

Legumes Pathology
Progress Report-15
(Restricted Circulation)

Legumes Pathology (Pigeonpea)

90010

RP

Report of Work
(June 1990-May 1991)



ICRISAT

Legumes Program

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

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LEGUMES PATHOLOGY (PISCEA)

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List of Approved Projects (1990)

No.	Title	Project Scientist(s)	Cooperators
LP 502(90)IC/IC	Management of phytophthora and alternaria blight and other stem and leaf diseases of pigeonpea	M.V. Reddy	D.H. Saith A.M. Ghanskar D.R. Butler R.P. Ariyanayagam Laxman Singh B.C. Gupta K.B. Saxena K.C. Jain C. Johansen Y.B. Chauhan
LP 503(90)IC/IC	Epidemiology and integrated control of pigeonpea wilt and sterility mosaic	M.V. Reddy A.M. Ghanskar	D.H. Saith D.R. Butler Y.B. Chauhan R.P. Ariyanayagam C. Johansen Laxman Singh K.C. Jain D.V.R. Reddy B.C. Gupta K.B. Saxena

I. SUMMARY

- 1) Disease situation in pigeonpea. Surveys by ICRISAT pathologists and reports from the Indian NARS pathologists indicate that sterility mosaic (SM) assumed serious proportions in the states of Maharashtra and Andhra Pradesh. Traditionally the disease was endemic in northern Indian states of Uttar Pradesh, Bihar and Gujarat and southern Indian states of Karnataka and Tamil Nadu. Disease surveys in Sri Lanka indicated that SM and yellow mosaic are widely prevalent but not serious. In Kenya, *Cercospora* leaf spot caused considerable damage in the experimental plots at Kenyan Agricultural Research Institute (KARI), Dryland Research Center, Katumani. Leaf spot was also found to be a problem in Malawi.
- 2) Disease nurseries at Patancheru and Gwalior. At Patancheru, evaluation of pigeonpea germplasm and breeding materials was carried against wilt, SM and phytophthora blight (PB). Combined screening for wilt and SM and wilt and Helicoverpa was also carried out. Evaluation was carried out in field plots and disease incidence in the susceptible checks in all the nurseries was very high (Table 1). This season PB incidence was relatively low. An usual observation made was that ICP 2376 which normally shows ring spot symptoms to SM has shown severe mosaic symptoms in patches in a wilt and SM nursery. Fusarium populations at sowing time and monthly intervals after sowing in different nurseries are given in Table 2. Fusarium population generally increased with time from sowing time in June to harvesting time in December. At Gwalior subcenter evaluation was carried out against SM and SM + wilt.
- 3) Evaluation of breeding materials for disease resistance. Evaluation of pigeonpea breeding materials in different generations against the major diseases has been one of the main activities of pathology. The materials screened for different diseases are listed in Table 3. A total of 4792 materials at Patancheru and 338 at Gwalior were evaluated during the season. The highlight of this season's evaluation is identification of few short-duration breeding lines resistant to phytophthora blight.
- 4) Evaluation of Ridomil MZ for phytophthora blight control. In an unreplicated field trial, the efficacy of Ridomil MZ (10% Metalaxyl + 48% Mancozeb WP) on PB was studied. At the normal dose of 3 g L⁻¹, it did not have much effect on the disease but at the higher dose of 6 g L⁻¹, 2-3 foliar sprays at 15 days interval starting from 15 days after sowing gave good control (Table 4).
- 5) Evaluation of new germplasm for disease resistance. 433 new accessions were evaluated for PB, SM and wilt resistance. Evaluation for PB and wilt resistance was done in fields and for SM in pots. The lines that showed promise against wilt,

PB and SM are listed in Table 5. ICP 14289 was the only line that was found promising against all the three diseases. There were several lines promising against one and two diseases.

6. Multilocation evaluation for disease resistance. Four trials, one each for PB, SM, wilt and multiple diseases were organized. For PB, 9 entries were sent to 8 locations and results were received from five locations (Table 6). For wilt, 24 entries were sent to 13 locations and results were received from eleven (Table 7). For SM, 14 entries were sent to 13 locations and results were received from ten (Table 8). For multiple diseases, 20 entries were sent to 9 locations and results were received from seven (Table 9). Data has not been received from all the locations but in each trial a few lines were found promising in multiple locations.
7. Evaluation of All India Coordinated Trial (ACT) entries against diseases. A total of 178 lines in different ACT's were evaluated against PB, SM and wilt (Table 10). Relatively, very few lines were promising for PB especially in the short-duration group. Several lines were promising for wilt and SM. The lines such as DPPA 85-3, DPPA 85-4, DPPA 85-8, and Kanpur local showed promise against all the three diseases.
8. Evaluation of pigeonpeas for wilt and SM resistance in a perennial system. In order to identify lines resistant to wilt and SM in a perennial system, 14 known wilt and SM resistant lines were sown in a wilt and SM nursery. In the first year, as expected, most of the lines remained promising for both the diseases (Table 11). At the end of the season, the lines were ratooned. The experiment will be continued for two more seasons.
9. Evaluation of lines from National Programs for disease resistance. Thirty breeding materials received from Dr. Batpute of Jawaharlal Nehru Krishi Viswa Vidyalaya (JNKV), Jabalpur were evaluated against wilt and SM. The results (Table 12) and the seed of the selected lines were sent to Dr Batpute. Twenty eight lines received from Dr Wanjare, Pulse Breeder, Punjabrao Krishi Vidyapeeth (PKV), Akola, were evaluated against wilt in pots following root-dip and transplantation inoculation technique (Table 13). One line (PRG 100), received from APAU Regional Research Station, Palam was evaluated against wilt in wilt sick plot. It showed 45% wilt.
10. Investigations on pathogenic variability in SM pathogen/mites vector. Eight differential lines were sent to 10 SM endemic locations in India, two locations in Nepal and one in Myanmar (Table 14). The results received so far from seven locations in India indicate variability in the pathogen across the locations. These differentials were also inoculated at Hyderabad with the isolates brought from four locations from

India (Table 15). This test also revealed variability between the isolates.

