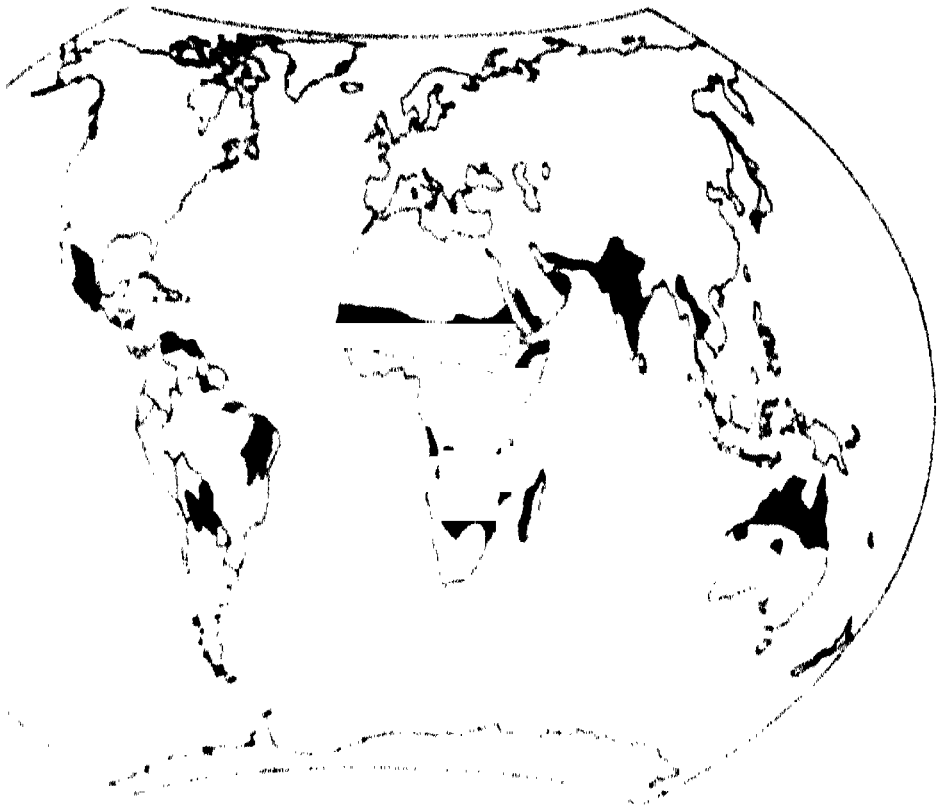


**INTERNATIONAL PEARL MILLET DISEASE RESISTANCE TESTING PROGRAM  
(IPMDRTP)**



**REPORT ON  
THE ELEVENTH (1987) INTERNATIONAL PEARL MILLET SMUT NURSERY  
(IPMSN)**



**ICRISAT**

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1988

The 22 entry (1987) IPMSN was conducted successfully at one location in India and two in West Africa. The across location mean smut severities for the test entries varied from  $\leq 1-38\%$  compared with 61% and 56% for the susceptible checks BJ 104 and ICMH 83202, respectively. Eleven entries were highly resistant with across location means of  $\leq 1\%$ , with a maximum of 2% at any one location. Six of the 11 smut resistant entries were also resistant to downy mildew ( $\leq 10\%$ ). In three years (1985-87) of multilocational testing at three to six locations every year, five of the common entries (ICMPS 100-6-1, ICMPS 601-6-1-4, ICMPS 601-6-3-1, ICMPS 601-6-6-3, ICMPS 900-9-3) have shown mean smut severities of not more than 1% indicating stability of resistance in these entries. One of the ICRISAT variety ICMV 82132, derived from smut resistant composite, has also shown stability of resistance in three years of testing. Seed of these lines could be made available from ICRISAT on request.

