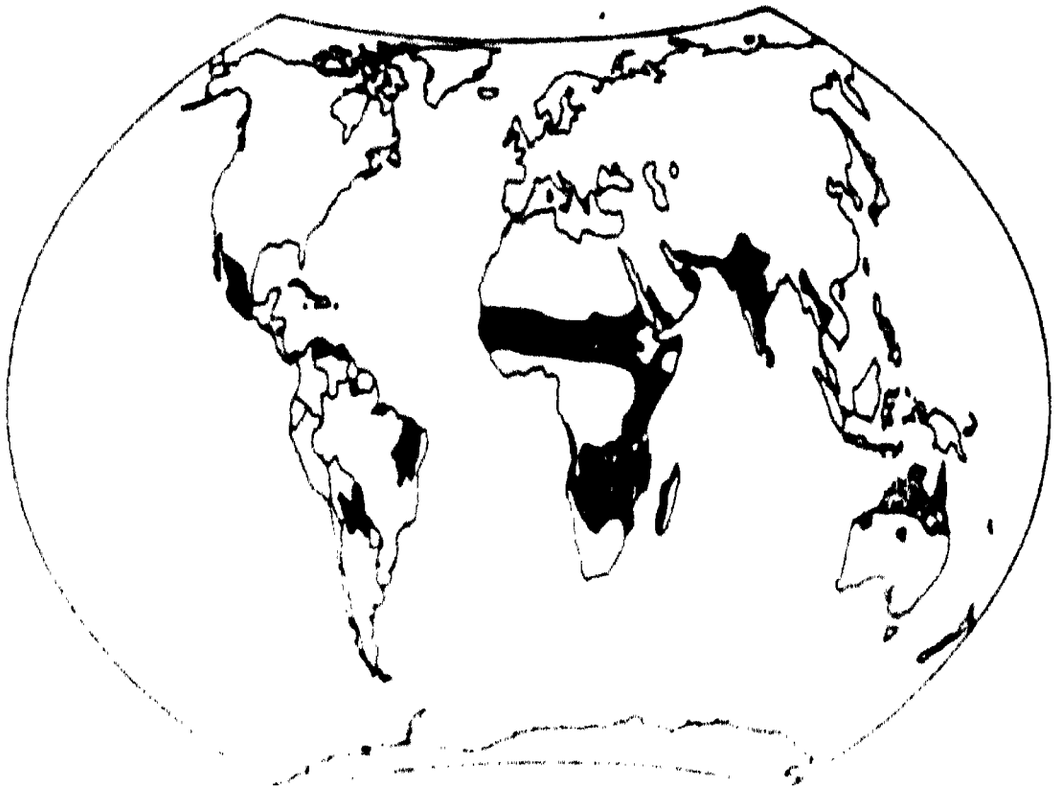
Progress Report: MP 9.45

INTERNATIONAL PEARL MILLET DISEASE RESISTANCE TESTING PROGRAM

(IPMDRTP)



REPORT OF

THE NINTH (1985) INTERNATIONAL PEARL MILLET RUST NURSERY
(IPMRN)

ICRISAT

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

1986

ABSTRACT

The 1985 International Pearl Millet Rust Nursery (IPMRN), containing 45 entries, was sent to cooperators at four locations in India. Data were received from all locations. Rust pressure was most severe at Mysore followed by Bhavanisagar. No entry was rust free at all locations. Three entries, 700481-21-8, 7042-1-4-4, and P 24-1, remained rust free at all locations except Aurangabad and one entry, IP 8695-4, developed no more than 2% mean rust at any location. Five other entries, 700481-23-2, P 1592, IP 2084-1, D1C 14-P2 and P 548, developed ≤ 10% mean rust across locations.

Résumé

La Pépinière internationale de la rouille du mil (IPMRN) pour 1985, comprenant 45 entrées a été expédiée aux coopérateurs à quatre points d'essai en Inde. Les données ont été reçues de tous les points d'essai. L'incidence de la rouille a été la plus grave à Mysore suivi de Bhavanisagar. Aucune entrée n'a été exempte de rouille à tous les points d'essai. Trois entrées, 700481-21-8, 7042-1-4-4 et P 24-1, n'ont pas eu de rouille à tous les points d'essai, à part Aurangabad et une entrée, IP 8695-4, n'a eu qu'une moyenne de 2% de rouille à tout point d'essai. Cinq entrées, 700481-23-2, P 1592, IP 2084-1, D1C 14-P2 et P 548, ont eu une moyenne de sévérité de ≤ 10% sur l'ensemble des points d'essai.

