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THE EIGHTH INTERNATIONAL PEARL MILLET ADAPTATION TRIAL (IPMAT 8), 1983

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ABSTRACT

The eighth International Pearl Millet Adaptation Trial (IPMAT 8) containing 22 entries (hybrids and open-pollinated varieties) was sent to cooperators at 21 locations in three countries, and results were received from 18 locations in three countries, at latitudes from $9^{o}12'$ N to $30^{o}56'$ N. Data were recorded, by the cooperators, on the performance of the entries (grain yield, time to bloom, plant height, and disease incidence), and on monthly rainfall during the crop growth period. This report presents the data from the individual locations, and summarises the across-location performance of the entries.

The top five entries over all locations consisted of three hybrids and two open-pollinated varieties: IVC-P8004 (ICMV 81111), MBH 137, ICH 448, UCH 10 and ICMS 8010. Unusually, the top-performing entry was a variety and not a hybrid.

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RESUME

Le huitième essai international d'aptation du petit mil (IPMAT 8) comprenant 22 entrées, dont des hybrides, des variétés synthétiques, et des variétés a été envoyé aux coopérateurs de 21 emplacements dans 3 pays. Des résultats ont été obtenus de 19 de ces emplacements situés dans 3 pays entre les latitudes 30^{0} 58' N to 13^{0} 28' N. Les coopérateurs ont noté les donées sur le comportement des entrées (rendement en grains, longueur de temps à la floraison, hauteur des plants, et incidence des maladies) ainsi que sur la pluviométrie mensuelle au cours de la période de croissance. Ce rapport présente les données provenant de chaque emplacement et résume le comportement des entrées sur l'ensemble des emplacements.

Sur tous les emplacements les cinq premières entrées pour le rendement en grains ont été trois hybrides et deux variétés, c'est à dire, IVC-P8004 (ICMV 81111), MBH 137, ICH 448, UCH 10 et ICMS 8010. Contrairement à d'habitude, la première entrée était une hybride et non pas une variété.

PREFACE

The International Pearl Millet Adaptation Trial (IPMAT), is operated as an international cooperative venture, with scientists in national programs contributing to and testing the IPMAT entries.

The entries in IPMAT are hybrids, synthetics, varieties derived from composites, and population bulks that have already proved their superiority in individual programs. IPMAT provides the opportunity to evaluate these materials under a wide range of environmental conditions, including varying disease pressure, so that the stability of performance can be assessed.

We are grateful to our cooperators who have given much of their time and resources to provide the information contained in this report. We welcome comments on the results and analyses and any suggestions on ways to improve this international cooperative trial.

The cooperators have already been sent individual analyses for their respective locations, and, in the year following the trial, a summary of the data across locations.

Scientists who require seed of any of the ICRISAT entries in IPMAT 8 should write to the Leader of the ICRISAT Pearl Millet Improvement Breeding Sub-Program, indicating the quantity required. If any of the IPMAT 8 entries have been used by cooperators, either for further breeding or for direct use as cultivars, we would appreciate being informed.

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THE EIGHTH INTERNATIONAL PEARL MILLET ADAPTATION TRIAL (IPMAT 8), 1983

OBJECTIVES

The purpose of IPMAT is to test ICRISAT and cooperators' elite material over a wide agro-climatological range to:

- determine the yield stability of diverse pearl millet hybrids and open-pollinated varieties under a range of latitudes, fertility conditions, rainfall, and disease pressures,
- identify those entries that possess resistance to downy mildew across environments.

Entries that are superior for yield and disease resistance may be considered for release at a regional level, or as parental material for hybridisation or further selection.

The trial can also be used to provide data on the grouping of locations; for the second time in a report of IPMAT, a regional analysis of the data for India has been done.

ENTRIES, DISTRIBUTION AND DATA RETURN

In IPMAT 8 there were 22 entries consisting of 6 hybrids, 15 open-pollinated varieties (7 synthetics and 8 varieties derived from composites) and a local check (Table 1).

The trial was distributed to 21 locations in three countries, and data were as returned for 18 locations in three countries (Tables 2 and 3).

TRIAL DESIGN, MANAGEMENT AND RAINFALL DATA

The trial was conducted as a randomised, complete block design in three replications. The management of the trial is summarized in Table 4. Monthly figures for rainfall during the crop growing period and information on irrigation were also supplied (Table 5).

RESULTS

GRAIN YIELD

All locations

The overall yields of the entries across all 19 locations showed that two of the top six entries were open-pollinated varieties (Tables 6 and 7). The highest-yielding entries are usually hybrids, and it is notable that IVC-P8004 (ICMV 81111 in the AICMIP trials) derived from the Inter Varietal Composite was the top-yielding entry. On average, the six ICRISAT-bred synthetics yielded better than the five ICRISAT-bred varieties that were derived from composites. The top six entries were separated by only 80 kg ha^{-1} in their yields, whilst the across-locaton standard error was $\pm$51 kg ha^{-1}.

The across location mean of the percentages of the trial means is a less biased estimate of performance than a straightforward

arithmetic mean, since the arithmetic mean is weighted towards those entries that perform best at the highest-yielding locations. Marked changes can be seen between rankings of entries on mean grain yield and the mean of the percentages of trial mean at each location (Table 6). Not surprisingly, the local check is top ranked on the basis of the mean of the percentages of the trial means, since the local check performed best in the two lowest-yielding environments (Niamey and Maradi, Niger). IVC-P8004 retains the top position amongst the test entries which indicates its stability of performance across locations. The second-ranked entry on grain yield, MBH 137, is the seventh-ranked entry on a mean percentage of trial mean basis. This clearly indicates that MBH 137 is performing well in the high-yielding environments, but less well in the poor-yielding ones. Another noteable change is ICH 448, which is ninth-ranked on grain yield, but third-ranked on mean percentage of trial mean.

Over the 19 locations, excluding check varieties, the best entry was a hybrid in 14 locations and was second best in 7 locations (Table 8). However, amongst the two worst entries hybrids were again more frequent, as they were worst in 13 locations and next worse in 8. This clearly suggests a greater instability amongst the hybrids. IVC-P8004, although top ranked on both mean grain yield and mean percentage of trial mean, comes in the top two entries at only two locations, illustrating that the remarkable performance of this entry is because of its stability across locations.

India

The across-location performance of the entries was analysed for the 15 locations in India (Table 9). The top-ranked entries are

little changed, apart from the fact that ICH 446 is now third-ranked, whilst ICH 448, which occupied this position over all locations, falls to ninth position.

Frequently, scientists discard locations with high coefficients of variation (CV's) from analyses of multilocational data. This is unfortunate as these environments are often low-yielding and therefore more typical of farmers' fields. The data were analysed across locations after excluding the data for Durgapure and Rahuri with CV's greater than 29% (Table 10). In general, the performance of the entries was little changed. However, MBH 137 is now the highest-ranked, which can be expected as hybrids tend to perform well in high yielding environments. The greatest change in rank is with ICMS 8013 which fell from 5th to 15th rank: this entry has an anomalous yield at Rahuri (3630 kg ha^{-1} compared to a trial mean of 2150 kg ha^{-1}, and a yield of 2570 kg ha^{-1} for the second-ranked entry). More can be learnt from this exercise concerning the effect of a single anomalous point in determining mean yield, rather than about discarding locations with high CV's.

Regions in India

India was divided into 'north' and 'south' regions to examine the performance of the entries in these two regions, and see if the performance of entries changes on a regional basis. The division has been made between Rahuri, Maharashtra, in the north region and ICRISAT, Andhra Pradesh, in the south. There are remarkable differences in performance of the entries in the two regions (Table 11). The only entry that performs well in both regions is IVC-P8004. MBH 137 and ICH 446 fell to 14th and 17th ranked in north

India, UCH 10 is twelth ranked in the south. Two of the top-ranking entries in one region - IVC 80135, third ranked in the south, and ICMS 8010, second ranked in the north - are not amongst the five top-ranked entries on an all-India basis. Amongst the top-ranked entries there were no great differences between performance measured as mean grain yield or as mean percentage of trial mean.

The validity and usefulness of the separation into north and south has been tested by an analysis of variance and a correlation analysis (Tables 12 and 13). Unlike the situation in IPMAT 7, the difference between the north and south regions was non-significant (Table 12). There was a greater difference between locations in the north than in the south, and the genotype x location interaction was also greater in the north than in the south (Table 12).

A correlation analysis was done between the entry yields at specific locations and the mean yields of the entries in the north, south and all-India (Table 13). A high correlation of yields of entries at a location with mean yields in a region, indicates that a trial at that location is useful for predicting yields of entries over a wider area for that year. The correlation analysis has been done with and without the data for the location being examined. The latter is a more rigorous test of the predictive value of a location. In IPMAT 8, in contrast to IPMAT 7, the locations in the southern region are superior at predicting the all-India performance of the entries. This is not an artifact of the southern location means contributing more to the overall means; there are more locations in the north, and the mean yield of the northern locations is slightly higher than the mean yield of the southern locations.

The correlation analysis justifies the zoning of the trial data. In most of the cases the locations fit best in their own region when the respective locations are included in the mean of the region i.e. the locations show a higher correlation with the mean of their own region than with that of the other region. This position is less clear, however, in the case of the northern region, when the individual locations are not contributing to the regional or overall mean. Jalna is an intermediate location and would appear to fit better in the south, and Durgapura is a very poor predictor of regional or overall means.

Sites which are good predictors include all the southern locations, apart from Palem, and include Kanpur, Jalna and Aurangabad in the north.

The correlation between north and south India means for each entry is only 0.16, and indicates how little the two regions have in common.

Stability analysis

Analyses according to Finlay and Wilkinson (1963) and Binswanger and Barah (1980) have been done. These are also reported in Witcombe (1985). The hybrids are, in general, higher-yielding, have higher slopes, and higher S^2_d values than the varieties (Fig 1). (The higher S^2_d values of the hybrids may well be a statistical artifact, as they are the minority of the entries in the trial, and atypical entries will tend to have larger deviations from the regression lines. This is because the environmental indices are the overall means across all locations of the entries in the trial, and are thus mainly determined by the open-pollinated varieties). In both analyses IVC-P8004 is

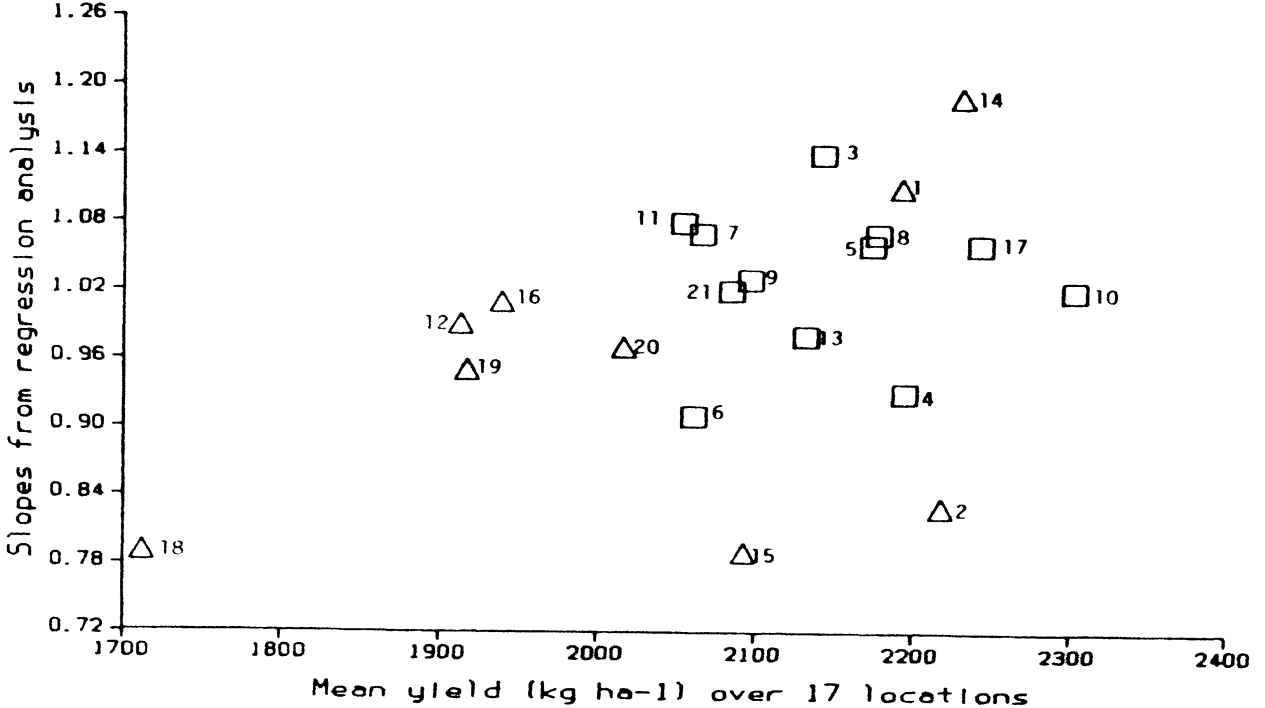

Fig. 1. Relationship between slopes and mean yield over 17 Indian locations from regression analysis. Hybrids are shown by triangles and varieties by squares. The numbers refer to the entries.