#### Résumé

La Pépinière internationale du charbon de mil (IPMSN) de 1987, comprenant 22 entrées a été conduite avec succès à un point d'essai en Inde et deux en Afrique occidentale. Les sévérités moyennes de charbon sur l'ensemble des points d'essai pour ces entrées se sont situées entre  $\leq 1$  et 38% par rapport à 61% et 56% pour les témoins sensibles BJ 104 et ICMH 83202, respectivement. Onze entrées se sont avérées très résistantes avec des sévérités moyennes de  $\leq 1\%$  sur l'ensemble des points d'essai, et avec une sévérité maximale de 2% à l'un ou l'autre des points d'essai. Six parmi les 11 entrées résistantes au charbon se sont montrées résistantes au mildiou ( $\leq 10\%$ ). Au cours de trois ans d'essais multiloaux (1985-87) à trois des cinq points d'essai, cinq entrées (ICMPS 100-6-1, ICMPS 601-6-1-4, ICMPS 601-6-3-1, ICMPS 601-6-6-3, ICMPS 900-9-3) ont montré des sévérités moyennes de  $\leq 1\%$ , ce qui indique une résistance stable chez ces entrées. Une des variétés mises au point par l'ICRISAT ICMV 82132, issue d'un composite résistant au charbon a également manifesté une résistance stable au cours de trois ans d'essais. Des semences de ces lignées sont disponibles à l'ICRISAT et peuvent être obtenues sur demande.

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Correct citation : ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) 1988. Report on the eleventh (1987) International Pearl Millet Smut Nursery. Progress Report MP 9.53. Patancheru, A.P. 502 324, India: ICRISAT. 16 pp.

## REPORT OF THE ELEVENTH (1987) INTERNATIONAL PEARL MILLET SMUT NURSERY

### INTRODUCTION

The eleventh International Pearl Millet Smut Nursery (IPMSN), one of the four disease nurseries in the International Pearl Millet Disease Resistance Testing Program (IPMDRTP) organised by ICRISAT Center, was conducted during the 1987 rainy season with the following objectives:

1. to test the resistance stability of ICRISAT Center developed/identified lines at smut hot spot locations in different pearl millet growing areas,
2. to monitor variations in the pathogen populations, and
3. to provide resistant sources to cooperating scientists and others involved in resistance breeding programs.

### Entries:

The 24 entry 1987 IPMSN included 7 entries from the previous IPMSNs, 9 newly identified smut resistant inbreds including 5 81B x SRL crosses (SR 74-1=[81B x SRL-50-1] x 26B]-13-4-1, SR 79-1 = [81B x SRL-50-1] x 26B]-13-4-5-1, SR 128-2 = [81B x SRL-53-1] x 843B]-3-1-2, SR 132-1 = [81B x SRL-53-1] x 843B]-10-2-1, SR 966A = [81B x SRL 53-1] x 843B]-30-2-3) from advanced smut screening at ICRISAT Center, 6 experimental varieties and 2 susceptible hybrids as checks, BJ 104 (early maturity) and ICMR 83202 (late maturity).

### Locations for the 1987 IPMSN:

The nursery was sent to cooperators at two locations in India, two in Niger, and one in Nigeria. Results were received from three locations where the nursery could be conducted successfully (Table 1), and no data

were received from Sadore (Niger) and Hisar (India).

#### **NURSERY MANAGEMENT**

Each entry was planted in two, 4m-row plots in two replications and cultural practices recommended for each location were followed. Artificial inoculation was done only at ICRISAT Center. Inoculum consisted of an aqueous sporidial suspension ( $10^6$  sporidia  $ml^{-1}$ ) from 3-5 day-old cultures of Tolyposporium paniculariae grown on potato agar at 35 C. For each plot, ten plants per row (total 20 panicles) were inoculated at the boot-leaf stage and bagged immediately. At the two West African locations, Bengou (Niger), and Samaru (Nigeria), only bagging was done at the boot-leaf stage.

Smut severity (%) was recorded on each panicle about 4 weeks after inoculation, using the standard smut severity assessment key. The mean smut severity per replication and mean severity and range (minimum and maximum severities) per location for each entry were calculated. Smut severity was calculated only for those entries which had a minimum of five panicles per replication.

#### **Other data**

In addition to the smut scores, data were received for other diseases including downy mildew, ergot, rust, blast, Phoma leaf spot (Phoma sp.) and Dactuliophora leaf spot (Dactuliophora alongata). Data on days to boot-leaf and weather were also received from three locations.

#### **RESULTS**

At Hisar in India and Sadore in Niger, conducting the nursery was not successful because of the low rains and unfavorable conditions for the

growth of pearl millet.