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THE 1985 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 important pearl millet diseases. The approach adopted to meet this objective is to expose promising lines to populatins of the pathogen at geographically diverse locations. 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. In the following years, requests were received from additional scientists to participate in this nursery. In view of this, the International Pearl Millet Rust Nursery (IPMRN) was initiated in 1978 and has continued in each succeeding year. In 1985 the trial was sent to cooperators at four locations in India and the results were received from all 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 are given in Table 1. At these locations severe rust often occurs annually.

ENTRIES

The trial contained 45 entries including 12 germplasm accessions selected after their rust evaluation at ICRISAT and Bhavanisagar and 31 entries with good performance from the 1984 IPWRN. NHC 3 was used as the local susceptible check at all locations.

SCREENING AND SCORING METHODS

Screening was conducted under natural rust occurrence at all locations. The severity assessment was made using Cobb's modified scale. Visual scores were taken of each of 20, randomly-selected plants per 2-row plot in each replication and an average was calculated. The rust scores of lower and upper leaves (top four leaves) were separately taken at about the dough stage.

RESULTS

Detailed data for the lower and upper leaves for all locations by replication are presented in Tables 2 and 3. However, the results obtained from the top four leaves only are discussed here since they are of most importance in contributing to yield.

Performance of Entries at Different Locations

Aurangabad: Rust pressure was high. No test entry was rust free and several entries developed more than 50% rust. Local susceptible check averaged 68% rust.

Bhavanisagar: Entries were evaluated under severe rust pressure. Five test entries developed 100% rust as did the local susceptible check. However, four entries, P 24-1, 700481-21-8, 7042-1-4-4, and DIC 14-P2 remained rust free.

ICRISAT Center: Rust pressure was moderate. The mean rust severity on local susceptible check was 56%. Several entries developed more than 25% rust. Three entries, P 24-1, 700481-21-8, and 7042-1-4-4, developed no rust even on lower leaves.

Mysore: Extremely heavy rust developed at this location. Several test entries and local susceptible check developed 100% rust. Three entries, P 24-1, 700481-21-8, and 7042-1-4-4, remained rust free.

Performance of entries across locations

Across location performance of entries is presented in Table 4. No entry was free at all locations. However, three entries, 700481-21-8, 7042-1-4-4, and P 24-1, remained rust free at all locations except Aurangabad, and one entry, IP 8695-4, developed no more than 2% mean rust at any location. Five entries, 700481-23-2, P 1592, IP 2084-1, DIC 14-P2 and P 548, developed ≤10% mean rust across locations and each showed <10% mean rust at three of the four locations. Of the remaining entries many showed 100% rust at one or more locations.

Performance of entries that have been screened for 2-9 years are presented in Table 5. Several of these entries have generally shown low levels of rust at the majority of the locations each year.

Other diseases

Records on natural occurrence of ergot were taken at Aurangabad. No entry was ergot free. However, several entries including P 140-3, P 1591, and DIC 14-P2 developed less than 10% ergot. IP 8695-4 showed the highest susceptibility (69%) to ergot (Table 6.)

DISCUSSION

Natural rust pressure was extremely high at Mysore and Bhavanisagar. Four entries, 700481-21-8, 7042-1-4-4, IP 8695-4, and P 24-1, showed high levels of location non-specific resistance. These lines showed high rust resistance in previous years trials also. 7042-1-4-4, a rust resistant selection of 7042, remained rust free for the second year at Bhavanisagar and at ICRISAT. It developed 4% rust, however, at Aurangabad. Also, P 1591 which had shown high levels of rust resistance in the past two testings developed severe rust at Mysore. The validity of these results will be tested in 1986.

Of the 13 entries that were evaluated for the first time, only one entry, DIC14-P2, showed 10% mean rust across locations with a maximum of 32% rust at one of the locations (Aurangabad). Other entries developed moderate to severe rust.

The 1986 IPMRN

The IPMRN will be conducted in 1986. Several new sources of rust resistance inaccessions of germplasm screened during the 1985 rainy season at Bhavanisagar will be included. Entries for this trial are welcome from scientists in national programs provided their rust resistance has been demonstrated.

SEED SUPPLY

Scientists who want seed of any entry included in this report should send their requests to the Principal Millet Pathologist at ICRISAT (Address given inside back cover of this report) indicating that the seed request is based on the 1985 IPMRN report.