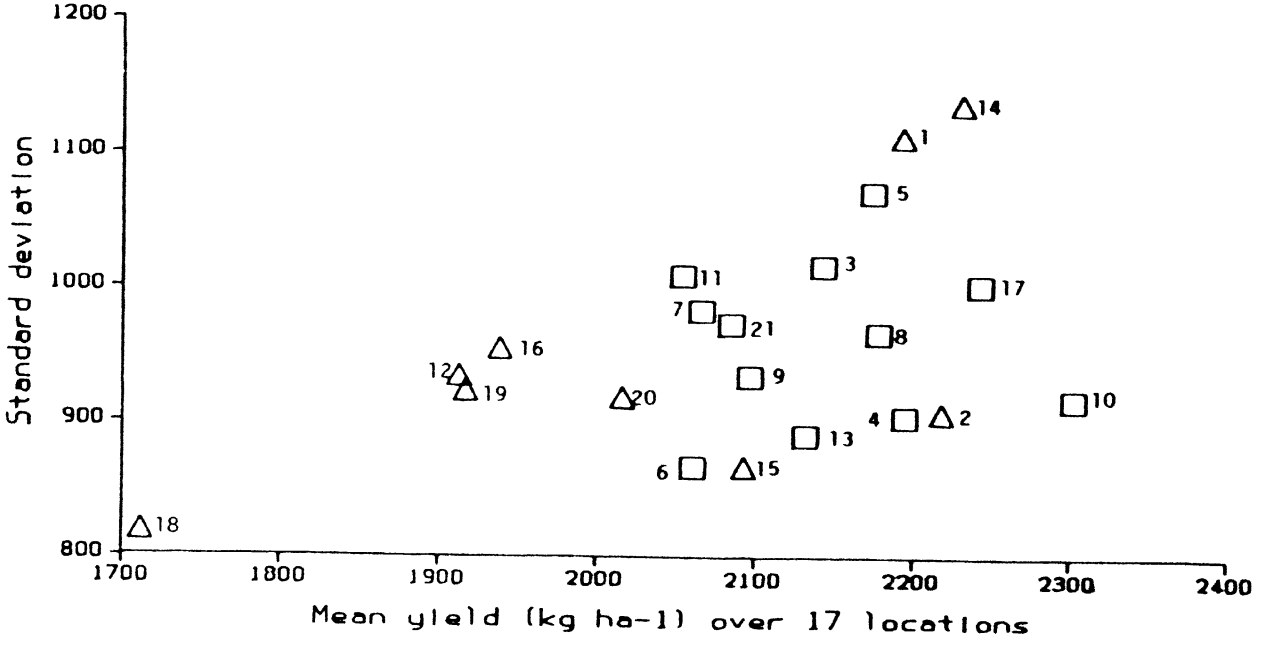

Fig. 2. Relationship between standard deviations and mean yield over 17 Indian locations. Hybrids are shown by triangles and varieties by squares. The numbers refer to the entries.

clearly superior for both yield and stability (Figs. 1, 2).

TIME TO 50% BLOOM

The location data show a weak trend for the entries to bloom later in the north (Table 14). No doubt, differences in rainfall, irrigation, and temperature between locations are reducing the trend that could be expected from differences in day length alone.

The differences in time to bloom between the test entries are not large, 7 d separates the earliest and latest entries (Table 15). The earliest entry is the check hybrid BJ 104. Among the highest-ranked entries for yield, UCH 10 is the latest and MBH 137 the earliest, but only 4 d separates these two entries.

PLANT HEIGHT

As in previous years, the open-pollinated varieties are taller than the hybrids (Table 16). The varieties derived from the Inter Varietal Composite are the first, second, and fourth ranked entries and are of about the same height as check variety ICMS 7703. The top-ranking hybrids for grain yield include MBH 137, ICH 448, UCH 10 and ICH 448, and these are all among the shortest entries, though they are still taller than BJ 104.

DOWNY MILDEW, SMUT, ERGOT AND RUST

The susceptibility of entries to downy mildew varied markedly between locations (Table 17). The two locations in West Africa had much higher levels of downy mildew but, even then, it is difficult to distinguish well between entries. ICMS 8010 appears to have good resistance to downy mildew. The top-ranked entry, IVC-P8004, has excellent resistance to downy mildew in India, and in controlled

experiments. Nevertheless, at Maradi in Niger it has levels of downy mildew which are high, but below the average for the trial.

The data on ergot and smut incidence are not included in Table 17. In open-pollinated heads in a trial where the entries have variable maturity, any scores for these diseases are misleading, since pollination of the florets prevents infection. Early and late entries in the trial are, therefore, at a disadvantage as there will be less pollen at the time they are flowering. In future, only disease nursery data will reported for these diseases. Rust data were provided for only a few locations and they were also incomplete, so these data are also not presented in Table 17.

JRW (March 1986)

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Table 1. Entries of IPMAT 8.

Entry no.	Entry	Origin	Entry type	Description
1	ICH 446	ICRISAT	Hybrid	5141A x R61-1-2-11
2	ICH 448	ICRISAT	Hybrid	5141A x (R294 x R377)-1-131
3	ICMS 8008	ICRISAT	Synthetic	Random mating of 3 inbreds derived from crosses involving late composite progenies, J 1436, A 836, B 282, J 888, and 700 .....
4	ICMS 8010	ICRISAT	Synthetic	Random mating of 5 inbreds derived from crosses involving J 1623, 700....., Souna D_2, Ex Bornu, J 25-1, KG-22-30-2, and 2390$_2$B.
5	ICMS 8013	ICRISAT	Synthetic	Random mating of 4 inbreds derived from crosses involving J 1188, B 282, J 1244, Souna D_2, Ex Bornu progenies and J 104, J 1486, and 700.....
6	ICMS 8014	ICRISAT	Synthetic	Random mating of 5 inbreds derived from crosses involving J 104, B 282, J 888, J 1244, J 68, J 1188, and 700.....
7	ICMS 8133	ICRISAT	Synthetic	Random mating of 6 inbreds derived from crosses involving B 816, Souna D_2, Ex Bornu, J 1798, J 1623, J 25-1, Gam 75, Inter Varietal Composite progenies, and 700.....
8	ICMS 8147	ICRISAT	Synthetic	Random mating of 6 inbreds derived from crosses involving 70-1, 700 ....., Serere Composite progenies, Souna D_2, Ex Bornu, J 1298, B 282, J 104, B Senegal, and 13003.
9	IVC-P8001	ICRISAT	Variety	Random mating of 6 S_2 progenies of Inter Varietal Composite selected at Patancheru in 1980.
10	IVC-P8004	ICRISAT	Variety	Random mating of 7 S_2 progenies of Inter Varietal Composite selected (ICMV 81111) at Patancheru in 1980.
11	IVC 80135	ICRISAT	Variety	An S_2 progeny variety of Inter Varietal Composite.
12	SC1 P8001	ICRISAT	Variety	Random mating of 4 S_2 progenies from Serere Composite-1 selected at Patancheru Center.
13	MC 81121	ICRISAT	Variety	Random mating of sister half-sibs derived from an S_2 progeny of Medium Composite.
14	MBH 137	MAHYCO	Hybrid	Contributed by Maharashtra Hybrid Seeds Company (MAHYCO).
15	KCH 1754	TNAU	Hybrid	Contributed by Kovilpatti Millet Experiment Station.
16	UCC 1	TNAU	Composite	Contributed by Coimbatore Millet Experiment Station.
17	UCH 10	TNAU	Hybrid	Contributed by Coimbatore Millet Experiment Station.
18	UCH 12	TNAU	Hybrid	Contributed by Coimbatore Millet Experiment Station.
19	BJ 104	AICMIP	Hybrid	Check (5141A x J 104).
20	WC-C75	ICRISAT	Variety	Check
21	ICMS 7703	ICRISAT	Synthetic	Check
22	Local check	-	-	Cooperator-selected local cultivar.

Table 2. Distribution of IPMAT 8.

Country	Number of locations
India	17[1]
Niger	2
Pakistan	2
Total	21

1. Excluding ICRISAT's downy mildew, ergot, and smut screening nurseries.

Table 3. Cooperators of IPMAT 8.

Location where experiment grown	Latitude °	'N	Cooperator/agency
India			
Ludhiana, Punjab	30	56	D.S. Virk, N.B. Singh, M. Srivastava, S.S. Chahal, PAU, Ludhiana, Punjab, India.
Hisar, Haryana	29	10	ICRISAT-HAU, Hisar, Cooperative Research Station, Haryana, India.
Durgapura, Rajasthan	26	54	Plant Breeder (Millet), University of Udaipur, Agricultural Research Station, Jaipur, India.
Kanpur, Uttar Pradesh	26	28	U. Singh Santoshi, Millet Breeder, Department of Plant Breeding and Genetics, C.S. Azad University of Agric. and Tech., Kanpur, Uttar Pradesh, India.
Gwalior, Madhya Pradesh	26	12	A.K. Singh, G.S. Chawkar, M.R. Jadhav, College of Agriculture, JNKVV, Gwalior, Madhya Pradesh, India.
Jamnagar, Gujarat	22	28	H.R. Dave, K.V. Pethani, L.R. Mungra, GAU, Jamnagar, India.
Aurangabad, Maharashtra	19	53	M.A. Quader, R.Y. Kannandkar, D.N. Sirsat, Bajra Research Station, MAUP, Paithan Road, Aurangabad. Aurangabad, Maharashtra, India.
Jalna, Maharashtra	19	51	R.R. Vohra, MAHYCO, Jalna, Maharashtra, India.
Rahuri, Maharashtra	19	26	Professor, Bajra Breeder, MPAU, Rahuri, Maharashtra, India.
ICRISAT Centre, Andhra Pradesh	17	22	ICRISAT Center, Patancheru P.O., Andhra Pradesh, India.
Palem, Andhra Pradesh	16	28	T.V.S. Rameshan Rao, Senior Scientist (Millets), Associate Director Research (Regional Agricultural Research Station APAU), Palem, Mahboobnagar Dist., Andhra Pradesh, India.
Bhavanisagar, Tamil Nadu	11	00	ICRISAT-TNAU Cooperative Research Station, Bhavanisagar, India.
Coimbatore, Tamil Nadu	11	00	C. Nagarajan, Crop Scientist, School of Genetics, TNAU, Coimbatore, Tamil Nadu, India.
Kovilpatti, Tamil Nadu	9	12	R. Rajasekharan, S. Nallaiah Durairaj, Cotton and Millets Expt. Station, TNAU Kovilpatti, Tamil Nadu, India.
Pakistan			
Bahawalpur	26	25	Economic Botanist, Agricultural Research Station, Bahawalpur, Pakistan.
Dadu Sind	25	45	Mohd. Ismail Memon, Production Agronomist, Agriculture Research Station, Dadu Sind, Pakistan.
Niger			
Niamey	13	29	K. Anand Kumar, ICRISAT Centre Sahelian, B.P. 12404, Niamey, Niger.
Maradi	13	28	B.B. Singh, Yusufou Bouzou, ICRISAT, B.P. 260, Maradi, Niger.