#### Weather

Data on temperature, rainfall, and number of rainy days from inoculation to the disease development period are presented by location in Table 2. The mean maximum temperatures during this period ranged from 30 C at Samaru to 36 C at Bengou and the mean minimum temperatures from 20 C at Samaru to 28 C at Bengou. The number of rainy days varied from 16 at Bambe (rainfall 154 mm) to 21 at ICRISAT Center (rainfall 160 mm). In addition at ICRISAT Center sprinkler irrigation was provided for 30 min twice a day, when needed, to provide high humidity throughout the disease development period.

#### PERFORMANCE OF ENTRIES

The data on smut severity (%), reactions to other diseases and days from planting to the boot-leaf stage, are presented by location in Tables 3 to 5. Among the three locations, the maximum smut pressure, as indicated by mean severity on the susceptible check, BJ 104, occurred at ICRISAT Center (73%) followed by, Samaru (65%), and Bengou (44%). However, based on mean smut severity over test entries, the highest smut pressure was experienced at Samaru (6.1%) followed by Bengou (5%) and ICRISAT Center (1.3%).

ICRISAT Center (Table 3): The mean smut severity of the test entries ranged from 0-12%. Ten entries remained smut-free, 6 had  $\leq 1\%$  smut, 5 had 2-4% smut, and the remaining one developed 12% smut. The susceptible checks BJ 104 and ICMH 83202 had 73 and 74% mean smut severities, respectively.

DM incidence varied from 0-4% on the test entries compared to 90% on a DM indicator, NHB 3. Twelve of the 22 test entries were free from DM, and

the remaining 10 had  $\leq 4\%$  DM. Fifteen of the 22 test entries were free from smut and had  $\leq 4\%$  DM.

Bengou (Table 4): The mean smut severity of the test entries ranged from 0 to 45%. Three entries remained smut-free and 11 showed  $\leq 1\%$  smut, 5 developed 2-6% smut and the remaining 3 had 18-45% smut. The susceptible checks BJ 104 and ICMH 83202 had 44 and 21% smut, respectively.

DM incidence was generally high, with the test entries having from 4 to 99% DM. Four test entries had  $\leq 7\%$  DM and the remaining showed between 13 and 99% DM, compared with 30 and 100% DM in checks BJ 104 and ICMH 83202 respectively.

Mean ergot severities among the test entries ranged from 2 to 34%. Nine entries had 2 to 6% ergot, 8 had 7 to 11% ergot, and the remaining 5 had 16 to 34% ergot. The checks, BJ 104 and ICMH 83202, developed 14 and 4% ergot, respectively.

Dactuliothra leaf spot was also prevalent at this location. All the entries were rated between 2-4 on a 1-5 rating scale.

Samara (Table 5): The mean smut severity of the test entries ranged from 1 to 65%. No entry was smut free, however, 8 entries developed only 1% smut, 8 developed 2-5% smut, 5 developed 6-11% smut and only one test entry (SR 128-2) developed 65% smut. The susceptible checks, BJ 104 and ICMH 83202, had mean smut severities of 65 and 74%, respectively.

DM incidence was high among the test entries, ranging from 5 to 99%. Five entries had 5-9% DM, 6 had 11-20% DM and the remaining 11 had 26-99% DM. The checks, BJ 104 and ICMH 83202, had 43 and 89% DM, respectively.

Sixteen test entries had  $\leq 10\%$  ergot severity compared with the checks: 63% in BJ 104 and 13% in ICMH 83202.

Three test entries were resistant to smut (1%), DM (≤9%) and ergot (≤10%).

Rust was moderate to severe at Samaru with severities in test entries ranging between 5 and 65%. Seven entries had ≤10% rust. The checks, BJ 104 and ICMH 83202, developed 53 and 65% rust, respectively.

Dactuliothra leaf spot and Phoma leaf spot diseases were severe at this location with all the entries rated between 3 and 5 on a 1-5 scale for both the diseases.

### PERFORMANCE OF ENTRIES ACROSS LOCATIONS

#### Smut

Minimum smut pressure among the test entries occurred at ICRISAT Center (1.3%) and the maximum at Samaru (6.1%). Based on the overall performance across the locations of the test entries, 11 had ≤1% smut with a maximum of 2% at any one location, 8 had 2-5% smut with a maximum of 11% at any one location, 2 developed 10% smut, and only one entry, SR 128-2, had 38% smut. The susceptible checks, BJ 104 and ICMH 83202, had 61 and 56 % smut severities, respectively (Table 6).