Table 1. Test locations and cooperators in the 1986 IPMON

Locations	Cooperators
Aurangabad	N.B. Pawar
ICRISAT Center	S.D. Singh & P. Malla Reddy
Mysore	H.S. Shetty
Bhavanisagar	S.D. Singh

Table 2. Percent mean rust severities of 45 entries in the 1985 IPYSN at Aurangabad and Bhavantnagar

Entry	Aurangabad				Bhavantnagar			
	Lower leaves		Upper Leaves		Lower leaves		Upper Leaves	
	Rep.1	Rep.2	Rep.1	Rep.2	Rep.1	Rep.2	Rep.1	Rep.2
P 24-1	40	70	4	7	0	0	0	0
P 140-3	70	90	12	41	100	100	60	40
P 542	25	80	1	5	40	65	11	26
P 548	10	20	1	1	10	40	2	18
P 615-1	25	80	1	21	100	65	75	37
P 1449-4	75	80	44	48	100	65	35	15
P 1564	-[a]	-	-	-	-	-	-	-
P 1577	30	15	1	1	10	25	2	18
P 1581	-	-	-	-	-	-	-	-
P 1588	40	60	4	12	100	65	100	35
P 1591	70	90	18	39	65	40	27	24
P 1592	10	15	1	3	65	10	49	2
P 1596-3	80	80	39	44	100	100	55	100
P 2880-2	90	90	57	34	100	65	57	65
P 2890	90	80	32	17	10	10	8	3
P 2895-3	80	90	37	40	100	100	65	21
P 2925-1	80	90	70	61	100	100	100	100
P 2943-3	90	90	54	23	100	65	100	39
700481-21-8	20	40	4	4	0	0	0	0
700481-23-2	20	20	5	3	5	10	1	2
7042-1-4-4	80	25	6	3	0	0	0	0
IP 70-L-3	60	70	41	10	53	65	28	23
IP 2084-1	40	35	3	4	25	10	10	1
IP 4920-2	80	75	47	16	100	100	51	100
IP 5221-3	90	90	65	58	65	100	28	100
IP 5230-1	40	20	3	5	40	65	12	31
IP 6147-4	20	80	2	31	100	100	100	100
IP 8695-4	10	10	1	1	10	0	1	2
IP 8714-1	80	80	21	33	100	100	100	100
IP 8877-3	40	25	2	1	100	40	100	15
IP 8998-1	60	80	6	11	83	100	28	100
45-331	70	90	29	55	65	65	44	65
45-373	60	40	27	6	100	40	43	12
SAD 421	70	80	37	39	100	100	86	100
J 104	80	80	10	16	40	40	30	16
J 1798	-	-	-	-	-	-	-	-
P 94/1/2-1	25	80	5	14	40	65	18	26
ICW 82116	50	90	27	28	63	40	21	28
D 212-P1	100	90	59	50	-	-	-	-
D 332/1/2-3	40	70	4	7	40	25	18	17
DIC 14-P2	90	70	28	37	0	0	0	0
DIC 158-P1	80	60	10	7	10	25	3	18
SRC 52-P1	80	30	36	7	100	65	8	16
Ex Borna 206-1	90	100	75	73	100	100	100	100
[F4FC 1436-4-3-2 x J104 ST-1-1-5]-2	80	90	61	48	100	25	65	16
Location mean for test entries	59	65	23	23	62	54	40	37
Local susceptible (NHB 3)[b]	90	90	71	64	100	100	100	100

a No germination
b Mean of five plots in each replication.

Table 3. Percent mean rust severities of 46 entries in the 1985 IPSMR at ICRISAT Center and Mysore