11. Pathogenic variability in Fusarium udum. Two separate trials were conducted on the pathogenic variability of E. udum. In one trial, 13 pigeonpea lines were tested against 13 isolates of E. udum following a root-dip and transplantation inoculation technique and considerable variation in the reaction of the lines across the isolates was found (Table 16). In another test, 10 lines were sent to 9 locations in India, one location in Kenya and two locations in Malawi (Table 17). Results from majority of the locations are yet to be received.
12. Infection and colonization of E. udum in pigeonpea. In a glasshouse experiment, the time needed for infection of pigeonpea by E. udum was determined in a set of three cultivars (one susceptible, one resistant, one short-duration). One week old seedlings were inoculated by root-dip method and transplanted in sterilized sand. Isolations were made from root, middle and top portions of the inoculated seedlings daily starting from one day after inoculation till 18th day after inoculation. The recovery of E. udum from resistant cultivar ICP 8863 was comparatively less than the other two cultivars (Table 18).

In a field experiment conducted in a Vertisol and an Alfisol wilt sick plot, isolations were also made from root, collar, middle and tip portions of the plants. Three varieties, representing one each of susceptible (ICP 2376), tolerant (C 11) and resistant type (ICP 8863) and a short-duration cultivar, ICPL 87 were used. Isolations were made at monthly intervals after sowing till maturity of the crop. E. udum could be isolated from all parts of the plant in all the cultivars from one month after sowing. The frequency of isolations from the root and collar portions was higher than from the middle and tip portions of the plant in the early stages of the plant growth (Table 19).

13. Effect of pigeonpea cultivars on E. udum population in soil. In Vertisol and Alfisol wilt sick plots, the influence of wilt susceptible, tolerant and resistant cultivars on E. udum population was studied. In all the cultivars, in both the soils, E. udum population generally increased with the increase in the age of the plant (Table 20).
14. Evaluation of pigeonpeas for macrophomina stem canker and root rot resistance. In collaboration with APAU, 200 pigeonpea germplasm accessions (ICP 1 to 330), were evaluated for resistance to the disease at Madhira in Khammam district, a 'hot-spot' location for the disease. A few lines such as ICP-29, ICP-41, ICP-43, ICP-64, ICP-79, ICP-81, ICP-95, ICP-102, ICP-113, ICP-130, ICP-131, ICP-132, ICP-147, ICP-151, ICP-163, ICP-167, ICP-178, ICP-182, ICP-202, ICP-219, ICP-238, ICP-268, ICP-294, ICP-305, and ICP-308 showed promise in

the preliminary evaluation.

15. Influence of cropping patterns and rotations on pigeonpea wilt incidence. In a Resource Management Program (RMP) experiment carried out in Alfisols and Vertisols at ICRISAT Center where in the different production systems are being studied, observations on both wilt incidence in pigeonpea and FUSARIUM WILT populations were recorded to study the influence of different systems on the disease and fungus.

Table 1. Final incidence of wilt, SM and PB in susceptible checks in different pigeonpea disease nurseries during 1990-91 at ICRIBAT Center, Patancheru and subcenter, Swalior.

Field	Disease(s)	Area (ha)	Susceptible check	Percent disease Average (range)	Frequency of susceptible check
ICRIBAT Center					
BIL 2A	Wilt	1.0	ICP 2376	99 (97-100)	1:2
BIL 2B	Wilt	1.75	LRS 30	100	Whole field
RM 6E	Wilt	0.3	ICP 2376	55	1:2
RP 1B	PB	1.11	ICP 7119	75	1:4
			ICP 2376	60	1:4
BIL 7C	SM	0.2	ICP 8863	100	1:10
BIL 7B	Wilt+	2.75	ICP 2376	100	1:2
	SM		ICP 8863	100	1:10
RM 3.2	Wilt+	0.1	ICP 2376	54	1:2
	SM		ICP 8863	100	1:10
BM 16C	Wilt+	1.0	ICP 2376	100	1:2
	<u>Helicoverpa</u>				
Swalior subcenter					
325	Wilt+	0.6	Bahar	100	1:1
	SM		ICP 8863	100	1:10
325B	SM	0.1	ICP 8863	100	1:10

* Wilt incidence is upto September 1990 only.

Table 2. *Erasmia* population of coming and pipemoss wilt incidence in susceptible cultivars at maturity in different wilt sick plots during 1990-91 at ICRIHT Center, Patancheru.

Field/Nursery	<i>Erasmia</i> population g^{-1} soil of coming ^{1,2}						Percent wilt at maturity (range)
	12-6-90	11-7-90	10-9-90	10-10-90	10-11-90	10-12-90	
Bil 2A (wilt nursery)	2310 (2050-2650)	2160 (1900-2300)	3130 (2350-3600)	3160 (2000-3000)	4430 (4130-4600)	3450 (3300-4750)	99 (97-100)
Bil 2B (wilt nursery)	2610 (1000-2430)	1990 (1730-2230)	2020 (1830-2100)	3350 (3032-3750)	5630 (3000-6450)	4230 (3230-5200)	100
Bil 7B (wilt+BM nursery)	2730 (2330-3050)	2560 (2050-3100)	2070 (2600-3400)	2020 (2500-3330)	5140 (4630-5650)	3060 (3330-4200) ³	100
RH 3C (wilt nursery)	2370 (1830-2830)	3000 (2830-3300)	3030 (3200-4200)	2400 (2130-2630)	4410 (3900-5230)	5050 (5330-6600)	54 ³
RH 8E (wilt nursery)	2510 (2200-2900)	2690 (2200-3730)	3770 (2800-4400)	3240 (2730-3500)	4130 (3400-4600)	5390 (4630-6000)	54 ³
RP 1B (blight nursery)	1090 (800-1450)	1440 (830-1900)	1630 (1300-2030)	2000 (1200-2600)	1290 (1050-1600)	3000 (1000-3900)	100
WH 16C (wilt+ <i>M. incognita</i> nursery)	2160 (1900-2330)	2190 (1330-2330)	2230 (1800-2430)	2000 (2400-3630)	3250 (4630-6030)	3730 (3400-5730)	100

1 Average *Erasmia* population with range in parentheses

2 Average of 5 replications

3 Wilt incidence upto September 1990

Table 3. List of pigeonpea breeding materials screened against different diseases during 1990-91 at ICRIBAT Center, Patancheru and subcenter, Swalior.