Table 4. Information on management of the trial at all locations.

Locations	Date planted 1983	Date harvested 1983	Fertilizer level (Kg ha^{-1}) N	P	K	Gross plot size (m^2)	Net plot size (m^2)	Spacing Row x plant (cm)	Local check
Ludhiana, Punjab	Jul 8	Oct 12	100	60	0	12	12	60 x 10	-
Hisar, Haryana	Jul 7	Oct 13	80	40	0	22.5	15	75 x 10	MBH 110
Durgapura, Rajasthan	Jul 30	Oct 24	50	30	0	15	8	50 x 10	Durgapura LC
Kanpur, Uttar Pradesh	Aug 1	Nov 17	40	40	0	15	15	50 x 10	Mainapur
Gwalior, Madhya Pradesh	Jul 22	Nov 13	40	20	0	15	10	50 x 10	GB-1
Jamnagar, Gujarat	Jul 25	Oct 3	80	40	0	21.6	12	60 x 10	-
Aurangabad, Maharashtra	Jul 13	Oct 15	60	30	0	12	7.6	50 x 10	Bengoan
Jalna, Maharashtra	Jul 13	Oct 24	100	40	40	13.5	7.2	45 x 15	-
Rahuri, Maharashtra	Jul 16	Oct 22	60	25	0	13.5	7.9	45 x 15	RHR 2
ICRISAT HF, Andhra Pradesh	Jun 24	Sep 27	80	40	0	18.0	12	75 x 10	MBH 110
ICRISAT LF, Andhra Pradesh	Jun 29	Sep 28	20	20	0	12	10	50 x 10	MBH 110
Palem, Andhra Pradesh	Jun 25	Sep 25	60	30	30	15	10	50 x 10	R.8.S
Bhavanisagar, Tamil Nadu	Jul 1	Sep 29	80	40	0	22.5	15	75 x 10	-
Coimbatore, Tamil Nadu	Sep 23	Dec 28	40	40	40	15	10	50 x 15	Co 6
Kovilpatti, Tamil Nadu	Oct 18	Jan 21(84)	70	35	35	13.5	9	45 x 15	KCH 1755 Hybrid
Bahawalpur, Pakistan	Jul 21	Nov 24	60	30	0	13.5	9	45 x -	Composite 75
Dadu Sind, Pakistan	Jul 31	Nov 8	80	40	0	13.5	9	45 x 20	18-8Y
Niamey, Niger	Jun 12	Oct 25	45	38	0	24	24	100 x 100	CIVT II
Maradi, Niger	Jun 27	Sep 26	23	25	0	30	20	100 x 100	CIVT Composite

Table 5. Rainfall during crop growth period at all locations.

Locations	Rainfall (mm)								Total[1] rainfall (mm)	Date planted	Date harvested	No. of irri-gations
	Jun 83	Jul 83	Aug 83	Sep 83	Oct 83	Nov 83	Dec 83	Jan 84				
Ludhiana		269	367	88	4				728	Jul 8	Oct 12	1
Hisar		148	110	92					350	Jul 7	Oct 13	1
Durgapura		388	127	67	81				664	Jul 30	Oct 24	NR[2]
Kanpur		212	192	318					722	Aug 1	Nov 17	0
Gwalior		215	225	337	81				858	Jul 22	Nov 13	0
Jamnagar		222	144	55	7				428	Jul 25	Oct 3	0
Aurangabad		136	190	462	14				810	Jul 13	Oct 15	0
Jalna			212	446	10				668	Jul 13	Oct 24	0
Rahuri		121	66	366	1				553	Jul 18	Oct 22	Yes
ICRISAT	87	211	305	287					890	Jun 27	Sep 27	0
Patancheru	76	160	253	426					915	Jun 25	Sep 25	NR[2]
Bhavanisagar	86	42	24	74					226	Jul 1	Sep 29	2
Coimbatore				56	183	105			345	Sep 23	Dec 29	3
Kovilpatti					189	167	60	5	470	Oct 19	Jan 21	0
Bahawalpur		50	10						60	Jul 21	Nov 24	2
Dadu Sind			75	25					100	Jul 31	Nov 8	5
Niamey	157	133	92	195	4				580	Jun 12	Oct 10	NR[2]
Maradi	46	37	94	46					222	Jun 27	Sep 28	0

1. During crop growth period only.
2. Not reported.

Table 8. Summary of performance of entries across all locations in India, Pakistan and Africa for grain yield, time to bloom, and plant height.

Entry	Entry no.	Grain yield					Time to bloom (d)		Plant height (cm)	
		Kg ha^{-1}	% of controls	Rank	Mean of % trial Mean[1]	Rank	Mean	Rank	Mean	Rank
ICVC-P8004	10	2110	114	1	111	2	53	12	219	2
MBH 137	14	2050	110	2	104	7	50	21	182	20
ICH 448	2	2040	110	3	110	3	52	15	193	18
UCH 10	17	2030	110	4	103	9	54	3	202	16
ICMS 8010	4	2030	109	5	110	4	52	18	207	13
ICH 446	1	2030	109	6	109	5	53	10	191	21
ICMS 8147	8	2000	108	7	104	8	54	4	213	7
ICMS 8013	5	1990	107	8	102	10	54	5	211	9
ICMS 8008	3	1960	106	9	99	12	52	19	206	15
MC 81121	13	1950	105	10	101	11	52	17	207	11
KCH 1754	15	1920	104	12	107	6	55	2	213	6
IVC-P8001	9	1910	103	13	97	16	53	9	214	5
ICMS 8133	7	1900	102	15	98	14	51	20	199	17
IVC 80135	11	1880	101	16	97	17	55	1	224	1
ICMS 8014	6	1880	101	17	98	15	53	14	209	10
SC1-P8001	12	1750	94	19	89	20	54	6	206	14
UCC 1	16	1730	93	21	87	21	54	7	214	4
UCH 12	18	1560	84	22	79	22	53	8	193	19
Controls										
Local check	22	1930	104	11	113	1	53	11	212	8
ICMS 7703	21	1910	103	14	99	13	53	13	215	3
WC-C75	20	1840	99	18	95	18	52	16	207	12
BJ 104	19	1740	94	20	89	19	48	22	171	22
SE		±51					±0.2		±1.8	
Mean		1910					53		205	

1. % of trial mean calculated at each location, and these percentages then averaged across locations.

Table 7. Grain yield of entries across all locations in India, Pakistan and Africa...

Entry	Entry no.	Kg ha^{-1}	Rank	Mean of % trial mean[1]	Rank	Ludhiana Kg ha^{-1}	Ludhiana Rank	Hisar Kg ha^{-1}	Hisar Rank	Durgapura Kg ha^{-1}	Durgapura Rank	Kanpur Kg ha^{-1}	Kanpur Rank	Gwalior Kg ha^{-1}	Gwalior Rank
ICVC-P8004	10	2110	1	111	2	1860	11	2680	5	1050	5	1160	6	2470	18
MBH 137	14	2050	2	104	7	1320	18	1580	19	490	21	840	15	2590	11
ICH 448	2	2040	3	110	3	2890	1	2210	13	980	7	1430	1	2450	20
UCH 10	17	2030	4	103	9	2490	3	2350	12	950	9	970	13	2660	6
ICMS 8010	4	2030	5	110	4	2690	2	2480	11	790	15	1260	3	2550	12
ICH 446	1	2030	6	109	5	2370	4	530	22	770	16	990	12	2470	18
ICMS 8147	8	2000	7	104	8	2070	7	2040	17	1190	4	930	14	2600	10
ICMS 8013	5	1990	8	102	10	1340	16	2540	7	850	12	1180	5	2510	14
ICMS 8008	3	1960	9	99	12	1640	14	2710	4	590	20	1080	7	2880	1
MC 81121	13	1950	10	101	11	1960	8	2780	3	770	16	810	17	2660	7
KCH 1754	15	1920	12	107	6	1920	9	1580	18	1500	1	1020	9	2460	19
IVC-P8001	9	1910	13	97	16	2080	6	2040	16	760	17	**1040**	**8**	**2610**	**9**
ICMS 8133	7	1900	15	98	14	1510	15	2540	9	850	13	1000	11	2680	4
IVC 80135	11	1880	16	97	17	1120	21	2480	10	920	11	720	21	2630	8
ICMS 8014	6	1880	17	98	15	1670	13	2540	8	1280	2	1330	2	2530	13
SC1 P8001	12	1750	19	89	20	1910	10	2050	15	650	19	710	22	2470	17
UCC 1	16	1730	21	87	21	1230	19	2060	14	960	8	780	20	2670	5
UCH 12	18	1560	22	79	22	1960	8	1140	20	700	18	790	18	2490	15
Controls															
Local check	22	1930	11	113	1	1740	12	3370	1	1030	6	790	19	2480	16
ICMS 7703	21	1910	14	99	13	1130	20	2910	2	800	14	1210	4	2220	21
WC-C75	20	1840	18	95	18	1320	17	2660	6	930	10	840	16	2750	3
BJ 104	19	1740	20	89	19	2300	5	1130	21	1270	3	1020	10	2760	2
SE		±51				±297		±173		±238		±111		±231	
Mean		1910				1840		2200		910		1000		2570	
CV(%)						16		23		45		19		16	

1. % of trial mean calculated at each location, and these percentages then averaged across locations.

Contd...

Table 7. (Contd.). Grain yield.

Entry	Entry no.	Jamnagar		Aurangabad		Jalna		Rahuri		PHF		PLF		Palem	
		Kg ha^{-1}	Rank	Kg ha^{-1}	Rank	Kg ha^{-1}	Rank	Kg ha^{-1}	Rank	Kg ha^{-1}	Rank	Kg ha^{-1}	Rank	Kg ha^{-1}	Rank
IVC-P8004	10	3750	5	3030	7	3280	5	2570	2	2970	9	2280	5	2390	6
MBH 137	14	3250	15	3570	3	3880	1	1890	15	3660	1	2950	1	2990	1
ICH 448	2	4000	2	2930	10	2000	21	2350	6	3150	6	2540	3	2190	9
UCH 10	17	3750	4	2780	13	3270	6	2290	9	2890	12	1840	16	1860	18
ICMS 8010	4	3400	14	3290	4	2740	12	2550	3	2810	16	1740	18	2100	11
ICH 446	1	3930	3	2500	18	2980	10	2200	11	3500	2	2750	2	2970	2
ICMS 8147	8	3740	6	2890	11	3330	4	2190	12	2890	13	2090	9	2190	10
ICMS 8013	5	3650	8	2760	14	2690	13	3630	1	2860	14	2170	8	2330	7
ICMS 8008	3	3420	13	3020	8	3060	8	1840	16	2930	11	2290	4	1940	16
MC 81121	13	3250	15	3000	9	2780	11	2220	10	2580	21	1780	17	2050	12
KCH 1754	15	3580	9	2260	19	1770	22	1440	21	3230	4	1700	20	2430	5
IVC-P8001	9	3460	12	3650	1	2550	15	2480	4	3080	8	2030	12	1290	22
ICMS 8133	7	3700	7	2540	17	3370	3	1440	22	2940	10	2040	11	2750	4
IVC 80135	11	3190	17	2720	16	2420	16	1840	19	3200	5	2080	10	2930	3
ICMS 8014	6	3520	11	2860	12	2310	19	2090	14	2610	19	2180	7	1780	20
SC1 P8001	12	3560	10	3140	6	2090	20	2110	13	2820	15	1860	15	2220	8
UCC 1	16	2940	19	2750	15	3180	7	2320	7	2600	20	1250	22	1570	21
UCH 12	18	2870	20	1410	22	2580	14	1840	17	2310	22	1740	19	2010	13
Controls															
Local check	22	2630	21	1720	20	3610	2	1560	20	3410	3	2180	6	1870	17
ICMS 7703	21	3200	16	3270	5	3030	9	2370	5	3110	7	1980	14	1850	19
WC-C75	20	3130	18	3640	2	2330	18	2290	8	2750	17	2020	13	1990	14
BJ 104	19	4020	1	1690	21	2380	17	1840	18	2740	18	1660	21	1950	15
SE		±203		±263		±100		±373		±197		±205		±218	
Mean		3450		2790		2800		2150		2960		2050		2170	
CV(%)		10		16		6		30		12		17		17	

Contd...

