INTERNATIONAL PEARL MILLET DISEASE RESISTANCE TESTING PROGRAM (IPMDRTP)
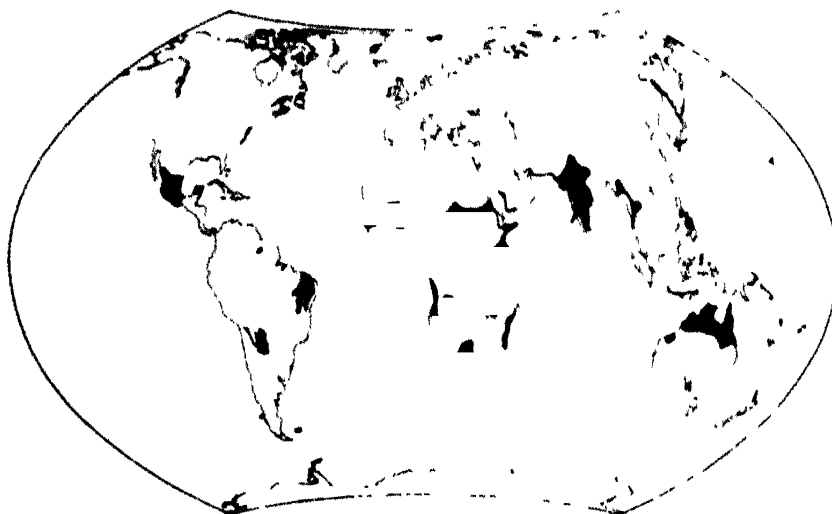
PROGRESS REPORT· PM Path -79

REPORT OF THE 1982 INTERNATIONAL PEARL MILLET RUST NURSERY (IPMRN)

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ABSTRACT

The 1982 International Pearl Millet Rust Nursery (IPMRN), containing 45 entries, was sent to cooperators at seven locations in India. The results were received from five locations. Screening of test entries was effective at Pudukottai, Bhavanisagar and Ludhiana. Three entries -- P-1581, 700481-21-8 and 700481-23-2 developed ≤10 percent rust at all locations. Several other entries averaged ≤10 percent across location mean rust and included 700481-22-8, IP-2084-1, Souna Mali, IP 1564, P 542 and 700481-33-1 that had shown high levels of rust resistance in previous years' IPMRN trials. Among the new entries P-2950 and P-618 performed well.
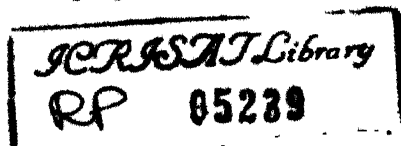
RESUME

En 1982, la Pépinière internationale de la rouille de petit mil (IPMRN) comprenant 45 entrées a été expédiée aux coopérateurs à sept points d'essai en Inde; nous avons reçu les résultats de cinq emplacements. Le criblage des entrées a donné des résultats satisfaisants à Pudukottai, à Bhavanisagar et à Ludhiana. Chez trois entrées dont P-1581, 700481-21-8 et 700481-23-2, l'incidence de rouille n'a pas dépassé 10%. D'autres entrées, notamment 700481-22-8, IP-2084-1, Souna Mali, IP 1564, P 542 et 700481-33-1 qui ont manifesté une forte résistance à la rouille dans les années précédentes, ont révélé une incidence moyenne de ≤ 10%. Parmi les nouvelles entrées, P-2950 et P-618 ont donné de bons résultats.

INTERNATIONAL PEARL MILLET RUST NURSERY

(IPMRN)

INTRODUCTION

One of the major objectives of the ICRISAT Pearl Millet Pathology Program is to identify broad-spectrum stable resistance to the important pearl millet diseases. The approach adopted to meet this objective is to expose promising lines to many populations of the pathogens under wide range of environmental conditions. In 1977 a Preliminary Pearl Millet Rust Nursery (PPMRN) with 74 test entries selected in two seasons' screening at Hyderabad and Bhavanisagar was tested at six locations in India with the help of cooperators. Considerable interest was shown in this nursery and requests were received from additional scientists to participate in the nursery. In view of this, the International Pearl Millet Rust Nursery (IPMRN) was initiated in 1978. In 1982 the trial was sent to cooperators at seven locations in India. At the time of preparation of this report results were received from five locations.

A brief report on results is given here so that breeders and pathologists can make use of the data in planning their future activities.