#### Downy mildew

Downy mildew pressure was high at both the West African locations based on the location means for the test entries (Bengou, 43% incidence; Samaru, 36% incidence). None of the entries remained DM free across all the locations. Six entries, however, had ≤10% mean DM with a maximum of 25% at any one location. The checks, BJ 104 and ICMH 83202, had mean DM incidence of 27 and 63%, respectively (Table 7).

## DISCUSSION

The results of the 1987 IPMSN have further confirmed the resistance stability of some of the common entries in 13 tests over 3 years across Indian and West African locations (Table 8). Of the eight common entries in 3 years (1985-1987) five showed across location mean smut severities of not more than 1%. These entries are pure inbreds and have desirable agronomic attributes including early maturity, short to medium height, and good grain yield potential. Of the 14 new entries (9 smut-resistant inbreds, and 5 varieties) included in the 1987 IPMSN, 5 entries (3 smut-resistant inbreds and 2 varieties) had across location mean smut severities of  $\leq 1\%$ , 6 (3 smut-resistant inbreds and 3 varieties) had 2-5% smut, 2 (smut-resistant inbreds) had 10% smut, and only one new entry, SR 128-2 had 38% smut. Entry SR 128-2 showed 45 and 65% smut at Bengou and Samaru, respectively, by simply bagging the panicles at the boot-leaf stage while at ICRISAT Center under artificial inoculations it developed only 3% smut. This seems to be important information on pathogenic variability. Among the five SR lines (81B x SRL), SR 74-1 and SR 79-1 showed consistently high levels of smut resistance across locations while the other three showed variable reactions. This requires rechecking.

An ICRISAT developed variety, ICMV 82132, derived from the Smut Resistant Composite which has been found promising for its high grain yield potential in West Africa, southern Africa, and India also showed stability of resistance (4-6% mean smut across locations), although smut in individual panicles ranged from 0-50%.

Six entries (ICMPS 100-5-1, ICMPS 900-9-3, ICMP5R 66, ICMP5R 76, ICMP5R 172 and ICMV H84313) showed combined resistance to smut ( $\leq 4\%$  severity) and DM ( $\leq 10\%$  incidence), (Table 9).



The two leaf diseases, *Dactuliophora* leaf spot and Phoma leaf spot, seem important at Samaru, Nigeria, and most entries were found susceptible. Efforts could be made to screen a large number of SR lines in Samaru and select for combined resistance to smut and leaf spots.

#### **MULTILOCATION TESTING IN 1988 AND BEYOND**

The 1988 IPMSN with about 25 entries will be made available to cooperators by the end of May 1988. Seed of entries which have shown stable resistance will be multiplied and made available for use in breeding programs.

Entries which have been selected for resistance to smut are requested from scientists in the national and regional programs for inclusion in the 1988 IPMSN. However, seed sent from abroad will take about a year before it can be included in the trial because of plant quarantine regulations in India.

#### **SEED SUPPLY**

Small quantities of seed of entries listed in this report can be made available to scientist on request. Please send in your request to the Principal Millet Pathologist at ICRISAT Center.

**Table 1. Locations and cooperators in the 1987 IPMSN.**

Country	Location	Cooperators
India	ICRISAT Center	R.P. Thakur and C.S. Kousik
Niger	Bengou	J. Werder
Nigeria	Samaru	S.K. Manzo

Table 2. Sowing date, rainfall, and temperature data during the period from inoculation to disease development at the 1987 IPMSN locations, rainy season.

----- Inoculation to disease development <sup>1</sup> -----							
Location	Latitude	Sowing Date	Period	Rainy days	Rainfall (mm)	Temperature	
						Max.	Min.
-----							
Bengou	12	26 Jun.	27 Jul - 12 Sept.	20	280	36	28
ICRISAT Center	17	25 Jun.	5 Aug - 9 Sept.	21	160	31	22
Samaru	11	7 Jul.	21 Aug.- 18 Sept.	16	154	30	20

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1. Fifteen days after last date of inoculation.