Table 7. (Contd.). Grain yield.

Entry	Entry no.	Bhavanisagar		Coimbatore		Kovilpatti		Bahawalpur		Dadu Sind		Niamey		Meradi	
		Kg ha^{-1}	Rank	Kg ha^{-1}	Rank	Kg ha^{-1}	Rank	Kg ha^{-1}	Rank	Kg ha^{-1}	Rank	Kg ha^{-1}	Rank	Kg ha^{-1}	Rank
IVC-P8004	10	3570	10	1470	11	980	7	1370	11	2270	2	590	5	870	10
MBH 137	14	3280	15	1880	1	680	17	1520	9	1550	10	450	12	470	4
ICH 448	2	2550	21	1330	15	640	19	2350	1	1730	4	570	8	440	7
UCH 10	17	4010	1	1070	20	1110	4	2130	2	1700	5	150	21	330	13
ICMS 8010	4	3210	17	1290	16	890	10	1720	7	1820	3	700	2	490	3
ICH 446	1	3900	3	1410	12	1150	1	1980	4	870	22	550	8	680	2
ICMS 8147	8	3570	9	1470	10	710	15	1440	10	1660	9	690	3	230	17
ICMS 8013	5	3560	11	1230	18	740	14	1740	6	1170	19	410	14	420	8
ICMS 8008	3	3980	2	1600	3	790	12	980	20	1690	6	450	13	340	12
MC 81121	13	3630	7	1560	4	800	11	2090	3	1520	12	610	4	220	19
KCH 1754	15	3720	5	1490	7	1140	2	1910	5	2430	1	530	9	460	5
IVC-P8001	9	3340	14	1480	8	1050	5	1020	18	1660	8	350	18	260	15
ICMS 8133	7	3130	18	1400	13	700	16	1060	17	1490	13	450	11	440	6
IVC 80135	11	3890	4	1650	2	780	13	1070	16	1280	17	500	10	360	11
ICMS 8014	6	3410	12	1510	6	670	18	1630	8	1130	21	350	18	260	15
SC1 P8001	12	2460	22	1340	14	450	20	1330	12	1350	15	350	17	390	9
UCC 1	16	3590	8	1290	16	920	8	1000	19	1250	18	230	20	250	16
UCH 12	18	2700	20	750	21	360	22	1910	5	1550	11	330	19	190	20
Controls															
Local check	22	3690	6	1200	19	1120	3	840	21	1320	16	1240	1	880	1
ICMS 7703	21	3390	13	1480	9	1010	8	1140	14	1380	14	580	7	230	18
WC-C75	20	2930	19	1520	5	910	9	1130	15	1140	20	400	15	320	14
BJ 104	19	3260	16	1260	17	390	21	1220	13	1690	7	100	22	440	7
SE		±375		±142		±25		±308		±137		±97		±84	
Mean		3400		1390		820		1480		1530		480		380	
CV(%)		19		18		5		36		16		35		42	

Table 8. Grain yield of top two and bottom two entries in all locations in India, Pakistan and Africa.

Locations	Location mean yield		Top entries[1]				Bottom entries[1]			
			1st		2nd		1st		2nd	
	Kg ha-1	Rank	Entry	Yield	Entry	Yield	Entry	Yield	Entry	Yield
Ludhiana	1840	11	ICH 448	2890	ICMS 8010	2690	IVC 80135	1120	UCC 1	1230
Hisar	2200	7	MC 81121	2780	ICMS 8008	2710	ICH 446	530	UCH 12	1140
Durgapura	910	16	KCH 1754	1500	ICMS 8013	1280	MBH 137	490	ICMS 8008	590
Kanpur	1000	13	ICH 448	1430	ICMS 8013	1330	SC1 P8001	710	IVC 80135	720
Gwalior	2570	6	ICMS 8008	2880	ICMS 8133	2680	ICH 448	2450	KCH 1754	2460
Jamnagar	3450	1	ICH 448	4000	ICH 446	3930	UCH 12	2870	UCC 1	2480
Aurangabad	2790	5	IVC-P8001	3650	MBH 137	3570	UCH 12	1410	KCH 1754	2280
Jalna	2800	4	MBH 137	3880	ICMS 8133	3370	KCH 1754	1770	ICH 448	2000
Rahuri	2150	9	ICMS 8013	3630	IVC-P8004	3030	ICMS 8133	1440	KCH 1754	1440
ICRISAT HF	2960	3	MBH 137	3660	ICH 448	3500	UCH 12	2310	UCC 1	2600
ICRISAT LF	2050	10	MBH 137	2950	ICH 448	2750	UCC 1	1250	KCH 1754	1700
Palem	2170	8	MBH 137	2990	ICH 448	2970	IVC-P8001	1290	UCC 1	1570
Bhavanisagar	3400	2	UCH 10	4010	ICMS 8008	3980	SC1 P8001	2460	ICH 448	2580
Coimbatore	1390	14	MBH 137	1880	IVC 80135	1650	UCH 12	750	UCH 10	1070
Kovilpatti	820	17	ICH 446	1150	KCH 1754	1140	UCH 12	380	SC1 P8001	460
Bahawalpur	1530	11	ICH 448	2350	UCH 10	2130	ICMS 8008	980	UCC 1	1000
Dadu Sind	1480	13	KCH 1754	2430	IVC-P8004	2270	ICH 446	870	ICMS 8013	1130
Niamey	480	18	ICH 448	660	ICMS 8010	490	UCH 12	190	MC 81121	220
Maradi	380	19	ICMS 8010	700	ICMS 8147	690	UCH 10	150	UCC 1	230

1. % of trial mean calculated at each location, and these percentages then averaged across locations.

Table 8. Summary of performance of entries across 15 locations in India.

Entry	Entry no.	Grain yield: Kg ha^{-1}	Grain yield: % of controls	Grain yield: Rank	Grain yield: Mean of % trial mean[1]	Grain yield: Rank	Time to bloom(d): Mean	Time to bloom(d): Rank	Plant height(cm): Mean	Plant height(cm): Rank
ICVC-P8004	10	2370	112	1	110	1	52	11	225	2
MBH 137	14	2320	110	2	103	8	49	21	200	20
ICH 448	1	2280	108	3	106	2	53	6	200	21
UCH 10	17	2280	108	4	106	4	53	9	212	13
ICMS 8013	5	2270	107	5	104	7	53	4	220	7
ICMS 8147	8	2260	107	6	104	6	54	3	219	8
ICMS 8010	4	2250	106	7	105	5	52	14	211	15
ICMS 8008	3	2250	106	8	102	12	51	19	216	12
ICH 448	2	2240	106	9	106	3	52	16	203	18
IVC-P8001	9	2200	104	10	102	11	52	10	221	6
MC 81121	13	2180	103	12	99	15	51	18	212	14
ICMS 8133	7	2170	103	13	99	17	50	20	204	17
IVC 80135	11	2170	103	14	99	18	55	2	233	1
ICMS 8014	6	2150	102	16	102	10	52	15	218	9
KCH 1754	15	2080	98	18	101	14	55	1	222	4
UCC 1	16	2010	95	19	92	19	53	7	223	3
SC1 P8001	12	1990	94	20	89	21	53	5	216	11
UCH 12	18	1710	81	22	77	22	53	8	200	19
Controls										
ICMS 7703	21	2200	104	11	102	9	52	13	221	5
Local check	22	2160	102	15	101	13	52	12	211	16
MC-C75	20	2130	101	17	99	16	51	17	216	10
BJ 104	19	1980	93	21	91	20	47	22	175	22
SE		±58					±0.2		±2.1	
Mean		2170					52		213	

1. % of trial mean calculated at each location, and these percentages then averaged across locations.

Table 10. Summary performance of entries across 13 locations[1] in India.

Entry	Entry no.	Grain yield: Kg ha^{-1}	Grain yield: % of controls	Grain yield: Rank	Grain yield: Mean of % trial mean[2]	Grain yield: Rank	Time to 50% bloom(d): Mean	Time to 50% bloom(d): Rank	Plant height(cm): Mean	Plant height(cm): Rank
MBH 137	14	2500	113	1	108	2	49	20	202	21
IVC-P8004	10	2450	111	2	109	1	52	11	234	2
ICH 446	1	2420	109	3	108	3	53	6	208	19
ICMS 8008	3	2410	109	4	106	4	51	18	222	11
UCH 10	17	2390	108	5	106	5	53	8	216	13
ICMS 8147	8	2350	106	6	102	10	54	3	225	9
ICMS 8010	4	2340	106	7	105	6	52	9	216	14
ICMS 8133	7	2330	105	8	102	12	49	19	211	17
ICH 448	2	2330	105	9	105	7	52	15	208	18
IVC 80135	11	2280	104	10	100	15	55	2	240	1
IVC-P8001	9	2280	103	13	102	9	52	10	227	7
MC 81121	13	2280	103	14	100	13	51	16	215	16
ICMS 8013	5	2270	103	15	100	14	54	4	226	8
ICMS 8014	6	2220	101	16	99	16	52	14	227	6
KCH 1754	15	2180	99	18	99	17	56	1	227	5
SC1 P8001	12	2080	94	19	90	20	54	5	221	12
UCC 1	16	2060	93	20	90	19	53	7	230	3
UCH 12	18	1780	80	22	76	22	53	8	203	20
Controls										
Local check	22	2280	104	11	102	11	52	12	216	15
ICMS 7703	21	2280	104	12	103	8	52	13	228	4
WC-C75	20	2210	100	17	98	18	51	17	223	10
BJ 104	19	2040	92	21	88	21	47	21	179	22
SE		±59					±0.2		±2.2	
Mean		2260					52		218	

1. Excludes Durgapura and Rahuri with CV > 29%.
2. % of trial mean calculated at each location, and these percentages then averaged across locations.

Table 11. Mean grain yield of entries by region in India.

Entry	Entry no.	All-India				North India				South India			
		Kg ha^{-1}	Rank	Mean of % trial mean[1]	Rank	Kg ha^{-1}	Rank	Mean of % trial mean[1]	Rank	Kg ha^{-1}	Rank	Mean % trial mean[1]	Rank
IVC-P8004	10	2370	1	110	1	2430	1	112	2	2280	5	109	5
MBH 137	14	2320	2	103	8	2160	14	92	18	2580	2	120	2
ICH 446	1	2290	3	106	2	2080	17	94	18	2610	1	124	1
UCH 10	17	2290	4	106	4	2390	3	109	4	2130	12	101	9
ICMS 8013	5	2270	5	104	7	2350	5	107	5	2150	10	99	13
ICMS 8147	8	2260	6	104	6	2330	6	107	6	2150	9	100	11
ICMS 8010	4	2250	7	105	5	2420	2	111	3	2010	18	95	17
ICMS 8008	3	2250	8	102	12	2250	9	100	11	2250	6	105	7
ICH 448	2	2240	9	106	3	2360	4	112	1	2070	13	97	16
IVC-P8001	9	2200	10	102	11	2300	7	104	8	2050	15	99	12
MC 81121	13	2180	12	99	15	2250	8	101	10	2070	14	97	15
ICMS 8133	7	2170	13	99	17	2180	13	98	13	2160	8	101	10
IVC 80135	11	2170	14	99	18	2000	20	90	21	2420	3	112	3
ICMS 8014	6	2150	16	102	10	2240	11	107	7	2030	16	95	18
KCH 1754	15	2080	18	101	14	1950	21	95	16	2290	4	110	4
UCC 1	16	2010	19	92	19	2100	16	95	17	1870	20	89	19
SC1 P8001	12	1990	20	89	21	2080	18	92	20	1860	21	85	20
UCH 12	18	1710	22	77	22	1750	22	80	22	1640	22	72	22
ICMS 7703	21	2200	11	102	9	2240	10	102	9	2130	11	103	8
Controls													
Local Check	22	2160	15	101	13	2100	15	97	14	2250	7	107	6
MC-C75	20	2130	17	99	16	2210	12	100	12	2020	17	98	14
BJ 104	19	1980	21	91	20	2050	19	97	15	1880	19	83	21
SE		±59				±79				±90			
Mean		2170				2180				2130			

1. % of trial mean calculated at each location, and these percentages then averaged across locations.