TEST LOCATIONS AND COOPERATORS

Details of the test locations and cooperators from whom results were received by Feb. 28, are given in Table 1. The locations represent an excellent coverage of Indian locations where severe rust pressure occurs annually.

ENTRIES

The trial contained 45 entries including 20 germplasm lines selected at ICRISAT and Bhavanisagar, and 25 best entries from the 1981 IPMRN. The cooperators were invited to include a loc susceptible check as an indicator of local rust pressure.

SCREENING AND SCORING METHODS

All screening was conducted under natural rust occurrence. The incidence assessment was made using Cobb's modified scale. A visual score of 20 plants per entry, randomly selected, in each replication was taken and an average was calculated. The rust scores of lower and upper leaves (top four leaves) were taken separately.

RESULTS

Detailed data for the lower and upper leaves for all locations by replication are presented in Tables 2-4. However, the results obtained from the top four leaves only are being explained here since they are of most importance in contributing to yield.

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Rust Pressures at Test Locations

A summary of mean rust infection based on the two replications for all locations is presented in Table 5. Entries were ranked on the maximum rust incidence values obtained at any location. Where maximum rust incidence values were the same for more than one entry, these entries were ranked on across location mean incidence values.

Kovilpatti: Rust pressure was low. However, no entry was rust free. Twenty entries developed 5 percent rust and with the exception of D-212P1, P-29, P-107 and P-105 all the remaining entries had <10 percent rust. Susceptible check averaged 19 percent mean rust.

Hissar: Five entries -- 700481-21-8, P-1581, 700481-22-8, P-1592, and D-212P1 were rust free and 7 entries averaged less than 5 percent rust. In the remaining entries rust incidence ranged from 5-25 percent. Susceptible check averaged 25 percent mean rust.

Ludhiana: Two entries -- IP-537B and P-1578 were rust free and 31 entries developed less than 5 percent rust. All the other entries except P-1449 had <10 percent rust. Suceptible check averaged 34 percent.

Bhavanisagar: Six entries including 700481-21-8, P-1581, 700481-33-1, D-212P1, P-544 and P-545 were rust free and all the remaining entries except P-1449, P-1632 and P-569 had less than <10 percent rust incidence. Susceptible check averaged 35 percent rust.

Pudukkottai: No entry was rust free and only three entries --
700481-21-8, 700481-23-2 and P-1581 developed less than 10 percent
rust. The mean rust incidence in the remaining entries ranged from
10-60 percent. Susceptible check also developed severe rust (56%).

Performance of Entries Across Locations

No entry was rust free at all locations. Three entries --
700481-21-8, 700481-23-2 and P-1581 had less than 10 percent mean rust
at all locations. Twelve entries averaged less than 10 percent across
location mean. However all these entries had more than 10 percent
rust, atleast at one of the locations, generally at Pudukkottai. The
majority of the test entries were susceptible at Pudukkottai.

OTHER DISEASES

Downy mildew (DM): Records on DM natural occurrence were taken
at Hissar, Kovilpatti and Pudukkottai. At Pudukkottai only one
entry--collection 91, developed DM (3%). At Kovilpatti and Hissar
also majority of the entries were either free or had less than 5
percent DM with the exception of 700481-7-5 and collection-99 at
Kovilpatti and 700481-21-8, 700481-22-8, P-542, and P-618 at Hissar.

Ergot: Records on ergot incidence were taken at Hissar,
Kovilpatti, and Pudukkottai. Ergot was most severe at Hissar where
most of the entries developed moderate to severe ergot. At the other
two locations most of the entries were either free or had less than 10
percent ergot Table 6.

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Smut: Natural smut occurred only at Hissar. One entry P-1564 was smut free and P-1577 had 10 percent smut. Other entries developed moderate to severe smut. Susceptible check developed 46 percent mean smut incidence.

DISCUSSION

Natural rust pressure was severe at Pudukkottai and adequate at the other locations, except Kovilpatti. Thus the screening of test entries has been effective. Stability of rust resistance was confirmed in several entries including 700481-21-8, 700481-23-2, P-1581, IP-2084-1, 700481-22-8, IP-537 B, Souna Mali and D-212P1 which have shown high levels of rust resistance in previous years' trials. Of the entries that were included for the first time P-1596, P-1577, P-618, 1592, P-2890 and P-615 have shown high levels of rust resistance. The majority of the best performing entries are of West African origin.

Several entries have shown distinct differential reactions among locations. These entries will be retested in the 1983 IPMRN to confirm their rust reactions.