Disease	No. of lines screened
ICRIBAT Center	
Wilt	520
BM	56
Phytophthora blight	1134
Wilt + BM	1933
Wilt + Helicoverpa	149
Total	4792
Swalior subcenter	
Wilt + BM	200
BM	138
Total	338

Table 4. Effect of seed dressing and foliar sprays of Ridomil MZ at two different concentrations on Phytophthora blight incidence (%) in a short-duration pigeonpea cultivar ICPL 87 at ICRIBAT Center, Patancheru during 1990-91 (plot size 9.6 m², 60x10 cm).

Treatment	Infected plant (%)	Yield (kg ha ⁻¹)
Seed dressing + 1 foliar spray @ 3 g L ⁻¹	38	390
Seed dressing + 1 foliar spray @ 6 g L ⁻¹	32	364
Seed dressing + 2 foliar sprays @ 3 g L ⁻¹	28	458
Seed dressing + 2 foliar sprays @ 6 g L ⁻¹	14	1020
Seed dressing + 3 foliar sprays @ 3 g L ⁻¹	56	208
Seed dressing + 3 foliar sprays @ 6 g L ⁻¹	4	1395

Table 5. New pigeonpea germplasm accessions found promising for PB, SM and wilt during rainy season, 1990, ICRISAT Center, Patancheru.

A. Phytophthora blight (PB)

ICP 13892, 13893, 13894, 13895, 13896, 13897, 13898, 13899,
 13900, 13901, 13902, 13903, 13904, 13905, 13907, 13908,
 13909, 13910, 13911, 13912, 13913, 13915, 13916, 13917,
 13918, 13919, 13920, 13921, 13922, 13923, 13924, 13925,
 13926, 13927, 13928, 13929, 13930, 13932, 13933, 13934,
 13935, 13936, 13937, 13938, 13939, 13941, 13943, 13944,
 13945, 13946, 13991, 13992, 14009, 14022, 14023, 14024,
 14025, 14026, 14027, 14028, 14030, 14031, 14032, 14033,
 14034, 14035, 14036, 14037, 14039, 14040, 14041, 14042,
 14043, 14044, 14045, 14046, 14047, 14048, 14049, 14050,
 14051, 14052, 14053, 14054, 14055, 14187, 14188, 14190,
 14191, 14192, 14198, 14199, 14200, 14201, 14204, 14214,
 14216, 14222, 14226, 14287, 14289, 14292, 14293, 14412,
 14413, 14414, 14430, 14431, 14432, 14433, 14434, 14435,
 14437, 14438, 14487, 14488, 14489, 14494, 14495, 14499,
 14500, 14501, 14502, 14503, 14504, 14505, 14506, 14507,
 14508, 14509, 14510, 14511, 14512, 14513, 14514, 14516,
 14517, 14518, 14519, 14520, 14521, 14522, 14523, 14524,
 14525, 14526, 14527, 14528, 14529, 14531, 14533, 14534,
 14535, 14536, 14538, 14539, 14540, 14541, 14542, 14543,
 14544, 14545, 14546, 14547, 14548, 14549, 14450, 14551,
 14552, 14553, 14554, 14555, 14602, 14603, 14604, 14605,
 14606, 14607, 14608, 14609, 14610, 14611, 14612, 14613

B. Sterility mosaic (SM)

ICP 12805, 12812, 13508, 13720, 13908, 13914, 13915, 13932,
 13952, 13957, 13994, 13995, 14017, 14018, 14269, 14271,
 14276, 14280, 14283, 14284, 14289, 14290, 14292, 14399,
 14410, 14415, 14438, 14439, 14463, 14464, 14469, 14490,
 14492, 14493, 14494, 14500, 14503, 14504, 14506, 14507,
 14508, 14513, 14514, 14523, 14553, 14591, 14592,

C. Fusarium wilt

ICP 13933, 13934, 13935, 14198, 14287, 14289, 14516, 14517

Table 6. Percent blight in entries of IICUPPER (1990-1991) at different locations in India.

Entry	Boroda	IARI, New Delhi	ICRISAT, Patancheru	ICPMT, Pantnagar	Bokaro
ICP 8564	38	35	12	48	43
ICP 8610	19	18	4	11	36
ICP 8692	8	31	2	92	27
ICP 8921	19	24	2	57	78
ICP 9046	4	12	3	91	49
ICP 9252	33	47	3	49	57
ICP 12789	13	-	7	31	30
ICPL 84623	63	27	45	42	79
UPBR 80-2-1	12	0	0	13	7
ICP 7119 (PB Check)	100	100	79 (67-83)	90 (85-96)	63 (42-83)
ICP 2376 (PB Check)	63 (63-66)	100	57 (54-66)	63 (62-66)	77 (64-90)

Figures in parentheses indicate range.

Seeds not received from Kanpur, and Akola. At Varanasi the trial failed due to continuous heavy rains.

Table 7. Percent wilt in entries of ISUWHR (1970-71) at different locations in India.