Table 12. Analysis of variance for grain yield by region in India for grain yield.

Source of variance	DF	Mean square	Mean square (%)	Variance ratio
South versus north region	1	938400	0.1	1.5 **
Southern locations	5	56937100	31.4	92.6 ***
Northern locations	8	45379800	40.1	73.8 ***
Pooled error (a)	28	614800	1.8	
Entries	20	979500	2.2	6.2 ***
Entries north versus south	20	738600	1.6	4.7 ***
Entries x south locations	100	244100	2.7	1.5 ***
Entries x north locations	160	538500	9.5	3.4 ***
Pooled error (b)	800	158400	10.5	

** P<.01
*** P<.001

Table 13. Correlation analysis of grain yield of entries by region in India.

	Yield of entries at individual locations correlated with:					
	Overall means			Overall means excluding respective locations		
	South	North	All India	South	North	All India
Northern locations						
Ludhiana, Punjab	-.19	.25	.57	-.19	-.09	-.17
Hisar, Haryana	-.09	.60	.36	-.09	.23	.09
Durgapura, Rajasthan	-.10	-.03	-.08	-.10	-.19	-.19
Kanpur, UP	.03	.57	.41	.03	.47	.33
Gwalior, MP	-.04	.03	-.01	-.04	-.06	-.07
Jamnagar, Gujarat	.23	.38	.41	.23	.18	.27
Aurangabad, Maharashtra	.30	.64	.63	.30	.34	.43
Jalna, Maharashtra	.40	.30	.46	.40	-.04	.24
Rahuri, Maharashtra	-.07	.59	.37	-.07	.34	.17
Southern locations						
ICRISAT HF, AP	.87	.11	.61	.79	.11	.51
ICRISAT LF, AP	.71	.21	.59	.55	.21	.47
Palem, AP	.69	-.21	.28	.44	-.21	.08
Bhavanisagar, TN	.60	.17	.49	.32	.17	.31
Coimbatore, TN	.68	.22	.58	.58	.22	.50
Kovilpatti, TN	.53	.35	.57	.39	.35	.49
Regions						
South	-	.16	.73			
North	-	-	.79			
All-India	-	-	-			

Table 14. Summary of performance of trial at all locations.

Location	Rainfall in crop growth period (mm)	Grain yield (kg ha^{-1})			Time to bloom (d)	Plant height (cm)
		Trial mean	Rank	Local check	Trial mean	Trial mean
Ludhiana	728[1]	1840	11	1740	56	274
Hisar	350[1]	2200	7	3370	58	316
Durgapura	664[2]	910	16	1030	51	183
Kanpur	722	1000	13	780	52	180
Gwalior	858	2570	6	2480	46	229
Jamnagar	428	3450	7	2630	52	254
Aurangabad	810	2790	5	1720	55	177
Jalna	668	2800	4	3610	57	211
Rahuri	555[1]	2150	9	1560	54	167
ICRISAT HF	890	2960	3	3410	51	247
ICRISAT LF	890	2050	10	2180	53	209
Palem	915	2170	8	1870	58	204
Bhavanisagar	226[1]	3400	2	3690	46	191
Coimbatore	345[1]	1390	14	1200	49	205
Kovilpatti	470	820	17	1120	45	141
Dadu Sind	60[1]	1530	11	1320	55	209
Bahawalpur	100[1]	1480	13	840	54	205
Niamey	580	480	18	1240	57	164
Maradi	220	380	19	890	54	134

1. Irrigated.
2. Irrigation not reported.

Table 15. Time to 50% bloom of entries across all locations in India, Pakistan and Africa...

Entry	Entry no.	Across		Ludhiana		Hisar		Durgapura		Kanpur		Gwalior		Jamnagar	
		Days	Rank	Days	Rank	Days	Rank	Days	Rank	Days	Rank	Days	Rank	Days	Rank
IVC 80135	11	55	1	58	5	60	7	51	7	55	4	49	2	53	5
KCH 1754	15	55	2	58	6	62	3	50	8	50	13	49	3	52	6
UCH 10	17	54	3	42	12	65	2	52	5	53	10	49	1	52	7
ICMS 8147	8	54	4	60	2	60	6	50	10	56	2	48	4	51	9
ICMS 8013	5	54	5	56	9	58	9	49	12	58	3	46	10	51	11
SC1 P8001	12	54	6	56	9	60	6	48	14	50	13	48	6	52	8
UCC 1	16	54	7	56	8	57	10	49	11	54	7	46	9	51	11
UCH 12	18	53	8	59	4	61	4	53	1	49	14	47	7	52	8
IVC P8001	9	53	9	57	7	60	6	53	2	53	8	46	8	52	8
ICH 446	1	53	10	61	1	66	1	53	3	55	5	48	6	55	3
IVC P8004	10	53	12	56	9	59	8	51	6	39	18	48	5	54	4
ICMS 8014	6	53	14	57	7	58	9	49	12	51	12	48	6	52	6
ICH 448	2	52	15	59	3	61	5	53	3	49	15	48	6	56	2
MC 81121	13	52	17	56	8	57	11	48	14	54	6	46	10	52	8
ICMS 8010	4	52	18	56	8	56	12	50	9	55	4	46	9	51	10
ICMS 8008	3	52	19	56	9	55	14	52	4	53	8	44	12	50	12
ICMS 8133	7	51	20	55	10	53	15	48	13	48	16	44	12	50	13
MBH 137	14	50	21	54	11	56	12	51	6	56	2	42	13	52	6
Controls															
Local check	22	53	11	54	11	55	14	53	1	58	1	49	3	58	1
ICMS 7703	21	53	13	55	10	55	13	52	5	54	8	46	9	50	13
WC-C75	20	52	16	56	8	57	11	52	5	52	11	44	11	48	15
BJ 104	19	48	22	56	8	52	16	53	2	42	17	42	13	49	14
SE		±0.2		±0.5		±0.8		±1.4		±0.9		±1.		±0 8	
Mean		53		56		58		51		52		46		52	
CV(%)				1		2		5		3		4		3	

Contd...

Table 15. (Contd.). Time to 50% bloom...

Entry	Entry no.	Aurangabad		Jalna		Rahuri		PHF		PLF		Palem	
		Days	Rank	Days	Rank	Days	Rank	Days	Rank	Days	Rank	Days	Rank
IVC 80135	11	58	1	61	2	54	9	57	1	59	1	61	2
KCH 1754	15	58	1	58	7	54	9	54	3	58	2	60	3
UCH 10	17	56	2	61	1	54	8	56	2	57	3	62	1
ICMS 8147	8	56	2	58	9	55	4	52	6	54	6	58	8
ICMS 8013	5	56	2	60	3	53	11	51	9	53	8	60	4
SC1 P8001	12	56	3	60	4	56	3	52	5	54	6	59	6
UCC 1	16	56	2	58	8	58	1	51	8	54	5	59	6
UCH 12	18	53	6	58	7	53	11	52	6	53	8	59	7
IVC-P8001	9	58	1	58	7	53	10	51	9	53	8	59	7
ICH 446	1	54	5	59	5	54	8	50	10	51	11	57	11
IVC-P8004	10	58	1	59	6	56	3	52	4	54	7	59	5
ICMS 8014	6	54	4	58	7	54	7	51	9	52	10	58	9
ICH 448	2	56	3	58	9	53	12	51	7	52	10	58	10
MC 81121	13	53	7	57	11	55	6	50	12	53	8	58	9
ICMS 8010	4	52	8	56	14	49	14	49	13	55	4	58	10
ICMS 8008	3	56	2	57	12	54	7	49	13	51	13	58	10
ICMS 8133	7	54	4	55	15	56	3	49	14	51	13	56	12
MBH 137	14	50	11	54	16	53	11	48	15	51	12	54	13
Controls													
Local check	22	49	12	51	18	55	6	46	16	46	15	57	11
ICMS 7703	21	53	7	56	13	56	2	50	11	52	9	58	10
WC-C75	20	52	10	57	10	55	5	50	11	52	9	57	11
BJ 104	19	52	9	51	17	51	13	45	17	46	14	53	14
SE		±1.4		±0.8		±0.8		±0.3		±0.7		±0.4	
Mean		55		57		54		51		53		58	
CV(%)		4		3		3		1		2		1	

Contd...

Table 15. (Contd.). Time to 50% bloom.

Entry	Entry no.	Bhavanisagar		Coimbatore		Kovilpatti		Bahawalpur		Dadu Sind		Niamey		Meradi	
		Days	Rank	Days	Rank	Days	Rank	Days	Rank	Days	Rank	Days	Rank	Days	Rank
IVC 80135	11	50	1	44	12	55	2	56	1	56	6	59	4	55	5
KCH 1754	15	49	2	60	1	55	1	53	8	57	3	59	5	54	10
UCH 10	17	45	10	44	12	41	13	56	3	58	1	66	1	64	1
ICMS 8147	8	49	3	55	4	48	5	56	3	52	13	56	11	54	9
ICMS 8013	5	47	6	53	6	52	4	54	8	55	7	60	2	56	4
SC1 P8001	12	49	3	54	5	47	7	55	4	53	11	58	6	55	6
UCC 1	16	48	4	53	6	44	9	56	3	56	5	59	4	54	9
UCH 12	18	44	11	57	3	39	18	56	3	55	8	58	7	57	2
IVC P8001	9	46	9	46	11	42	11	56	2	55	8	59	3	57	2
ICH 446	1	44	12	49	8	39	17	53	10	54	9	58	8	53	11
IVC P8004	10	48	5	51	7	42	10	56	3	54	10	57	9	54	8
ICMS 8014	6	46	8	47	10	41	12	54	7	57	2	58	7	54	10
ICH 448	2	44	11	39	15	41	14	56	3	54	10	57	9	54	10
MC 81121	13	47	7	46	11	41	13	55	4	56	4	56	10	53	12
ICMS 8010	4	46	8	60	1	42	11	55	4	53	11	50	16	52	13
ICMS 8008	3	46	9	43	13	46	8	55	5	54	9	55	12	53	12
ICMS 8133	7	45	10	41	14	42	10	54	8	55	8	53	15	52	13
MBH 137	14	41	14	37	17	40	15	54	8	47	14	53	14	50	14
Controls															
Local check	22	42	13	58	2	55	1	55	6	53	12	59	5	57	3
ICMS 7703	21	46	8	48	9	53	3	55	6	52	13	54	13	55	7
WC-C75	20	46	9	46	11	47	8	55	4	54	10	58	7	54	8
BJ 104	19	40	15	38	16	40	16	53	11	46	15	56	10	50	15
SE		±0.5		±0.0		±0.3		±0.7		±1.3		±2.1		±1.4	
Mean		46		49		45		55		54		57		54	
CV(%)		2		0		1		2		4		7		4	

Table 18. Plant height of entries across all locations in India, Pakistan and Africa...