The 1983 IPMRN

The IPMRN will be continued in 1983. Several new sources of resistance that performed well at Bhavanisagar during 1982 will be included. Entries for this trial are welcome from scientists in the national programs provided they have been shown to be rust resistant at the home locations.

SEED SUPPLY

Scientists who want seed of any entry listed in this report should send a request to the Millet Pathologist at ICRISAT (address given inside back cover of this report) indicating that seed request is from the 1982 IPHRN.

Table 1. Test locations and cooperators in the 1980 IPHRN

Locations	Cooperators
Ludhiana	S.S. Chahal
Hissur	D.P. Thakur
Bhavanisagar	S.D. Singh and P.M. Reddy
Pudukkottai	S. Muthusamy
Kovilpatti	D.S. Aaron

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Table 2. Percent mean rust incidence in 45 1982 IPMRN entries and local
susceptibles at Kovilpatti and Hissar

| Entry | Kovilpatti | | | | Hissar | |
| | Lower leaves[a] | | Upper leaves [a] | | Upper leaves [a] | |
	R1	R2	R1	R2	R1	R2
700481-7-5	10	10	5	5	10	5
700481-21-8	5	10	5	5	0	0
700481-22-8	10	10	5	5	-	0
700481-23-2	25	5	5	5	0	5
700481-33-1	10	10	5	5	10	25
700481-35-5	10	10	10 *	5	10	0
Souna Mali	40	10	10	5	5	0
Collection-75	25	25	10	10	10	0
Collection-91	10	10	10	5	5	5
IP-537-B	5	10	5	5	25	-
IP-2084-1	5	5	5	5	10	5
D-212-P1	40	5	25	5	0	0
P-15	10	40	5	5	25	0
P-24	25	40	5	5	5	5
P-29	40	25	25	5	5	5
P-105	40	40	25	10	5	5
P-107	65	5	25	5	40	5
P-140	10	25	5	5	10	5
P-182	10	5	10	5	5	5
P-208	40	25	5	5	5	0
P-542	10	10	5	5	10	5
P-543	65	40	10	5	0	5
P-544	25	25	10	10	40	10
P-545	25	40	10	5	-	10
P-546	10	40	10	10	5	25
P-548	10	40	5	10	-	5
P-553	40	40	10	10	5	10
P-568	25	10	5	5	10	5
P-569	5	10	5	5	25	0
P-615	10	10	5	5	40	5
P-618	5	10	5	5	25	5
P-1449	40	25	10	10	5	5
P-1551	65	40	10	10	5	5
P-1564	5	25	5	5	0	5
P-1577	25	25	5	5	5	0

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Table 2. (Contd..)

| entry | Kovilpatti | | | | Hissar | |
| | Lower leaves [a] | | Upper leaves [a] | | Upper leaves [a] | |
	R1	R2	R1	R2	R1	R2
P-1578	10	40	10	5	10	40
P-1581	10	5	5	5	0	-
P-1588	40	40	10	5	10	25
P-1592	25	25	10	5	0	0
P-1596	10	10	10	5	0	0
P-1630	40	10	10	10	5	0
P-1632	25	25	10	5	0	40
P-2880	25	25	10	5	25	25
P-2890	65	40	10	10	5	5
P-2950	10	-	5	-	25	10
Location mean for entries	24	21	9	6	10	7
Local susceptibles [b]	46	45	25	13	29	21

a   Means calculated before values were rounded-off.
b   Mean   of five plots in each replication.

Note: Lower leaves observation was not recorded at Hissar.

Table 3. Percent mean rust incidence in 45 1982 IPMRN entries and local
susceptibles at Ludhiana and Bhavanisagar