Entry	ICRISAT Center				Mysore			
	Lower leaves		Upper Leaves		Lower leaves		Upper Leaves	
	Rep.1	Rep.2	Rep.1	Rep.2	Rep.1	Rep.2	Rep.1	Rep.2
P 24-1	0	0	0	0	0	0	0	0
P 140-3	65	65	31	31	100	100	83	60
P 542	25	25	7	8	65	65	42	50
P 548	40	25	18	3	40	40	34	4
P 615-1	40	40	12	18	100	100	90	60
P 1449-4	25	40	9	8	100	100	74	58
P 1564	-[a]	18	-	6	-	100	-	76
P 1577	40	40	8	10	100	100	90	79
P 1581	-	40	-	22	-	65	-	54
P 1588	40	40	9	9	100	65	72	54
P 1591	25	25	9	8	100	100	84	65
P 1592	5	5	1	1	0	40	11	4
P 1598-3	25	40	7	22	100	100	70	100
P 2080-2	65	65	34	36	100	100	100	100
P 2090	25	25	6	8	65	40	28	44
P 2095-3	25	25	8	8	100	65	83	33
P 2925-1	40	65	13	30	100	100	100	100
P 2943-3	65	65	22	30	100	100	69	100
700481-21-8	0	0	0	0	0	0	0	0
700481-23-2	5	10	2	3	15	65	3	37
7042-1-4-4	0	0	0	0	0	0	0	0
IP 70-L-3	40	25	14	12	100	100	100	48
IP 2084-1	25	25	5	3	100	40	25	22
IP 4920-2	40	40	18	20	100	100	68	53
IP 5221-3	40	40	21	19	65	100	53	100
IP 5230-1	25	25	9	7	100	100	55	45
IP 6147-4	40	40	9	9	100	100	83	100
IP 8695-4	5	5	0	0	5	10	2	2
IP 8714-1	40	40	17	21	100	100	77	100
IP 8877-3	25	25	7	7	65	40	34	16
IP 8998-1	40	40	14	15	100	65	100	43
45-331	40	40	21	22	100	65	83	27
45-373	25	10	4	3	40	65	47	34
SAD 421	40	40	26	21	100	100	93	100
J 104	25	25	9	8	65	40	51	25
J 1798	-	-	-	-	100	-	65	-
P 94/1/2-1	25	25	6	6	65	25	34	7
ICW 82116	25	40	7	15	65	100	31	66
D 212-P1	65	65	25	36	-	-	-	-
D 332/1/2-3	10	25	3	9	100	65	37	47
DIC 14-P2	5	5	0	0	10	40	1	11
DIC 158-P1	10	10	4	3	25	40	25	44
SRC 52-P1	25	40	3	9	40	25	28	14
Ex Bornu 206-1	65	40	33	17	100	100	100	100
[F4FC 1436-4-3-2 x J104 ST-1-1-5]-2	65	65	36	36	100	100	90	100
Location mean for test entries	31	31	11	13	72	69	55	51
Local susceptible (NBB 3)[b]	100	100	56	57	100	100	100	100

a No germination.
b Mean of five plots in each replication.

Table 4. Percent mean rust severities by location and across locations, and ranges of rust values of 45 [illegible] entries at four locations during the 1985 rainy season

Entry	Locations				Mean across locations	Range[a]
	Aurangabad	Bhavanisagar	ICRISAT Center	Mysore		
700481-21-8	4	0	0	0	1	0-4
7042-1-4-4	4	0	0	0	1	0-4
IP 8695-4	1	2	0	2	1	0-2
P 24-1	5	0	0	0	1	0-7
700481-23-2	4	1	2	20	7	1-37
P 1592	2	26	1	7	9	1-49
IP 2084-1	4	5	4	24	9	1-25
DIC 14-P2	32	0	0	6	9	0-37
P 548	1	10	10	19	10	1-34
DIC 158-P1	9	10	3	34	14	3-44
P 94/1/2-1	9	22	6	20	14	5-34
SRC 52 P1	22	12	6	21	15	3-36
D 332/1/2-3	6	17	6	42	18	3-47
P 2890	25	5	7	36	18	3-44
P 542	3	18	8	46	19	1-50
J 104	14	23	8	38	21	8-51
IP 5230-1	4	22	8	50	21	3-55
45-373	16	28	3	41	22	3-47
IP 8877-3	2	57	7	25	23	1-100
P 1577	1	10	9	84	26	1-90
ICMV 82116	28	25	11	48	28	7-66
P 1591	29	25	9	74	34	8-84
IP 70-L-3	26	25	13	74	34	10-100
P 1449-4	46	25	9	66	36	8-74
P 1588	8	67	9	63	37	4-100
P 2895-3	39	43	8	58	38	8-83
P 1581	-	-	22	54	38	22-54
P 615-1	11	56	15	75	39	1-90
IP 8998-1	9	64	15	71	40	6-100
P 1564	-[b]	-	6	76	41	6-76
45-331	[illegible]	54	21	55	42	21-83
D 212-P1	55	-	30	-	43	25-59
P 140-3	[illegible]	50	31	71	45	12-83
IP 4920-2	[illegible]	75	18	60	46	16-100
P 1596-3	[illegible]	[illegible]	14	85	54	7-100
IP 6147-4	[illegible]	100	9	91	54	2-100
P 2943-3	[illegible]	[illegible]	26	84	55	22-100
IP 5221-3	[illegible]	64	20	76	55	19-100
(FAFC 1436-4-3-2 x J104 ST-1-1-5)-2	54	41	36	95	56	36-100
IP 8714-1	[illegible]	100	19	88	58	17-100
P 2880-2	45	61	35	100	60	34-100
SAC 421	38	93	23	97	63	21-100
J 1798	-	-	-	65	65	-
P 2925-1	65	100	21	100	72	13-100
Ex Bornu 206-1	74	100	25	100	75	17-100
Location mean for test entries	23	39	12	53	33	
Local susceptible (NHB 3)[c]	68	100	56	100	81	

a Based on individual replication.
b % germination.
c Mean of ten plots from two replications.