Entry	1971										
	Badrnagar	Borsala	Gulbarga	Gwalior	Palancheru	Pudhottalai	Sohora	New Delhi	Dhali	Ranchi	Bahori
ICP 6997	92	29	89	100	93	20	30	11	47	8	94
ICP 8038	4	16	10	75	2	21	47	16	8	13	8
ICP 8099	21	21	6	94	4	13	27	11	7	20	10
ICP 8061	18	61	12	80	13	27	90	13	57	3	9
ICP 8062	31	23	24	93	40	13	34	13	44	7	14
ICP 8063	9	21	3	89	3	14	12	12	7	4	7
ICP 8064	82	8	33	97	23	16	20	14	21	8	8
ICPL 270	73	23	71	93	40	40	8	21	21	23	17
ICPL 87	36	26	39	82	39	10	23	12	25	20	44
DMR 144A	14	23	37	38	27	21	9	14	14	26	53
DMR 24	21	7	17	37	27	20	17	24	27	17	12
DMR 349	13	11	11	26	14	18	25	39	10	3	10
DMR 370	3	13	4	71	3	16	20	16	9	4	4
DMR 190	24	24	2	66	29	12	10	13	9	24	9
DMR 254	9	9	9	73	12	12	29	16	8	19	8
ICPL 8206A	66	14	3	90	12	26	24	26	7	7	13
SPMA 1	68	13	30	92	37	19	21	18	18	19	53
SPMA 6	73	14	84	91	38	24	23	24	16	29	11
SPMA 7	66	13	36	84	62	26	24	18	30	9	21
SPLA 6	37	16	30	6	17	12	19	12	19	3	7
SPLA 10	19	27	42	44	14	17	2	21	8	4	8
SPLA 11	46	8	33	67	19	17	7	21	12	16	12
ICPL 8043L	76	21	80	91	49	16	32	21	25	28	42
ICPL 87119	3	13	9	29	2	23	53	24	9	16	19
ICP 2376	100	94	98	100	93	45	33	37	37	33	100
(Wilt check)		(17-71)	(92-100)		(70-100)	(36-63)	(33-64)	(47-64)	(43-74)	(40-71)	
No. of lines with $\geq 10\%$ wilt	3	4	8	1	3	1	3				

Figures in parentheses indicate range.

Data not received from Kanpur, and Chianti.

Table 8. Percent BR in entries of *IBMP* (1990-91) at different locations in India.

Entry	Bodnagar	Baroda	Gulbarga	Guadlar	Patanchers	Kanpur	Pantnagar	Pudhittalai	Sholi Bahari	
ICP 2376	0	0	37	0	0	92	5	100	22	6
ICP 6997	0	0	4	0	0	14	67	20	9	14
ICP 7633	0	0	0	5	0	100	3	0	0	0
ICP 7234	3	0	13	0	2	31	0	33	14	9
ICP 7067	0	17	2	0	0	37	5	11	9	0
ICP 7098	0	0	33	0	6	81	7	61	20	7
ICP 8094	0	0	25	0	0	56	6	37	23	4
ICP 8062	0	0	3	3	14	32	31	0	5	0
ICP 10976	0	0	6	5	0	13	5	0	2	0
ICPL 366	3	0	4	0	0	99	6	5	9	0
ICPL 87119	0	0	30	0	0	90	52	47	12	3
ICPL 84631	0	0	0	95	100	89	36	22	7	63
ICPL 86403	0	0	0	0	3	67	32	16	19	0
ICPL 83672	0	0	0	0	3	83	12	17	23	4
ICP 8063 (BR check)	100	10 (0-33)	36 (22-46)	100	100	73 (39-97)	19 (9-63)	95 (66-100)	84 (74-94)	100

Figures in parentheses indicate range.

Data not received from Bangalore, Varanasi, and Ludhiana.

Disease incidence was low (5-10%) at Faizabad and Ranchi.

Table 9. Percent PB, SH and wilt in entries of IITPMR (1990-91) at different locations in India.

Entry	Badaagar		IARI, New Delhi		ICRISAT, Patancheru		Podukottai		Behara	Varanasi	Bahari		
	SH	Wilt	PB	Wilt	PB	SH	Wilt	SH	Wilt	PB	PB	SH	Wilt
ICP 7198	0	20	70	19	5	3	29	8	17	17	100	13	28
ICP 7200	14	16	16	18	6	18	8	39	13	29	48	20	9
ICP 8087	15	28	85	69	7	66	8	26	14	57	100	76	12
ICP 8103	3	93	73	27	9	2	81	7	13	15	50	53	90
ICP 8410	100	81	31	11	5	89	87	29	31	29	81	36	91
ICP 8492	38	92	85	15	6	33	92	16	38	13	81	93	93
ICP 8860	100	2	73	15	11	1	2	10	11	60	100	13	3
ICP 8861	0	21	100	15	59	2	23	0	17	100	100	0	8
ICP 8862	0	45	-	21	75	1	38	0	8	44	100	0	50
CP 8867	0	21	-	27	33	0	0	0	0	100	100	-	50
ICP 8869	0	20	92	18	66	0	6	5	11	68	100	25	11
CP 9080	77	83	-	-	6	15	97	27	27	47	69	100	86
ICP 9174	2	14	71	11	5	14	10	35	9	48	100	26	5
ICP 9199	34	88	-	16	3	43	93	61	34	29	81	77	39
ICP 9340	80	83	21	16	6	72	93	59	13	55	100	68	100
ICP 9739	60	26	56	17	7	100	81	20	20	39	100	58	50
ICP 10958	14	44	83	13	13	3	11	30	14	23	100	52	23
ICPL 227	19	9	73	13	5	8	12	62	6	44	100	39	24
CPL 87851	0	15	95	29	76	6	2	44	20	55	81	22	20
KPMR 80-2-2	12	23	0	24	11	5	6	23	22	16	69	30	14
ICP 7119 (PB check)	-	-	100	-	55	-	100	-	-	93	100	-	-
					(33-72)					(79-100)			
ICP 8376 (PB/wilt check)	-	100	100	-	100	-	-	-	57	94	100	-	100
									(46-74)	(88-100)			
CP 8863 (SH check)	100	-	-	-	-	100	-	76	-	-	-	100	-
								(56-100)					

- = Not recorded; Figures in parentheses indicate range.
Data not received from Kanpur, and Pantnagar.