Entry	Entry no.	Across		Ludhiana		Hisar		Durgapura		Kanpur		Gwalior		Jawaneger	
		(cm)	Rank	(cm)	Rank	(cm)	Rank	(cm)	Rank	(cm)	Rank	(cm)	Rank	(cm)	Rank
IVC 80135	11	224	1	318	1	347	1	205	4	177	12	227	10	276	3
IVC-P8004	10	219	2	264	14	343	2	160	19	186	8	252	2	258	7
UCC 1	16	214	4	276	8	337	3	176	15	171	16	235	7	258	6
IVC-P8001	9	214	5	275	9	323	5	185	11	185	8	245	4	248	15
KCH 1754	15	213	6	284	6	308	12	201	6	195	4	231	8	280	2
ICMS 8147	8	213	7	260	17	318	8	179	14	188	5	226	12	243	17
ICMS 8013	5	211	9	291	5	337	3	187	9	198	3	227	10	251	11
ICMS 8014	6	209	10	279	7	323	5	152	20	188	7	227	11	251	12
MC 81121	13	207	11	254	20	320	7	199	7	171	18	220	15	248	14
ICMS 8010	4	207	13	257	19	313	10	189	8	200	2	238	6	240	18
SC1 P8001	12	206	14	259	18	303	13	208	1	178	11	244	5	261	5
ICMS 8008	3	206	15	298	4	312	11	184	13	174	13	225	13	245	16
UCH 10	17	202	16	269	12	322	6	207	2	173	14	225	14	268	4
ICMS 8133	7	199	17	266	13	320	7	171	17	172	15	215	17	252	10
ICH 448	2	193	18	273	10	317	9	186	10	170	17	197	18	256	9
UCH 12	18	193	19	269	11	290	16	205	5	165	19	226	12	239	19
MBH 137	14	192	20	262	16	300	14	207	3	168	18	216	16	227	20
ICH 448	1	191	21	306	2	293	15	151	21	165	19	228	9	257	8
Controls															
ICMS 7703	21	215	3	300	3	332	4	163	18	180	9	245	3	268	6
Local check	22	212	8	231	21	303	13	185	12	240	1	261	1	292	1
WC-C75	20	207	12	264	14	313	10	163	18	179	10	245	3	250	13
BJ 104	19	171	22	263	15	277	17	173	18	146	20	180	19	227	20
SE		±1.8		±1.3		±6.5		±10.5		±6.7		±5.8		±8.8	
Mean		205		274		318		183		180		229		254	
CV(%)				1		4		10		6		4		6	

Contd...

Table 18. (Contd.). Plant height...

Entry	Entry no.	Aurangabad (cm)	Rank	Jalna (cm)	Rank	Rahuri (cm)	Rank	PHF (cm)	Rank	PLF (cm)	Rank	Palem (cm)	Rank
IVC 80135	11	193	7	270	1	179	4	278	1	243	1	205	10
IVC-P8004	10	191	8	221	5	172	10	275	2	220	6	221	2
UCC 1	16	207	2	232	2	181	2	255	8	227	2	204	11
IVC-P8001	9	187	10	224	3	178	5	260	5	217	7	200	14
KCH 1754	15	174	15	217	9	172	10	256	7	220	6	205	9
ICMS 8147	8	206	3	223	4	175	7	253	9	220	6	203	12
ICMS 8013	5	199	4	220	6	173	9	263	3	220	6	208	6
ICMS 8014	6	198	5	218	8	171	11	241	16	213	8	226	1
MC 81121	13	173	16	213	11	176	6	245	14	205	10	211	5
ICMS 8010	4	175	14	209	14	168	12	249	12	188	14	197	17
SC1 P8001	12	176	13	211	12	161	14	263	3	220	6	195	19
ICMS 8008	3	189	9	217	9	162	13	257	6	210	9	200	15
UCH 10	17	177	12	216	10	160	15	251	11	223	4	197	18
ICMS 8133	7	147	19	196	17	150	19	247	13	200	11	201	13
ICH 448	2	195	6	201	15	151	18	242	15	197	12	207	7
UCH 12	18	142	20	198	16	157	16	227	18	182	16	193	20
MBH 137	14	158	17	196	18	157	17	224	19	222	5	198	16
ICH 446	1	148	18	186	19	141	20	235	17	190	13	216	4
Controls													
ICMS 7703	21	209	1	220	7	189	1	262	4	225	3	217	3
Local check	22	139	21	182	20	173	8	215	20	187	15	206	8
MC-C75	20	185	11	211	13	180	3	251	10	220	6	205	9
BJ 104	19	125	22	169	21	137	21	193	21	155	17	189	21
SE		±11.2		±7.5		±5.7		±5.8		±9.7		±4.7	
Mean		177		211		167		247		209		204	
CV(%)		11		6		6		4		8		4	

Contd...

Table 18.(Contd.). Plant height.

Entry	Entry no.	Bhavanisagar (cm)	Rank	Coimbatore (cm)	Rank	Kovilpatti (cm)	Rank	Bahawalpur (cm)	Rank	Dadu Sind (cm)	Rank	Niamey (cm)	Rank	Maradi (cm)	Rank
IVC 80135	11	222	2	204	12	156	4	180	18	225	4	205	2	150	3
IVC-P8004	10	226	1	227	7	163	1	217	8	252	1	170	8	138	5
UCC 1	16	205	5	239	3	143	12	179	20	225	5	191	4	128	10
IVC P8001	9	210	4	229	6	145	11	223	5	238	2	155	13	132	8
KCH 1754	15	218	3	208	11	157	3	208	10	202	14	156	12	152	2
ICMS 8147	8	201	7	236	4	153	6	205	12	228	3	192	3	135	6
ICMS 8013	5	199	9	172	19	148	8	217	7	205	11	160	9	130	9
ICMS 8014	6	200	8	252	1	140	13	220	6	210	10	151	15	122	13
MC 81121	13	204	6	180	17	155	5	232	2	223	6	184	5	118	14
ICMS 8010	4	199	10	208	10	138	15	228	4	202	14	182	6	147	4
SC1 P8001	12	181	15	231	5	145	10	213	9	188	17	157	11	127	11
ICMS 8008	3	197	11	209	9	157	2	184	16	203	13	157	10	138	5
UCH 10	17	181	16	177	18	136	17	203	13	188	17	138	19	130	9
ICMS 8133	7	185	14	209	8	136	16	231	3	212	9	146	16	134	7
ICH 448	2	155	22	183	16	114	21	179	19	198	16	133	21	125	12
UCH 12	18	173	19	201	13	129	18	220	6	185	18	141	17	125	12
MBH 137	14	173	18	161	20	126	19	208	11	216	8	122	22	115	15
ICH 446	1	170	20	185	15	123	20	192	15	177	19	137	18	130	9
Controls															
ICMS 7703	21	186	13	197	14	139	14	242	1	223	6	175	7	125	12
Local check	22	193	12	209	8	147	9	181	17	220	7	263	1	193	1
WC-C75	20	176	17	245	2	150	7	199	14	204	12	155	14	132	8
BJ 104	19	158	21	157	21	103	22	159	21	190	15	134	20	125	12
SE		±7.8		±15.4		±5.0		±7.8		±1.4		±9.0		±5.8	
Mean		191		205		141		205		209		164		134	
CV(%)		7		13		6		7		1		10		7	

Table 17. Downy mildew, incidence at 6 locations.

	Downy mildew incidence (%)					
	Ludhiana	Durgapura	Gwalior	Aurangabad	Maredi	Niamey
ICH 446	0	0	1	0	5	24
ICH 448	0	0	1	0	20	43
ICMS 8008	0	0	1	0	28	21
ICMS 8010	0	0	1	0	12	0
ICMS 8013	2	0	1	0	29	31
ICMS 8014	0	0	1	1	51	37
ICMS 8133	2	6	1	0	25	4
ICMS 8147	2	0	1	0	22	13
IVC-P8001	2	0	1	0	27	20
IVC-P8004	0	0	1	0	20	18
IVC 80135	4	0	1	0	31	11
SC1 P8001	5	0	1	0	31	25
MC 81121	4	10	1	0	34	18
MBH 137	0	0	1	0	21	17
KCH 1754	4	0	1	0	22	32
UCC 1	3	0	1	0	34	43
UCH 10	0	0	1	1	17	16
UCH 12	2	0	2	0	36	42
Controls						
BJ 104	5	0	1	0	27	58
WC-C75	0	2	1	0	19	14
ICMS 7703	3	0	1	0	31	14
Local Check	5	13	2	0	19	28

Table 18. Trial data from Ludhiana, Punjab, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	DM %	Ergot %	Smut %
		Kg ha^{-1}	Rank	% of mean					
ICH 448	2	2880	1	157	59	273	0	13	18
ICMS 8010	4	2690	2	146	56	257	0	18	18
UCH 10	17	2480	3	135	42	269	0	24	21
ICH 446	1	2370	4	129	61	306	0	10	18
IVC-P8001	9	2080	6	113	57	275	2	18	15
ICMS 8147	8	2070	7	113	60	260	2	15	13
MC 81121	13	1960	8	106	56	254	4	15	18
UCH 12	18	1960	8	106	59	269	2	15	17
KCH 1754	15	1920	9	104	58	284	4	13	27
SC1 P8001	12	1910	10	104	56	259	5	11	13
IVC-P8004	10	1860	11	101	56	264	0	10	15
ICMS 8014	6	1670	13	91	57	279	0	13	18
ICMS 8008	3	1640	14	89	56	298	0	15	21
ICMS 8133	7	1510	15	82	55	266	2	11	15
ICMS 8013	5	1340	16	73	56	291	2	17	20
MBH 137	14	1320	18	72	54	262	0	10	15
UCC 1	16	1230	19	67	56	276	3	15	18
IVC 80135	11	1120	21	61	58	318	4	13	18
Controls									
BJ 104	19	2300	5	125	56	263	5	13	21
Local check	22	1740	12	94	54	231	5	10	24
MC-C75	20	1320	17	72	56	264	0	10	17
ICMS 7703	21	1130	20	61	55	300	3	13	18
SE		±173			±0.5	±1.3	-	±1.4	±1.6
Mean		1840			56	274	1.9	14	18
CV(%)		16			1	1	-	18	15

Table 19. Trial data from Hisar, Haryana, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Height (cm)	Head count (10^{-3} ha^{-1})
		Kg ha^{-1}	Rank	% of mean			
MC 81121	13	2780	3	127	57	320	111
ICMS 8008	3	2710	4	123	55	312	125
IVC-P8004	10	2680	5	122	59	343	107
ICMS 8013	5	2540	7	116	58	337	117
ICMS 8014	6	2540	8	115	58	323	111
ICMS 8133	7	2540	9	115	53	320	110
IVC 80135	11	2480	10	113	60	347	100
ICMS 8010	4	2480	11	113	56	313	120
UCH 10	17	2350	12	107	65	322	108
ICH 448	2	2210	13	100	61	317	114
UCC 1	16	2060	14	94	57	337	101
SC1 P8001	12	2050	15	93	60	303	110
IVC-P8001	9	2040	16	93	60	323	104
ICMS 8147	8	2040	17	93	60	318	100
KCH 1754	15	1580	18	72	62	308	86
MBH 137	14	1580	19	72	56	300	104
UCH 12	18	1140	20	52	61	280	76
ICH 446	1	530	22	24	66	293	60
Controls							
Local check	22	3370	1	153	55	303	110
ICMS 7703	21	2910	2	132	55	332	116
WC-C75	20	2660	6	121	57	313	114
BJ 104	19	1130	21	51	52	277	151
SE		±297			±0.8	±6.5	±7.8
Mean		2200			58	316	107
CV(%)		23			2	4	13

Table 20. Trial data from Durgapura, Rajasthan, India.