Entry	Ludhiana				Bhavanisagar			
	Lower leaves[a]		Upper leaves[a]		Lower leaves[a]		Upper leaves[a]	
	R1	R2	R1	R2	R1	R2	R1	R2
700481-7-5	40	20	7	6	5	8	1	1
700481-21-8	2	-	1	-	0	0	0	0
700481-22-8	5	5	<1	3	5	10	3	1
700481-23-2	60	20	10	4	5	10	1	4
700481-33-1	5	10	<1	3	0	0	0	0
700481-35-5	50	5	9	<1	10	8	8	4
Souna Mali	5	2	<1 *	<1 * *	-	18	-	5
Collection-75	20	40	6	10	18	10	11	3
Collection-91	50	5	12	1	10	-	5	-
IP 537-B	5	5	0	0	5	8	0	2
IP-2084-1	20	30	4	6	5	5	1	1
D-212-P1	50	50	11	9	0	0	0	0
P-15	0	10	0	1	10	8	4	3
P-24	10	5	1	1	0	10	0	2
P-29	0	10	<1	1	18	-	7	-
P-105	5	10	1	1	33	18	12	7
P-107	10	10	2	2	5	33	0	13
P-140	50	30	7	6	25	25	11	3
P-182	5	5	2	0	3	5	1	1
P-208	0	5	<1	1	8	5	3	1
P-542	20	0	5	0	5	8	5	1
P-543	20	0	4	0	5	10	4	3
P-544	50	10	9	3	5	5	0	0
P-545	5	20	2	4	5	-	0	-
P-546	20	20	5	3	25	8	11	4
P-548	0	10	<1	3	10	5	1	0
P-553	0	10	<1	4	5	10	1	2
P-568	30	5	7	<1	-	-	-	-
P-569	50	5	10	<1	25	-	13	-
P-615	20	2	6	1	5	5	4	1
P-618	5	20	<1	4	5	25	4	5
P-1449	80	80	23	26	33	10	18	6
P-1551	10	20	4	3	-	-	-	-
P-1564	0	5	<1	<1	8	5	1	1
P-1577	20	0	7	<1	8	8	2	1

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Table 3 (Contd..)

Entry	Ludhiana				Bhavanisa ar			
	Lower leaves[a]		Upper leaves[a]		Lower leaves[a]		Upper leaves	
	R1	R2	R1	R2	R1	R2	R1	R2
P-1578	2	0	0	0	-	5	-	3
P-1581	10	5	3	<1	0	3	0	0
P-1588	40	10	13	2	18	-	9	-
P-1592	0	-	<1	-	8	0	2	0
P-1596	0	0	<1	0	10	8	1	5
P-1630	10	30	3	4	10	10	6	3
P-1632	20	0	3	0	-	25	-	11
P-2880	20	20	3	5	5	18	3	9
P-2890	0	5	<1	<1	8	10	4	3
P-2950	20	10	5	2	10	5	7	1
Location mean for entries	19	13	4	3	9	9	4	3
Local susceptibles[b]	69	60	36	32	59	73	35	35

a Means calculated before values were rounded-off.
b Mean of five plots in each replication.

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Table 4. Percent mean rust incidence in 45 1982 IPMRN entries and local susceptibles at Pudukkottai

Entry	Pudukkottai			
	Lower leaves[a]		Upper leaves[a]	
	R1	R2	R1	R2
700481-7-5	40	33	40	26
700481-21-8	2	8	1	5
700481-22-8	25	18	20	5
700481-23-2	18	8	11	3
700481-33-1	18	8	23	5
700481-35-5	25	65	17	65
Souna Mali	65	40	40	14
Collection-75	65	53	31	55
Collection-91	40	53	37	42
IP-537-B	40	25	26	18
IP-2084-1	25	40	6	17
D-212-P1	53	25	34	25
P-15	40	18	22	14
P-24	53	40	35	37
P-29	25	53	14	49
P-105	65	65	56	51
P-107	65	53	55	33
P-140	65	40	45	33
P-182	53	33	38	24
P-208	65	-	48	-
P-542	40	40	23	43
P-543	65	65	42	51
P-544	65	65	62	57
P-545	65	65	43	53
P-546	25	65	25	40
P-548	53	25	39	10
P-553	40	53	23	40
P-568	65	65	34	49
P-569	40	65	18	52
P-615	18	45	12	19
P-618	18	40	8	14
P-1449	-	65	-	45
P-1551	65	65	53	51
P-1564	-	53	-	28
P-1577	25	40	9	26

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Table 4. (Contd..)

Entry	Lower leaves[a]		Upper leaves[a]	
	R1	R2	R1	R2
P-1578	65	65	33	50
P-1581	0	33	0	14
P-1588	65	65	65	55
P-1592	8	40	12	26
P-1596	40	40	24	28
P-1630	35	40	33	46
P-1632	65	53	49	47
P-2880	-	53	-	49
P-2890	25	65	24	39
P-2950	-	40	-	20
Location mean for entries	42	45	30	33
Local susceptibles[b]	65	65	55	58

The header "Pudukkottai" spans all four data columns.

a Means calculated before values were rounded-off.
b Means of five plots in each replication.