Table 30. Percent PB, SN and Milt to ACT entries during 1990-1991 at HERBERT Center, Polk County.

Entries	Percent disease			Entries	Percent disease		
	PB	SN	Milt		PB	SN	Milt
EMCT				P 33	96	87	73
				P 605	95	90	68
AF 98	63	71	-	P 851	92	80	64
AL 13	83	80	-	P 852	95	85	61
AL 15	81	79	-	Kemper local (check)	38	8	13
AL 31	68	97	-	ICP 2376 (Milt check)	88	0	100
H 87-2	90	82	-	BN 1 (SN check)	81	100	62
H 87-7	96	6	-	ICP 7119 (PB check)	97	-	-
ICPL 83066	89	93	-	ICP 8863 (SN check)	-	100	-
ICPL 88823	100	83	-	ICP 2376 (Milt check)	100	-	100
ICPL 88823	91	100	-				
ICPL 88810	99	98	-	ACT1			
ICPL 87995	98	96	-				
ICPL 88801	100	94	-	CB 5	56	93	83
P 601	97	89	-	GMUT 82-104	31	32	74
P 604	93	94	-	GMUT 84-31	67	77	64
P 605	98	78	-	H 82-26	97	93	68
P 852	98	77	-	H 83-9	87	71	81
TAT 10(Ch)	96	92	-	H 84-14	88	97	82
TAT 14	83	67	3	ICPL 83824	100	3	11
WPM 120 (Ch)	82	89	89	ICPL 83845	98	97	-
Kemper local (Check)	33	7	2	ICPL 88826	100	98	-
ICP 2376 (Milt Check)	100	0	86	HTN 15	81	91	-
BN 1 (SN Check)	76	97	84	HTN 20	79	100	-
ICP 7119 (PB check)	83	-	-	Pant A 1-1	84	67	-
ICP 8863 (SN check)	-	100	-	Pant 84-248-4	89	70	-
ICP 2376 (Milt check)	87	-	100	Pant 102	90	87	87
				Pant 103	87	81	88
EMCT				Pant 104	88	80	78
				Pant 8505	87	8	81
AF 188	95	88	67	Pant 8507	89	14	88
AF 189	96	88	83	Pant 8508	98	8	79
AF 179	96	85	89	Pant 8509	77	29	79
H 81-22	96	90	77	Pant 8514	76	48	88
H 82-1	98	87	69	PMS 100	37	89	57
H 83-13	98	88	73	Pusa 1	63	28	56
H 83-12	97	93	85	Pusa 6	97	10	56
ICPN 8 (check)	96	97	83	Kemper local (check)	26	10	18
ICPL 87 (check)	96	6	38	ICP 2376 (Milt check)	88	0	100
ICPL 88831	100	41	40	BN 1 (SN check)	56	100	58
ICPL 88832	98	97	64	ICP 7119 (PB check)	93	-	-
ICPL 88843	100	98	78	ICP 8863 (SN check)	-	100	-
ICPL 86823	96	19	78	ICP 2376 (Milt check)	100	-	100
ICPL 88826	99	98	78				
Ramak (check)	94	86	93	ACT 2			
HTN 10	97	100	87				
BN 1	88	78	81	C 11 (check)	66	100	58
BN 2	89	73	86	CORG 11	89	23	97

Entries	Percent disease			Entries	Percent disease		
	PD	SH	Wilt		PD	SH	Wilt
COBE 14	92	22	90	Pigeonpea Promising Entries			
BNUT 82-38	28	94	94				
BNUT 82-98	22	73	90	BPPA 85-1	41	9	20
BNUT 82-104	27	39	93	BPPA 85-2	12	4	0
BNUT 83-17	43	98	83	BPPA 84-8-3	37	13	0
BNUT 85-28	34	55	91	BPPA 85-3	8	0	3
ICPL 227	34	4	4	BPPA 85-4	19	10	3
ICPL 85063	44	0	100	BPPA 85-5	11	7	11
ICPL 87119	51	3	0	BPPA 85-6	5	29	7
ICPL 88046	40	6	0	BPPA 85-7	37	3	0
ICPL 88047	30	14	7	BPPA 85-8	9	6	0
NHB 44	54	100	81	BPPA 85-9	29	15	0
NTH 21	57	100	7	BPPA 85-10	7	92	3
Pusa 16	85	0	50	BPPA 85-11	19	6	0
BPPA 6	52	100	10	BPPA 85-12	32	0	0
BPPA 8	55	100	14	BPPA 85-13	37	4	0
TUT 15	91	20	40	BPPA 85-14	28	3	0
Kanpur local (check)	14	6	0	BPPA 85-15	22	16	0
ICP 2376 (Wilt check)	97	5	100	BPPA 85-16	43	62	4
BN 1 (SH check)	71	91	70	ICP 2376 (Wilt check)	85	4	100
ICP 7119 (PD check)	100	-	-	BN 1 (SH check)	80	100	18
ICP 8863 (SH check)	-	100	-	ICP 7119 (PD check)	78	-	-
ICP 2376 (Wilt check)	85	-	100	ICP 8863 (SH check)	4	100	-
				ICP 2376 (Wilt check)	94	-	100
ACT 3							
				Pre-Rabi CVT entries			
BA 33	70	0	72				
BA 34	54	0	90	AGS 522	85	100	12
ICPL 371	38	8	85	BA 11	88	0	17
ICPL 83072	41	3	54	BNUT 82-58	88	100	9
KA 25	40	92	25	BNUT 85-14	81	100	41
KA 32-1	74	0	94	BNUT 86-7	88	100	8
NHB 88-1	37	0	74	NTH 9	46	100	11
NHB 88-2	17	0	24	NTH 12	34	100	4
NHB 89-1	21	6	4	Pusa 3	61	100	58
Pusa 4	27	37	22	Pusa 15	65	0	69
Pusa 8A	10	100	10	Pusa 17	83	7	77
Pusa 9	80	78	7	Pusa 18	90	0	84
Pusa 14	91	0	72	T 13-15	22	100	24
SPLA 1	29	71	25	Kanpur local (check)	16	27	0
SPLA 2	32	85	4	ICP 2376 (Wilt check)	74	0	96
SPLA 11	89	97	51	BN 1 (SH check)	72	100	15
ICP 2376 (Wilt check)	42	0	98	ICP 7119 (PD check)	100	-	-
BN 1 (SH check)	57	94	75	ICP 8863 (SH check)	-	100	-
ICP 7119 (PD check)	87	-	-	ICP 2376 (Wilt check)	59	-	100
ICP 8863 (SH check)	-	100	-				
ICP 2376 (Wilt check)	94	-	100				