**Table 3. Smut and downy mildew (DM) reactions and days to boot-leaf stage (DTBL) of the entries in IPNSM, ICRISAT Center, 1987 rainy season.**

Designation	Smut Severity (%)				DM	DTBL
	Rep 1	Rep 2	Mean	Range	Inoc. (%) <sup>1</sup>	
ICMPS 100-5-1	0	0	0	0-0	0	49
ICMPS 200-5-5-5	0	0	0	0-0	0	45
ICMPS 601-6-1-4	<1	<1	<1	0-1	3	56
ICMPS 601-6-3-1	0	<1	<1	0-2	1	50
ICMPS 601-6-6-3	0	0	0	0-0	4	49
ICMPS 900-9-3	0	0	0	0-0	0	45
ICMPS 1600-2-4	0	0	0	0-0	4	43
ICMPSR 63	0	0	0	0-0	0	43
ICMPSR 66	0	0	0	0-0	0	49
ICMPSR 76	0	0	0	0-0	1	49
ICMPSR 172	0	0	0	0-0	0	49
SR 74-1	0	0	0	0-0	0	50
SR 79-1	<1	0	<1	0-1	0	50
SR 128-2	1	6	3	0-25	3	45
SR 132-1	13	11	12	1-50	0	43
SR 9664	1	<1	1	0-2	0	44
ICMV 82132	3	4	4	0-50	1	42
ICMV H84117	2	2	2	0-35	4	43
ICMV H84216	2	2	2	0-35	0	38
ICMV H84313	<1	<1	<1	0-2	0	45
ICMV H84409	3	<1	2	0-40	2	38
ICMV H85427	<1	<1	<1	0-1	1	45
BJ 104 (Susc. check)	71	76	73	10-98	8	38
ICMH 83202 (Susc. check)	76	73	74	2-95	0	49
NHB 3 ( DM Check)	-	-	-	-	90	-

1. DM reactions based on screening by spray inoculations at seedling stage with sporangial suspension, mean of 2 replications.

Table 4. Smut, downy mildew (DM), ergot and Dactuliophora leaf spot (DLS) reactions and days to boot-leaf stage (DTBL) of the entries in the IPMSN, at Bengou, 1987 rainy season.

Designation	Smut Severity (%)				DM Incf. (%) <sup>1</sup>	Ergot Sev. (%) <sup>1</sup>	DLS (1-5) <sup>2</sup>	DTBL
	Rep 1	Rep 2	Mean	Range				
ICMPS 100-5-1	0	0	0	0-0	13	9	3	47
ICMPS 200-5-5-5	<1	0	<1	0-1	73	8	3	45
ICMPS 601-6-1-4	<1	<1	<1	0-1	21	3	2	53
ICMPS 601-6-3-1	<1	1	1	0-30	30	9	3	47
ICMPS 601-6-6-3	<1	0	<1	0-3	29	6	3	51
ICMPS 900-9-3	<1	0	0	0-1	5	11	3	48
ICMPS 1600-2-2	1	1	1	0-10	56	6	3	48
ICMPSR 63	<1	<1	<1	0-2	28	16	3	52
ICMPSR 66	<1	0	<1	0-1	4	30	3	50
ICMPSR 76	1	<1	1	0-5	4	25	3	50
ICMPSR 172	0	0	0	0-0	7	9	3	45
SR 74-1	2	<1	1	0-3	99	7	4	56
SR 79-1	2	0	1	0-10	74	2	3	45
SR 12A-2	66	25	45	5-95	92	34	3	45
SR 132-1	30	7	18	0-95	83	9	4	45
SR 9664	28	17	22	5-80	72	29	3	45
ICMV 82132	5	6	6	0-30	42	3	2	42
ICMV H84117	2	3	3	0-15	29	5	3	42
ICMV H84216	5	1	3	0-60	33	2	2	41
ICMV H84313	2	3	2	0-15	25	2	3	42
ICMV H84409	3	2	2	0-15	42	5	3	41
ICMV H85427	1	<1	1	0-10	82	7	2	41
BJ 104 (Susc. check)	51	37	44	0-95	30	14	3	44
ICMH 83202 (Susc. check)	15	27	21	1-85	100	4	3	48

1. mean of two replications.

2. mean of two replications

1= 5% leaf area covered with disease.

5= >90% leaf area covered with disease.

Table 5. Smut, downy mildew (DM), ergot, rust, Phoma leaf spot (PLS) and *Dothidiophora* leaf spot (DLS) reactions and days to boot-leaf stage (DTBL) of the entries in the IPMSR, Samaru, 1987 rainy season.