Table 5. Percent mean rust incidence, location mean and range of 45 IPMRN entries and means of local susceptibles at five locations during 1982 rainy season

Entry	Kovil-patti	Hissar	Ludhi-ana	Bhavani-sagar	Puduk-kottai	Mean[a]	Range[b]
700481-21-8	5	0	1	0	3	2	0-10
700481-23-2	5	3	7	2	7	5	1-10
P-1581	5	0	2	0	7	3	0-14
IP-2084-1	5	8	5	1	11	6	1-17
700481-22-8	5	0	1	2	12	4	0-20
P-2950	5	18	3	4	20	10	1-20
700481-33-1	5	18	1	0	14	8	0-23
P-15	5	13	1	4	18	8	0-25
P-618	5	15	2	4	11	7	1-25
P-1592	8	0	<1	1	19	6	1-26
P-1577	5	3	4	2	17	6	0-26
P-1596	8	0	<1	3	26	7	0-26
IP-537-B	5	25	0	1	22	11	0-26
P-1564	5	3	<1	1	28	7	1-26
D-212-P1	15	0	10	0	30	11	0-34
P-24	5	5	1	1	36	10	0-37
P-548	8	5	1	1	24	8	0-38
P-182	8	5	1	1	31	9	0-38
P-2890	10	5	<1	3	32	10	1-39
Souna Mali	8	3	<1	5	27	8	0-40
P-615	5	23	3	3	15	10	1-40
P-553	10	8	2	2	32	11	1-40
700481-7-5	5	8	6	1	33	11	1-40
700481-35-5	8	5	5	6	41	13	0-40
P-546	10	15	4	7	33	14	3-40
Collection-91	8	5	7	5	39	13	1-41
P-542	5	8	3	3	33	10	0-43
P-140	5	8	6	7	39	13	5-45
P-1449	10	5	24	12	45	19	5-45
P-1630	10	3	3	4	39	12	3-46
P-208	5	3	1	2	48	12	0-48
P-568	5	8	4	-	41	14	1-48
P-29	15	5	1	7	31	12	1-49
P-1632	8	20	1	11	48	18	0-49
P-2880	8	25	4	6	49	18	4-49

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Table 5 (Contd..)

Entry	Kovil-patti	Hissar	Ludhi-ana	Bhavani-sagar	Puduk-kottai	Mean[a]	Range[b]
P-543	8	3	2	4	46	12	0-50
P-1578	8	25	0	3	42	15	0-50
P-569	5	13	5	13	36	14	0-51
P-545	8	10	3	0	48	14	0-53
P-1551	10	5	3	-	52	18	3-53
P-105	18	5	1	9	54	17	1-54
Collection-75	10	5	8	7	43	15	0-55
P-107	15	23	2	6	44	18	0-55
P-544	10	25	6	0	59	20	0-62
P-1588	8	18	8	9	60	20	0-65
Location mean for entries	8	9	3	4	32		
Local suscep-tibles[c]	19	25	34	35	56		

a Means calculated before figures were rounded-off.
b Based on individual replication.
c Mean of five plots in each replication.

Table 6. Percent mean ergot severities on 45 entries in the 1982 IPMRN and local susceptible checks at three locations

Entry	Hissar	Kovilpatti	Pudukkottai
700481-7-S	30	1	10
700481-21-8	15	3	0
700481-22-8	0	0	3
700481-23-2	30	1	0
700481-33-1	30	0	3
700481-35-S	17	1	2
Souna Mali	38	0	13
Collection-75	18	0	10
Collection-91	15	0	33
IP-537-B	33	0	5
IP-2084-1	50	0	8
D-212-P1	25	0	3
P-15	24	0	7
P-24	8	2	8
P-29	49	2	6
P-105	45	0	10
P-107	20	3	9
P-140	20	3	11
P-182	10	1	33
P-208	25	1	5
P-542	30	0	10
P-543	40	4	8
P-544	54	1	5
P-545	5	1	3
P-546	17	0	3
P-548	25	0	3
P-553	35	3	0
P-568	28	0	5
P-569	43	1	28
P-615	18	0	5
P-618	27	0	10
P-1449	33	3	3
P-1551	30	0	3
P-1564	15	0	5
P-1577	28	0	8

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Table 6. (Contd..)

Entry	Hissar	Kovilpatti	Pudukkottai
P-1578	25	0	8
P-1581	-	0	4
P-1588	27	1	0
P-1592	33	0	10
P-1596	48	0	5
P-1630	13	0	7
P-1632	30	1	5
P-2880	28	0	0
P-2890	40	0	2
P-2950	20	0	3
Local susceptibles[a]	19	1	5

a Mean of five plots in each replication.