Entries	Percent disease		
	PB	SM	Wilt
IET Early			
H 86-7	56	90	97
H 87-4	60	100	89
ICPL 86015	72	26	74
ICPL 87031	68	0	62
ICPL 87104	74	9	73
ICPL 89044	30	13	25
KE 1	56	100	75
MTH 22	30	90	61
MTH 23	44	89	38
P 606	80	29	94
P 607	79	89	86
Kanpur local (check)	3	6	6
ICP 2376 (Wilt check)	72	12	76
BDN 1 (SM check)	47	100	25
ICP 7119 (PB check)	100	-	-
ICP 8863 (SM check)	-	100	-
ICP 2376 (Wilt check)	60	-	100
IET-Medium			
GAUT 86-10	14	75	17
GAUT 87-6	13	86	4
JAS 148-10	27	100	42
KM 7	21	100	6
MTH 24	38	86	9
MTH 25	35	90	83
MTH 26	21	100	78
MTH 27	24	100	33
MTH 28	19	96	41
SPMA 1	41	100	13
SPMA 3	28	100	55
Kanpur local (check)	6	50	0
GAUT 85-18	12	31	11
GAUT 86-31	21	29	4
GAUT 87-8	17	100	59
GAUT 89-17	26	13	100
ICP 2376 (Wilt check)	91	15	100
BDN 1 (SM check)	50	100	40
ICP 7119 (PB check)	88	-	-
ICP 8863 (SM check)	-	100	-
ICP 2376 (Wilt check)	98	-	100
- = Not received.			

Table 11. Evaluation of pigeonpea lines for wilt and BM resistance in a perennial system, ICRISAT Center, Patancheru, rainy season 1990 (Reps 4, RC8, plot size 4.8 m²).

Entries	Average disease (%)		Average yield (kg ha ⁻¹)
	Wilt	BM	
ICP 7198	30 (32)	11 (19)	1206
ICP 8094	7 (13)	3 (7)	2355
ICP 8859	9 (18)	85 (68)	679
ICP 8860	5 (12)	2 (4)	2574
ICP 8862	56 (49)	5 (10)	422
ICP 8867	2 (0.4)	0 (0.5)	184
ICP 9174	5 (11)	4 (10)	2622
ICP 11289	4 (8)	3 (10)	1409
ICP 11290	23 (27)	8 (24)	1143
ICP 11291	17 (24)	1 (2)	2008
ICP 11298	11 (18)	1 (5)	2364
PR 5149 Sel.	3 (7)	0 (2)	2096
PI 397430 Sel.	6 (13)	0.5 (2)	2155
ICPL 227	1 (5)	3 (9)	1779
LRG 30	92 (74)	100 (90)	0
ICP 8863	5 (10)	100 (90)	710
SE +	5.2 (4.3)		236.3
CV (%)	61 (43)		31.9

Figures in parentheses are angular transformed values.

Table 12. Reaction of pigeonpea breeding lines from Jabalpur to fusarium wilt and sterility mosaic at ICRISAT, Patancheru, 1990-1991.

Cultivars (cross)	Average percent SM	Average percent wilt
F2		
ICPL 335 X T 21	77.1	42.6
ICPL 8362 X T 21	77.2	70.4
ICP 7035 X T 21	67.3	65.1
ICP 4769 X T 21	79.7	43.1
ICPL 335 X NO 148	73.5	66.2
ICP 8362 X NO 148	77.3	62.7
ICP 7035 X NO 148	63.6	70.7
ICP 4769 X NO 148	50.4	66.1
ICPL 335 X JAS 87-1	26.7	32.0
ICPL 8362 X JAS 87-1	30.2	8.6
ICP 7035 X JAS 87-1	13.5	46.6
ICP 4769 X JAS 87-1	21.9	37.1
BC1F2		
(ICPL 335 X T 21) T 21	88.7	86.9
(ICPL 8362 X T 21) T 21	93.7	74.5
(ICPL 335 X NO 148) NO 148	80.1	89.2
(ICPL 8362 X NO 148) NO 148	87.9	58.0
F3		
ICPL 335 X T 21	71.0	54.6
ICPL 8362 X T 21	74.7	48.7
ICPL 335 X NO 148	73.9	36.5
ICPL 8362 X NO 148	59.8	34.0
ICPL 335 X JAS 87-1	19.8	23.8
ICPL 8362 X JAS 87-1	30.7	7.6
ICP 4769 X JAS 87-1	27.8	27.0
Parental lines		
T 21	98.8	93.4
NO 148	100.0	98.2
JAS 87-1	3.9	90.2
ICPL 335	2.9	2.6
ICPL 8362	1.5	1.6
ICP 7035	5.0	18.1
ICP 4769	1.5	6.5
ICP 8863 (SM check)	100.0	-
ICP 2376 (Wilt check)	-	100.0

Table 13. Reaction of pigeonpea accessions from Akola to fusarium wilt ICRISAT Center, Patancheru (pot culture screening) 1990-91.