Designation	Smut Severity (%)				DM	Ergot	Rust	PLS	DLS	DTBL
	Rep 1	Rep 2	Mean	Range	Incl. (%) <sup>1</sup>	Sev. (%) <sup>1</sup>	Sev. (%) <sup>1</sup>	(1-5) <sup>2</sup>	(1-5) <sup>2</sup>	
ICMPS 100-5-1	2	2	2	0-10	5	73	8	4	5	45
ICMPS 200-5-5-5	3	3	3	0-10	99	-	65	3	3	54
ICMPS 601-6-1-4	3	3	3	0-15	59	2	65	4	5	46
ICMPS 601-6-3-1	1	2	2	0-5	36	35	8	4	4	48
ICMPS 601-6-6-3	1	1	1	0-5	32	33	18	3	5	46
ICMPS 900-9-3	1	1	1	0-5	14	8	25	4	5	46
ICMPS 1600-2-4	5	6	6	0-35	30	5	5	5	4	46
ICMPSR 63	5	4	5	0-10	19	3	8	5	5	47
ICMPSR 66	6	8	7	0-35	9	33	18	3	4	45
ICMPSR 76	10	11	11	0-35	13	6	25	5	5	47
ICMPSR 172	1	2	1	0-7	6	10	25	5	5	45
SR 74-1	1	1	1	0-5	79	6	18	4	4	45
SR 79-1	1	0	1	0-3	90	0	53	4	4	46
SR 128-2	61	69	65	35-100	88	4	53	4	4	48
SR 132-1	1	1	1	0-5	61	5	18	4	5	45
SR 9664	6	8	7	0-35	69	68	5	4	3	47
ICMV B2132	5	7	6	0-35	20	3	18	5	5	48
ICMV B84117	1	2	1	0-5	9	5	53	5	4	47
ICMV B84216	3	4	3	0-15	19	2	5	4	4	45
ICMV B84313	1	1	1	0-7	6	5	33	4	5	48
ICMV B84409	4	5	4	0-25	26	5	10	4	4	47
ICMV B85427	2	2	2	0-7	11	5	25	5	5	45
BJ 104 (Sus. check)	68	62	65	45-90	43	63	53	5	5	39
ICMH 83202 (Sus. check)	79	69	74	50-100	89	13	65	5	4	42

1. Mean of two replications.
2. Mean of two replications
  - 1= 5% leaf area covered with disease.
  - 5= >90% leaf area covered with disease.
3. No panicles due to downy mildew infection.

**Table 6. Mean smut severity (%) of entries in the 1987 IPMSN at one location in India, and two in West Africa, rainy season 1987.**

Designation	ICRISAT Center <sup>1</sup>	Bengou <sup>2</sup>	Samaru <sup>2</sup>	Entry means
ICMPS 100-5-1	0	0	2	1
ICMPS 200-5-5-5	0	<1	3	.1
ICMPS 601-6-1-4	<1	<1	3	1
ICMPS 601-6-3-1	<1	1	2	1
ICMPS 601-6-6-3	0	<1	1	1
ICMPS 900-9-3	0	0	1	<1
ICMPS 1600-2-4	0	1	6	2
ICMPSR 63	0	<1	5	2
ICMPSR 66	0	<1	7	3
ICMPSR 76	0	1	11	4
ICMPSR 172	0	0	1	<1
SR 74-1	0	1	1	1
SR 79-1	<1	1	1	1
SR 128-2	3	45	65	38
SR 132-1	12	16	1	10
SR 9664	1	22	7	10
ICMV 82132	4	6	6	5
ICMV H84117	2	3	1	2
ICMV H84216	2	3	3	3
ICMV H84313	<1	2	1	1
ICMV H84409	2	2	4	3
ICMV H85427	<1	1	2	1
Location means	1.3	5.0	6.1	
BJ 104 (Susc. check)	73	44	65	61
ICMB 83202 (Susc. check)	74	21	74	56

1. Mean of 40 inoculated panicles from two replications.

2. Mean of 20-40 bagged panicles from two replications.

Table 7. Mean downy mildew (DM) reactions of the entries in the 1987 IPMSN across one Indian location and two west African locations, rainy season 1987.