Entry	Entry no.	Grain yield Kg ha^{-1}	Rank	% of mean	Time to 50% bloom (d)	Height (cm)	Plant count (ha)	DM %	Smut %	Rust
KCH 1754	15	1500	1	164	50	201	175	0	10	2
ICMS 8014	6	1280	2	140	49	152	175	0	5	3
ICMS 8147	8	1190	4	130	50	179	163	0	5	3
IVC-P8004	10	1050	5	116	51	160	171	0	10	2
ICH 448	2	980	7	107	53	186	180	0	10	3
UCC 1	16	960	8	105	49	176	166	0	5	4
UCH 10	17	950	9	105	52	207	156	0	5	0
IVC 80135	11	920	11	101	51	205	157	0	5	2
ICMS 8013	5	850	12	93	49	187	168	0	10	3
ICMS 8133	7	850	13	93	48	171	162	6	10	3
ICMS 8010	4	780	15	86	50	189	174	0	5	2
ICH 446	1	770	16	84	53	151	193	0	5	3
MC 81121	13	770	16	84	48	199	157	10	10	3
IVC-P8001	9	760	17	83	53	185	144	0	5	2
UCH 12	18	700	18	77	53	205	143	0	5	2
SC1 P8001	12	650	19	71	48	208	165	0	10	2
ICMS 8008	3	580	20	64	52	184	156	0	5	4
MBH 137	14	490	21	53	51	207	165	0	5	2
Controls										
BJ 104	19	1270	3	139	53	173	180	0	5	3
Local check	22	1030	6	113	53	185	173	13	5	4
MC-C75	20	930	10	102	52	163	147	2	3	2
ICMS 7703	21	800	14	88	52	163	168	0	5	2
SE		±238			±1.4	±10.5	±10.6	-	±0.4	±0.2
Mean		910			51	183	165	1.4	7	3
CV(%)		45			5	10	11	-	9	13

Table 21. Trial data from Kanpur, Uttar Pradesh, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Height (cm)	Plant count (10^{-3} ha^{-1})	Head count (10^{-3} ha^{-1})	Ergot	Smut
		Kg ha^{-1}	Rank	% of mean						
ICH 448	2	1430	1	144	49	170	64	162	1	8
ICMS 8014	6	1330	2	134	51	188	79	116	2	2
ICMS 8010	4	1260	3	126	55	200	74	99	2	2
ICMS 8013	5	1180	5	118	56	198	73	99	1	4
IVC-P8004	10	1160	6	116	39	186	69	122	3	3
ICMS 8008	3	1080	7	108	53	174	69	184	0	2
IVC-P8001	9	1040	8	105	53	185	62	108	2	2
KCH 1754	15	1020	9	103	50	195	61	129	2	5
ICMS 8133	7	1000	11	100	48	172	70	110	2	5
ICH 446	1	990	12	99	55	165	53	123	1	2
UCH 10	17	970	13	98	53	173	56	97	3	5
ICMS 8147	8	930	14	94	56	188	68	174	0	4
MBH 137	14	840	15	85	56	168	51	102	0	3
MC 81121	13	810	17	81	54	171	64	152	2	5
UCH 12	18	790	18	79	49	165	72	196	1	6
UCC 1	16	780	20	78	54	171	61	81	6	3
IVC 80135	11	720	21	72	55	177	55	75	8	3
SC1 P8001	12	710	22	71	50	178	52	74	2	7
Controls										
ICMS 7703	21	1210	4	122	54	180	64	123	0	4
BJ 104	19	1020	10	103	42	146	67	249	4	5
WC-C75	20	840	16	85	52	179	68	105	2	2
Local check	22	790	19	79	58	240	78	126	2	3
SE		±111			±0.9	±6.7	±6.3	±31.6	-	-
Mean		1000			52	180	649	127	2.1	4.0
CV(%)		19			3	6	17	43	-	-

Table 22. Trial data from Gwalior, Madhya Pradesh, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Height (cm)	Plant count (10^{-3} ha^{-1})	Head count (10^{-3} ha^{-1})	DM %	Smut %
		Kg ha^{-1}	Rank	% of mean						
ICMS 8008	3	2880	1	112	44	225	167	231	1	1
ICMS 8133	7	2680	4	104	44	215	162	213	1	1
UCC 1	16	2670	5	104	46	235	149	205	1	1
UCH 10	17	2660	6	104	49	225	161	183	1	1
MC 81121	13	2660	7	103	46	220	139	170	1	1
IVC 80135	11	2630	8	102	49	227	176	194	1	0
IVC-P8001	9	2610	9	102	46	245	156	199	1	0
ICMS 8147	8	2600	10	101	48	226	140	188	1	0
MBH 137	14	2590	11	101	42	216	174	228	1	1
ICMS 8010	4	2550	12	99	46	238	150	178	1	0
ICMS 8014	6	2530	13	98	48	227	129	163	1	0
ICMS 8013	5	2510	14	98	46	227	161	217	1	1
UCH 12	18	2490	15	97	47	226	113	223	2	1
SC1 P8001	12	2470	17	96	48	244	120	169	1	0
ICH 448	1	2470	18	96	48	228	128	205	1	1
IVC-P8004	10	2470	18	96	48	252	151	167	1	0
KCH 1754	15	2460	19	96	49	231	149	180	1	0
ICH 448	2	2450	20	95	48	197	137	186	1	2
Controls										
BJ 104	19	2760	2	107	42	180	178	330	1	2
WC-C75	20	2750	3	107	44	245	142	191	1	0
Local check	22	2480	16	96	49	261	159	209	2	1
ICMS 7703	21	2220	21	86	46	245	139	214	1	1
SE		±231			±1.0	±5.8	±13.4	±18.7	-	-
Mean		2570			46	229	149	201	1.1	0.6
CV(%)		16			4	4	16	16	-	-

Table 23. Trial data from Jamnagar, Gujarat, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Height (cm)	Plant count (10^{-3} ha^{-1})	Head count (10^{-3} ha^{-1})	Smut %
		Kg ha^{-1}	Rank	% of mean					
ICH 448	2	4000	2	116	56	256	114	197	0
ICH 446	1	3930	3	114	55	257	96	177	0
UCH 10	17	3750	4	109	52	266	107	159	0
IVC-P8004	10	3750	5	109	54	258	108	155	0
ICMS 8147	8	3740	6	108	51	243	111	171	0
ICMS 8133	7	3700	7	107	50	252	109	171	0
ICMS 8013	5	3650	8	106	51	251	115	165	0
KCH 1754	15	3580	9	104	52	280	117	153	0
SC1 P8001	12	3560	10	103	52	261	110	173	0
ICMS 8014	6	3520	11	102	52	251	106	169	0
IVC-P8001	9	3460	12	100	52	246	100	148	0
ICMS 8008	3	3420	13	99	50	245	110	177	0
ICMS 8010	4	3400	14	98	51	240	106	146	0
MBH 137	14	3250	15	94	52	227	101	150	0
MC 81121	13	3250	15	94	52	248	107	184	0
IVC 80135	11	3190	17	92	53	276	118	139	0
UCC 1	16	2940	19	85	51	258	106	162	0
UCH 12	18	2870	20	83	52	239	123	194	0
Controls									
BJ 104	19	4020	1	116	49	227	125	275	0
ICMS 7703	21	3200	16	93	50	258	109	173	0
MC-C75	20	3130	18	91	48	250	116	147	0
Local check	22	2630	21	76	58	292	144	183	0
SE		±203			±0.8	±8.8	±7.9	±10.7	
Mean		3450			52	254	111	171	
CV(%)		10			3	6	12	11	

Table 24. Trial data from Aurangabad, Maharashtra, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	Plant count (10^{-3} ha^{-1})	Head count (10^{-3} ha^{-1})	DM %	Ergot %	Rust
		Kg ha^{-1}	Rank	% of mean							
IVC-P8001	9	3650	1	131	58	187	311	277	0	13	1
MBH 137	14	3570	3	128	50	158	278	346	0	4	4
ICMS 8010	4	3290	4	118	52	175	282	300	0	10	2
SC1 P8001	12	3140	6	112	56	176	299	322	0	16	1
IVC-P8004	10	3030	7	108	58	191	298	294	0	5	1
ICMS 8008	3	3020	8	108	56	189	366	316	0	12	2
MC 81121	13	3000	9	108	53	173	292	301	0	11	2
ICH 448	2	2930	10	105	56	195	221	345	0	12	3
ICMS 8147	8	2890	11	104	56	206	277	271	0	9	1
ICMS 8014	6	2860	12	102	54	198	297	368	1	10	1
UCH 10	17	2780	13	99	56	177	315	282	1	9	1
ICMS 8013	5	2760	14	99	56	199	345	307	0	13	1
UCC 1	16	2750	15	99	56	207	323	304	0	8	2
IVC 80135	11	2720	16	97	58	193	314	257	0	10	1
ICMS 8133	7	2540	17	91	54	147	296	257	0	15	2
ICH 446	1	2500	18	90	54	148	288	388	0	12	1
KCH 1754	15	2260	19	81	58	174	221	261	0	14	1
UCH 12	18	1410	22	51	53	142	269	303	0	25	4
Controls											
WC-C75	20	3640	2	130	52	185	352	302	0	8	1
ICMS 7703	21	3270	5	117	53	209	321	308	0	5	1
Local check	22	1720	20	62	49	139	293	450	0	23	3
BJ 104	19	1690	21	60	52	125	292	354	0	22	1
SE		±263			±1.4	±11.2	±34.0	±23.6	-	±2.5	-
Mean		2790			55	177	297	314	0.2	12.1	1.7
CV(%)		16			4	11	20	13	-	38	-

Table 25. Trial data from Jalna, Maharashtra, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	Plant count (10^{-3} ha^{-1})	Head count (10^{-3} ha^{-1})
		Kg ha^{-1}	Rank	% of mean				
MBH 137	14	3880	1	139	54	196	92	190
ICMS 8133	7	3370	3	120	55	196	95	228
ICMS 8147	8	3330	4	119	58	223	88	222
IVC-P8004	10	3280	5	117	59	221	94	206
UCH 10	17	3270	6	117	61	218	99	242
UCC 1	16	3180	7	113	58	232	84	203
ICMS 8008	3	3060	8	109	57	217	88	244
ICH 446	1	2980	10	106	59	186	105	287
MC 81121	13	2780	11	99	57	213	95	230
ICMS 8010	4	2740	12	98	56	209	93	214
ICMS 8013	5	2690	13	96	60	220	93	224
UCH 12	18	2580	14	92	58	198	95	227
IVC-P8001	9	2550	15	91	58	224	100	190
IVC 80135	11	2420	16	86	61	270	94	145
ICMS 8014	6	2310	19	82	58	218	92	218
SC1 P8001	12	2090	20	75	60	211	90	150
ICH 448	2	2000	21	71	58	201	92	210
KCH 1754	15	1770	22	63	58	217	82	176
Controls								
Local check	22	3610	2	129	51	182	96	230
ICMS 7703	21	3030	9	108	56	220	96	244
BJ 104	19	2380	17	85	51	169	101	332
WC-C75	20	2330	18	83	57	211	94	181
SE		±100			±0.8	±7.5	±31.4	±78.9
Mean		2800			57	211	935	218
CV(%)		6			2	6	6	6

Table 28. Trial data from Rahuri, Maharashtra, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	Plant count (10^{-3}ha^{-1})	Head count (10^{-3}ha^{-1})
		Kg ha^{-1}	Rank	% of mean				
ICMS 8013	5	3630	1	169	53	173	130	153
IVC-P8004	10	2570	2	119	56	172	147	155
ICMS 8010	4	2550	3	118	49	168	144	110
IVC-P8001	9	2480	4	115	53	178	152	162
ICH 448	2	2350	6	109	53	151	144	186
UCC 1	16	2320	7	108	58	181	108	138
UCH 10	17	2290	9	106	54	160	136	128
MC 81121	13	2220	10	103	55	176	142	140
ICH 446	1	2200	11	102	54	141	90	166
ICMS 8147	8	2190	12	102	55	175	128	146
SC1 P8001	12	2110	13	98	56	161	89	133
ICMS 8014	6	2090	14	97	54	171	157	137
MBH 137	14	1890	15	88	53	157	150	169
ICMS 8008	3	1840	16	86	54	162	170	133
UCH 12	18	1840	16	86	53	157	134	182
IVC 80135	11	1840	18	85	54	179	161	118
KCH 1754	15	1440	20	67	54	172	114	114
ICMS 8133	7	1440	21	67	56	150	153	168
Controls								
ICMS 7703	21	2370	5	110	56	189	158	146
WC-C75	20	2290	8	107	55	180	142	154
BJ 104	19	1840	17	85	51	137	141	202
Local check	22	1560	19	72	55	173	169	138
SE		±373			±0.8	±5.7	±12.0	±18.5
Mean		2150			54	167	139	148
CV(%)		30			3	6	15	22