Entry	Average percent wilt
AK 2-1	100
AK 2-2	100
AK 2-3	90
AK 2-5	100
AK 6-2	20
AK 6-3	30
AK 6-4	10
AK 6-5	0
AK 6-6	10
AK 8-2	90
AK 8-3-1	100
AK 8-3-2	60
AK 8-3-3	50
AK 9-1	80
AK 9-2	70
AK 9-3	100
AK 9-4	60
AK 9-5	40
AK 9-6	70
AK 9-7	70
AK 10-3	70
AK 10-4	90
AK 10-5	90
AK 10-7	90
AK 10-8	100
AK 10-9	80
AK 10-14	90
AK 10-15	60
ICP 2376 (Wilt check)	100

Table 14. Reaction of pigeonpea sterility mosaic differentials to SM at different locations in

Entry	Bahapur	Coimbatore	Gwalior	Patancheru	Kanpur	Pudukkottai	Dhali
ICP 2376	MR	S	R	MR	S	S	S
ICP 7033	R	R	R	R	S	R	R
ICP 8862	S	S	R	R	S	R	R
ICP 8863	S	S	S	S	S	S	S
ICP 10976	R	S	R	R	S	R	R
ICP 11164	MR	R	R	R	S	S	S
Bahar	MR	R	R	R	MR	R	MR
Purple 1	MR	R	MR	S	S	R	R

R = Resistant (no apparent symptoms with 0-10% mosaic incidence)

MR = Moderately resistant (ring spot symptoms with 11-20% mosaic incidence)

S = Susceptible (more than 20% severe mosaic incidence)

Data not received from Bangalore, Kumargunj, and Pantrager

Table 15. Reaction of pigeonpea sterility mosaic differentials to different isolates of SM from India (pot experiment in Hyderabad city) during 1990/91.

Entry	ICRISAT			
	Bangalore	Coimbatore	Gwalior	Patancheru
ICP 2376	S	S	R	R
ICP 7033	R	S	R	R
ICP 8862	S	MR	MR	R
ICP 8863	S	S	S	S
ICP 10976	R	S	R	R
ICP 11164	R	S	R	R
Bahar	R	R	R	R
Purple 1	S	S	MR	S

R = Resistant (no apparent symptoms with 0-10% mosaic incidence)

MR = Moderately resistant (ring spot symptoms with 11-20% mosaic incidence)

S = Susceptible (more than 20% severe mosaic incidence)

Table 1A. Reaction of pigeonpea wilt differential lines to different isolates of *Ascochyta blight* at ICRISAT Center, Patancheru (pot test) 1990-91.

Differential cultivar	Percent wilt ¹												
	Anni- Soda-			IMR1				Jabal-		Kalyan-			
	Abala	geri	pur	Dharach	Shali	Omaliar	Patancheru	Bulhi	pur	Jaina	pur	Varanasi	Raheri
ICP 2376	35	93	93	70	68	70	65	85	30	73	78	50	90
ICP 8858	28	63	43	35	53	33	3	73	25	48	68	28	18
ICP 8899	3	15	0	0	0	40	8	0	0	3	0	0	0
ICP 8862	20	40	40	20	27	36	5	38	15	50	31	27	0
ICP 8863	0	25	0	0	3	25	13	0	0	0	5	3	0
ICP 9145	23	73	98	33	19	33	18	30	23	95	33	30	20
ICP 9174	18	60	30	3	8	25	0	0	0	33	0	3	10
C 11	0	6	-	3	13	40	8	18	0	3	20	5	0
BON 1	5	5	3	0	5	28	8	18	0	10	0	0	0
BON 2	3	8	15	8	10	36	13	25	5	10	13	13	0
LRS 50	100	100	90	80	100	100	80	100	80	90	90	100	100
T 21	48	95	90	55	65	5	60	85	60	40	84	80	85
7	82	90	75	65	65	15	90	60	45	73	75	90	90
3	95	90	65	60	65	10	65	95	30	45	95	75	100
Nakta	55	85	55	50	50	5	70	65	30	40	73	73	90

¹ = Average of 4 tests.

Table 17. Percent wilt incidence in pigeonpea wilt differentials at different locations in India during 1990-91.

Entry	Percent wilt			
	Badnapur	Gulbarga	Gwalior	Rahuri
ICP 2376	98	100	100	100
ICP 8858	12	8	72	33
ICP 8859	3	8	74	21
ICP 8862	28	11	90	55
ICP 8863	3	0	52	5
ICP 9145	15	11	57	17
ICP 9174	3	19	0	9
C 11	41	37	86	90
BDN 1	80	54	81	97
BDN 2	48	34	77	93

Data not received from Kanpur, Behore, Pudukkottai, S.K. Nagar and Patancheru from India, Katumani (Kenya), Bvumba and Lilongwe (Malawi).

Table 18. Infection and movement of *E. udum* in three pigeonpea cultivars after inoculation by root-dip inoculation and transplanting technique, ICRISAT Center 1990-91.

Infection and colonization of <i>E. udum</i> in different parts of plant									
Days after inoculation	ICP 2376			ICP 8863			T 21		
	Root	Middle	Tip	Root	Middle	Tip	Root	Middle	Tip
1	-	-	-	-	-	-	-	+	-
2	-	-	-	-	-	-	-	-	-
3	+	-	-	-	-	-	+	+	-
4	+	+	-	+	+	-	+	+	-
6	+	-	-	+	-	-	+	+	+
7	+	+	-	+	-	-	+	-	+
8	+	+	-	+	+	-	+	+	+
9	+	+	-	-	-	-	-	-	-
10	+	+	+	+	+	+	+	+	+
13	+	+	+	+	+	-	+	+	+
14	+	+	+	+	-	-	+	+	+
15	+	+	+	-	-	-	+	-	-
16	+	+	-	+	+	-	+	-	-
17	+	+	+	-	-	-	+	+	+
18	+	+	+	+	-	-	+	+	+

+ = Presence of *E. udum*, - = Absence of *E. udum*

Table 19. Infection and movement of *E. ulmi* in four pigeonpea cultivars planted in Alfisol and Vertisol silt silt plots at ICRISAT Center, 1990-91.