Table 5. Performance of 19 rust resistant entries and susceptible check across locations[a] in 2-9 years (1977-1985) of testing in India

Entry	Origin	Mean rust severity (%)								
		'77	'78	'79	'80	'81	'82	'83	'84	'85
700481-21-8	Nigeria	7(0-25)[b]	11(0-30)	4(0-8)	4(1-9)	4(0-11)	2(0-5)	5(0-11)	5(1-10)	1(0-4)
700481-22-8	Nigeria	8(0-25)	6(0-26)	2(0-26)	13(2-46)	5(0-15)	4(0-12)	5(1-14)	10(1-29)	-
700481-23-2	Nigeria	7(0-25)	5(0-20)	6(0-8)	12(<1-26)	6(0-20)	5(2-7)	9(0-31)	5(0-14)	7(1-20)
IP 537 B	USA	0[c]	7(0-36)	3(0-8)	9(1-25)	6(0-17)	11(0-25)	-	-	-
Souna Mali	Mali	-	-	4(3-5)	10(3-16)	6(0-21)	8(<1-27)	11(3-30)	6(1-15)	-
IP 2084-1	India	-	-	-	7(5-10)	6(0-16)	6(1-11)	3(1-7)	6(0-15)	9(4-24)
P 24	Cameroon	-	-	-	16(5-36)	6(0-15)	10(1-36)	8(5-18)	9(0-27)	1(0-5)
D 212 P1	Niger	-	-	-	10(1-21)	6(0-25)	11(0-30)	-	2(1-13)	-
P 140	Cameroon	-	-	-	-	-	-	6(0-12)	3(2-9)	45(28-71)
P 615	Mali	-	-	-	-	-	-	8(1-16)	7(1-13)	39(11-75)
P 1564	Senegal	-	-	-	-	-	-	3(<1-8)	<1(0-1)	41(8-76)
P 1577	Senegal	-	-	-	-	-	-	3(<1-7)	5(1-20)	28(1-64)
P 1581	Senegal	-	-	-	-	-	-	1(0-5)	1(0-5)	38(22-64)
P 1591	Senegal	-	-	-	-	-	-	2(0-5)	2(0-7)	36(9-74)
P 1592	Senegal	-	-	-	-	-	-	5(1-10)	3(<1-9)	9(1-26)
P 2880	Niger	-	-	-	-	-	-	4(1-9)	8(0-33)	18(5-36)
7042-1-4-4	Chad	-	-	-	-	-	-	-	1(0-2)	1(0-4)
IP 8885-4	Sudan	-	-	-	-	-	-	-	11(1-24)	1(0-2)
P 548	Mali	-	-	-	-	-	-	-	3(0-13)	18(1-39)
Susceptible Check		51(10-100)	42(12-79)	34(2-59)	31(12-57)	26(13-53)	34(19-56)	40(20-65)	41(13-72)	81(56-100)

a Locations: Aurangabad, Bangalore, Bhavanisagar, Coimbatore, Durgapura, Hisar, ICRISAT Center, Kovilpatti, Kudumiamalai, Ludhiana, Mysore, and Pune; 4-7 locations each year.
b Figures in parentheses are severity ranges.
c This entry was tested only at Hyderabad and Bhavanisagar during the year 1977.

Table 6. Mean ergot severity (%) in [illegible] entries at Aurangabad

Entry	Mean
P 24-1	38
P 140-3	7
P 542	50
P 548	36
P 615-1	54
P 1449-4	34
P 1564	-[a]
P 1577	6
P 1581	-
P 1588	36
P 1591	9
P 1592	35
P 1596-3	42
P 2880-2	30
P 2890	9
P 2895-3	36
P 2925-1	25
P 2943-3	41
700481-28-1	30
700481-23-2	30
7042-1-4-4	67
IP 70-L-1	49
IP 2084-1	34
IP 4920-2	54
IP 5221-3	24
IP 5230-1	25
IP 6147-4	28
IP 8695-4	69
IP 8714-1	17
IP 8877-3	41
IP 8998-1	9
45-331	35
45-373	28
SAD 421	46
J 104	2
J 1798	-
P 94/1/2-1	7
ICMV 82116	31
D 212-P1	16
D 332/1/2-2	36
DIC 14-P2	8
DIC 158-P1	25
SRC 52-P1	25
ExBornu 206-1	34
[F4FC 1436-4-3-2 x J 104 ST-1-1-5]-2	20
Local mean for entries	30
Local Susceptible (NHB 3)[b]	24

a No germination
b Mean of five plots in each replication.

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