Designation	ICRISAT Center	Bengou	Samaru	Entry means
ICMPS 100-5-1	0	13	5	6
ICMPS 200-5-5-5	0	73	99	57
ICMPS 601-6-1-4	3	21	59	28
ICMPS 601-6-3-1	1	30	36	22
ICMPS 601-6-6-3	4	29	32	22
ICMPS 900-9-3	0	5	14	6
ICMPS 1600-2-4	4	56	30	30
ICMPSR 63	0	28	19	16
ICMPSR 66	0	4	9	4
ICMPSR 76	1	4	13	6
ICMPSR 172	0	7	6	4
SR 74-1	0	99	79	59
SR 79-1	0	74	90	55
SR 128-2	3	92	88	61
SR 132-1	0	83	61	48
SR 9664	0	72	69	47
ICMV 82132	1	42	20	21
ICMV H84117	4	29	9	14
ICMV H84216	0	33	19	17
ICMV H84313	0	25	6	10
ICMV H84409	2	42	26	23
ICMV H85427	1	82	11	31
Location means	1	43	36	
BJ 104 (Sus. check)	8	30	43	27
ICMH 83202 (Sus. check)	0	100	89	63

1. Inoculations done by spraying of sporangial suspension at seedling stage



**Table 8. Performance of eight common entries in the IPHSH across several locations in India and West Africa over 3 years.**

Designation	Smut severity (%) in			mean
	1985 <sup>1</sup>	1986 <sup>2</sup>	1987 <sup>3</sup>	
ICMPS 100-5-1	<1	<1	1	1
ICMPS 200-5-5-5	8	1	1	3
ICMPS 601-6-1-4	<1	-4	1	1
ICMPS 601-6-3-1	1	1	1	1
ICMPS 601-6-6-3	<1	-	1	1
ICMPS 900-9-3	<1	1	1	1
ICMPS 1600-2-4	6	1	2	3
ICMV 82132	7	7	5	6
BJ 104 (Check)	63	49	61	58

1. Mean of four locations: Bambeey, Bengou, Hisar, and ICRISAT Center.
2. Mean of six locations: Bambeey, Bengou, Sadore, Samaru, Hisar, and ICRISAT Center.
3. Mean of three locations: Bengou, ICRISAT Center and Samaru.
4. Not tested.

**Table 9. Performance of the entries in the 1987 IPNSH for smut, downy mildew (DM), ergot, rust, Dactuliephora leaf spot (DLS) and Phoma leaf spot (PLS), across locations in India and West Africa, rainy season 1987.**

Designation	Smut Sev <sub>1</sub> (%) <sup>1</sup>	DM Inci <sub>1</sub> (%) <sup>1</sup>	Ergot Sev <sub>2</sub> (%) <sup>2</sup>	Rust Sev <sub>3</sub> (%) <sup>3</sup>	DLS (1-5) <sup>4</sup>	PLS (1-5) <sup>5</sup>
ICMPS 100-5-1	1	6	41	8	4	4
ICMPS 200-5-5-5	1	57	8	65	3	3
ICMPS 601-6-1-4	1	28	3	65	4	4
ICMPS 601-6-3-1	1	22	22	8	4	4
ICMPS 601-6-6-3	1	22	20	18	4	3
ICMPS 900-9-3	<1	6	10	25	4	4
ICMPS 1600-2-4	2	30	6	5	4	5
ICMPSR 63	2	16	10	8	4	5
ICMPSR 66	3	4	32	18	4	3
ICMPSR 76	4	6	16	25	4	5
ICMPSR 172	<1	4	10	25	4	5
SR 74-1	1	59	7	18	4	4
SR 79-1	1	55	1	53	4	4
SR 128-2	38	61	19	53	4	4
SR 132-1	10	48	7	18	5	4
SR 9664	10	47	49	5	3	4
ICMV 82132	5	21	3	18	4	5
ICMV H84117	2	14	5	53	4	5
ICMV H84216	3	17	2	5	3	4
ICMV H84313	1	10	4	33	4	4
ICMV H84409	3	23	5	10	4	4
ICMV H85427	1	31	6	25	4	5
BJ 104 (Sus. check)	61	27	39	53	4	5
ICMB 83202 (Sus. check)	56	63	9	65	4	5

1. Mean of 3 locations, Bengou, ICRISAT Center, and Samaru.

2. Mean of 2 locations, Bengou and Samaru.

3. Mean at one location, Samaru.

4. Mean of 2 locations, Bengou and Samaru.

1 = 5% leaf area covered with disease.

5 = >90% leaf area covered with disease.

5. Mean at one location, Samaru.

1 = 5% leaf area covered with disease.

5 = >90% leaf area covered with disease.