Cultivar	Isolation source (part of the plant)	Frequency (%) of <i>Escherichia ulmi</i> isolated ¹										
		Vertisol (DIL 20)					Alfisol (DP 10)					
		11-7-90	13-8-90	12-9-90	10-10-90	10-11-90	20-12-90	14-8-90	13-9-90	10-10-90	10-11-90	10-12-90
ICP 0063	Root	00	33	33	33	0	93	73	60	26	0	46
	Collar	00	40	46	46	66	60	46	93	66	26	00
	Middle stem	13	6	0	26	26	60	20	13	20	13	6
	Tip	6	0	0	13	26	53	33	33	20	13	13
C 11	Root	33	40	66	13	6	66	6	26	26		Plants wilted/ harvested
	Collar	00	66	33	33	20	06	93	40	40		*
	Middle stem	60	20	20	33	33	26	40	46	6		*
	Tip	0	20	6	46	20	20	6	46	0		*
ICPL 87	Root	60	66	13	46	46	60	00	33	20		*
	Collar	93	73	60	66	40	60	60	46	6		*
	Middle stem	20	33	6	40	20	46	13	33	20		*
	Tip	0	13	20	40	20	73	26	53	6		*
ICP 2376	Root	66	60	73	26	20	06	66	00	13		*
	Collar	73	33	00	33	33	66	00	100	20		*
	Middle stem	6	6	33	40	33	40	33	26	26		*
	Tip	6	26	26	20	0	26	33	40	20		*

¹ = Mean of three replications.

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Table 20. Effect of pigeonpea cultivars on population of *E. winitii* in Alfisol and Vertisol wilt sick plots at ICRISAT Center, 1990/91.

		<i>E. winitii</i> propagules g ⁻¹ soil and wilt incidence						
		Vertisol						
Cultivar		10-6-90	11-7-90	13-8-90	12-9-90	10-10-90	16-11-90	20-12-90
ICP 0063	Fungus population	2383	2783	2533	3900	4700	3366	4383
	Wilt incidence	-	-	-	0	0	2	-
C 11	Fungus population	2383	2783	2567	4333	-	4283	4383
	Wilt incidence	-	-	-	24	38	79	88
ICPL 87	Fungus population	2633	2783	2617	4666	5100	4533	4383
	Wilt incidence	-	-	-	0	0	2	4
ICP 2376	Fungus population	2383	2783	2633	4233	-	6183	4383
	Wilt incidence	-	-	-	27	40	94	100

		<i>E. winitii</i> propagules g ⁻¹ soil and wilt incidence (%)					
		Alfisol					
Cultivar		11-7-90	14-8-90	13-9-90	10-10-90	16-11-90	10-12-90
ICP 0063	Fungus population	1290	1523	1477	2100	2600	3427
	Wilt incidence	-	-	0	0	5	12
C 11	Fungus population	1327	1543	1497	2060	2900	3520
	Wilt incidence	-	-	3	3	13	19
ICPL 87	Fungus population	1430	1547	1403	2100	2917	3590
	Wilt incidence	-	-	0	0	2	14
ICP 2376	Fungus population	1573	1522	1373	2337	2780	4530
	Wilt incidence	-	-	0	0	14	21

III. PUBLICATIONS

Gupta, S.C., Jain, K.C., Saxena, K.B., Reddy, M.V., and Lateef, S.S. 1990. ICPL 85059 - A short duration dwarf pigeonpea line. International Pigeonpea Newsletter 12: 6-9.

Gupta, S.C., Jain, K.C., Saxena, K.B., Reddy, M.V., Lateef, S.S., Sharma, D., Faris, D.S., Nene, Y.L., and Lakshman Singh. 1990. Registration of a short duration dwarf pigeonpea germplasm line ICPL 85059. Crop Science (submitted).

Raju, T.N. and Reddy, M.V. 1990. Integrated management of phytophthora blight of pigeonpea. Paper presented at the Indian Phytopathological Society, Central Zone Chapter Annual Meetings, 29-30 Noveer, 1990, Rajendranagar, Hyderabad, India.

Reddy, M.V. 1990. Disease problems of pigeonpea in East Africa - Progress and future research needs. Paper presented at the first EARCAL pigeonpea scientists meet, 25-30 June, 1990, Nairobi, Kenya.

Reddy, M.V., Nene, Y.L., Raju, T.N., Bheila, V.K., Barker, N., Remanandam, P. and Amin, K.S. 1991. Pigeonpea lines field resistant to phytophthora blight. International Pigeonpea News Letter 13: (in press).

Reddy, M.V., Raju, T.N. and Nene, Y.L. 1991. Appearance of a new strain of pigeonpea sterility mosaic pathogen. International Pigeonpea Newsletter (submitted).

Reddy, M.V., Raju, T.N. and Saxena, K.B. 1991. Effectiveness of hill plots in screening pigeonpea for resistance to fusarium wilt. Indian Journal of Pulses Research. (submitted, ICRISAT Journal Article No. 1188).

Reddy, M.V., and Singh, K.B. 1990. Relationship between temperature, relative humidity and ascochyta blight development in winter sown chickpea in Syria. Phytopath. Medet. (accepted).

Reddy, M.V. and Singh, K.B. 1990. First report of slow blighting resistance in chickpea to ascochyta blight. Plant Disease (submitted).

Saxena, K.B., Swami Rao, T., and Reddy, M.V. 1991. ICPL 87051 - A white, bold seeded, wilt and sterility mosaic tolerant line of pigeonpea. International Pigeonpea Newsletter 13: (in press).

Singh, K.B. and Reddy, M.V. 1990. Advances in disease resistance in chickpea. Advances in Agronomy (accepted).

prog.mvr/29-1-1991