Table 27. Trial data from ICRISAT, High fertility, Andhra Pradesh, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	Ear length (cm)	Plant count (10^{-3} ha^{-1})	Head count (10^{-3} ha^{-1})
		Kg ha^{-1}	Rank	% of mean					
MBH 137	14	3660	1	124	48	224	21	76	163
ICH 446	1	3500	2	119	50	235	24	82	199
KCH 1754	15	3230	4	109	54	256	31	71	146
IVC 80135	11	3200	5	108	57	278	26	90	120
ICH 448	2	3150	6	106	51	242	23	76	188
IVC-P8001	9	3080	8	104	51	260	27	80	136
IVC-P8004	10	2970	9	101	52	275	22	77	144
ICMS 8133	7	2940	10	99	48	247	25	78	143
ICMS 8008	3	2930	11	99	48	257	24	81	170
UCH 10	17	2890	12	98	56	251	25	65	128
ICMS 8147	8	2890	13	98	52	253	24	78	141
ICMS 8013	5	2860	14	97	51	263	23	87	166
SC1 P8001	12	2820	15	95	52	263	27	75	132
ICMS 8010	4	2810	16	95	49	248	23	85	155
ICMS 8014	6	2610	19	88	51	241	25	84	145
UCC 1	16	2600	20	88	51	255	22	73	176
MC 81121	13	2580	21	87	50	245	27	79	127
UCH 12	18	2310	22	78	52	227	25	79	193
Controls									
Local check	22	3410	3	115	46	215	23	86	144
ICMS 7703	21	3110	7	105	50	262	23	73	162
MC-C75	20	2750	17	93	50	251	25	80	154
BJ 104	19	2740	18	93	45	193	20	75	288
SE		±197			±0.3	±5.8	±1.9	±6.4	±9.9
Mean		2960			51	247	24	77	160
CV(%)		12			1	4	14	15	11

Table 28. Trial data from ICRISAT, Low fertility, Andhra Pradesh, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	Ear length (cm)	Plant count (10^{-3}ha^{-1})	Head count (10^{-3}ha^{-1})
		Kg ha^{-1}	Rank	% of mean					
MBH 137	14	2850	1	144	51	222	21	153	166
ICH 446	1	2750	2	134	51	190	22	173	167
ICH 448	2	2540	3	124	52	197	20	161	192
ICMS 8008	3	2290	4	112	51	210	27	157	166
IVC-P8004	10	2280	5	111	54	220	23	158	160
ICMS 8014	6	2180	7	106	52	213	21	166	173
ICMS 8013	5	2170	8	106	53	220	23	168	165
ICMS 8147	8	2090	9	102	54	220	23	134	138
IVC 80135	11	2080	10	102	59	243	26	16.	154
ICMS 8133	7	2040	11	100	51	200	22	153	167
IVC-P8001	9	2030	12	99	53	217	25	163	163
SC1 P8001	12	1860	15	91	54	220	20	157	145
UCH 10	17	1840	16	90	57	223	26	145	136
MC 81121	13	1780	17	87	53	205	22	164	150
ICMS 8010	4	1740	18	85	55	188	21	151	148
UCH 12	18	1740	19	85	53	182	20	172	176
KCH 1754	15	1700	20	83	58	220	38	152	163
UCC 1	16	1250	22	61	54	227	22	127	127
Controls									
Local check	22	2180	6	106	46	187	21	162	162
WC-C75	20	2020	13	99	52	220	22	161	162
ICMS 7703	21	1960	14	96	52	225	20	143	165
BJ 104	19	1660	21	81	46	155	18	166	251
SE		±205			±0.7	±9.7	±1.7	±8.4	±11.8
Mean		2050			53	209	22	156	163
CV(%)		17			2	8	13	9	13

Table 28. Trial data from Palem, Andhra Pradesh, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	Plant count (10^{-3} ha^{-1})	Head count (10^{-3} ha^{-1})	Ergot %
		Kg ha^{-1}	Rank	% of mean					
MBH 137	14	2990	1	138	54	198	108	156	4
ICH 446	1	2970	2	137	57	216	126	238	22
IVC 80135	11	2930	3	135	61	205	120	148	15
ICMS 8133	7	2750	4	127	56	201	109	184	10
KCH 1754	15	2430	5	112	60	205	117	135	10
IVC-P8004	10	2390	6	110	59	221	124	175	14
ICMS 8013	5	2330	7	108	60	208	125	201	9
SC1 P8001	12	2220	8	103	59	195	101	115	25
ICH 448	2	2190	9	101	58	207	131	156	7
ICMS 8147	8	2190	10	101	58	203	116	144	5
ICMS 8010	4	2100	11	97	58	197	118	184	7
MC 81121	13	2050	12	95	58	211	111	205	9
UCH 12	18	2010	13	93	59	193	125	186	10
ICMS 8008	3	1940	16	89	58	200	120	177	8
UCH 10	17	1860	18	86	62	197	110	148	28
ICMS 8014	6	1780	20	82	58	226	124	153	15
UCC 1	16	1570	21	72	59	204	96	150	17
IVC-P8001	9	1290	22	60	59	200	108	112	10
Controls									
WC-C75	20	1990	14	92	57	205	118	102	13
BJ 104	19	1950	15	90	53	169	112	265	15
Local check	22	1870	17	86	57	206	124	176	8
ICMS 7703	21	1850	19	85	58	217	130	191	15
SE		±216			±0.4	±4.7	±5.5	±19.2	±4.7
Mean		2170			58	204	117	168	12.8
CV(%)		17			1	4	6	20	85

Table 30. Trial data from Bhavanisagar, Tamil Nadu, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	Ear length (cm)	Plant count (10^{-3} ha^{-1})	Head count (10^{-3} ha^{-1})
		Kg ha^{-1}	Rank	% of mean					
UCH 10	17	4010	1	118	45	181	25	141	203
ICMS 8008	3	3980	2	117	46	197	24	124	198
ICH 446	1	3900	3	115	44	170	25	124	274
IVC 80135	11	3890	4	114	50	222	26	120	169
KCH 1754	15	3720	5	110	49	218	36	120	188
MC 81121	13	3630	7	107	47	204	25	120	175
UCC 1	16	3590	8	105	48	205	22	115	195
ICMS 8147	8	3570	9	105	49	201	25	107	179
IVC-P8004	10	3570	10	105	48	226	29	122	188
ICMS 8013	5	3560	11	105	47	199	24	103	181
ICMS 8014	6	3410	12	100	46	200	27	128	192
IVC-P8001	9	3340	14	98	46	210	26	124	183
MBH 137	14	3290	15	97	41	173	23	113	207
ICMS 8010	4	3210	17	94	46	199	25	110	183
ICMS 8133	7	3130	18	92	45	185	23	116	186
UCH 12	18	2700	20	79	44	173	25	120	235
ICH 448	2	2550	21	75	44	155	22	108	223
SC1 P8001	12	2460	22	73	49	181	25	124	153
Controls									
Local check	22	3690	6	109	42	193	23	124	210
ICMS 7703	21	3390	13	100	46	186	23	123	165
BJ 104	19	3280	16	96	40	158	20	130	332
WC-C75	20	2930	19	86	48	176	23	114	173
SE		±375			±0.5	±7.6	±1.0	±5.8	±17.9
Mean		3400			46	191	25	119	199
CV(%)		19			2	7	7	9	16

Table 31. Trial data from Coimbatore, Tamil Nadu, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	Rust
		Kg ha^{-1}	Rank	% of mean			
MBH 137	14	1880	1	135	37	161	4
IVC 80135	11	1650	2	119	44	204	4
ICMS 8008	3	1600	3	115	43	209	4
MC 81121	13	1560	4	112	46	180	4
ICMS 8014	6	1510	6	115	43	209	4
MC 81121	13	1560	4	112	46	180	4
ICMS 8014	6	1510	6	108	47	252	3
KCH 1754	15	1490	7	107	60	208	4
IVC-P8001	9	1480	8	106	46	229	3
ICMS 8147	8	1470	10	106	55	236	4
IVC-P8004	10	1470	11	106	51	227	4
ICH 446	1	1410	12	101	49	185	3
ICMS 8133	7	1400	13	100	41	209	4
SC1 P8001	12	1340	14	96	54	231	4
ICH 448	2	1330	15	95	39	183	4
UCC 1	16	1290	16	92	53	238	4
ICMS 8010	4	1290	16	92	60	208	4
ICMS 8013	5	1230	18	88	53	172	4
UCH 10	17	1070	20	77	44	177	4
UCH 12	18	750	21	54	57	201	4
Controls							
WC-C75	20	1520	5	109	46	245	4
ICMS 7703	21	1480	9	106	48	197	4
BJ 104	19	1260	17	90	38	157	4
Local check	22	1200	19	86	58	208	3
SE		±142			±0.0	±15.4	-
Mean		1390			48	205	3.8
CV(%)		18			0	13	-

Table 32. Trial data from Kovilpatti, Tamil Nadu, India.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	Plant count (10^{-3}ha^{-1})	Head count (10^{-3}ha^{-1})	Rust
		Kg ha^{-1}	Rank	% of mean					
ICH 448	1	1150	1	140	38	123	137	275	2
KCH 1754	15	1140	2	140	55	157	136	164	2
UCH 10	17	1110	4	136	41	136	128	191	2
IVC-P8001	9	1050	5	129	42	145	138	170	2
IVC-P8004	10	980	7	120	42	163	138	171	3
UCC 1	16	920	8	113	44	143	135	147	2
ICMS 8010	4	880	10	108	42	138	134	161	3
MC 81121	13	800	11	97	41	155	138	143	2
ICMS 8008	3	780	12	96	46	157	127	151	2
IVC 80135	11	780	13	95	55	156	137	168	3
ICMS 8013	5	740	14	91	52	148	120	140	2
ICMS 8147	8	710	15	87	48	153	137	170	4
ICMS 8133	7	700	16	86	42	136	138	173	3
MBH 137	14	680	17	83	40	126	117	177	2
ICMS 8014	6	670	18	82	41	140	136	164	2
ICH 448	2	640	19	79	41	114	138	203	3
SC1 P8001	12	450	20	55	47	145	126	156	2
UCH 12	18	360	22	44	39	129	138	185	4
Controls									
Local check	22	1120	3	137	55	147	133	160	2
ICMS 7703	21	1010	6	124	53	139	132	176	2
MC-C75	20	910	9	111	47	150	128	164	2
BJ 104	19	390	21	47	40	103	120	141	4
SE		±25			±0.3	±5.0	±7.0	±6.3	-
Mean		820			45	141	132	170	2.5
CV(%)		5			1	6	9	6	4

Table 33. Trial data from Bahawalpur, Pakistan.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	Plant count (10^{-3} ha^{-1})	Head count (10^{-3} ha^{-1})	Rust
		Kg ha^{-1}	Rank	% of mean					
ICH 448	2	2350	1	159	56	179	47	181	1
UCH 10	17	2130	2	144	56	203	43	120	1
MC 81121	13	2090	3	141	55	232	57	157	1
ICH 446	1	1980	4	134	53	192	54	144	1
UCH 12	18	1910	5	129	56	220	43	160	1
KCH 1754	15	1910	5	129	53	208	41	107	1
ICMS 8013	5	1740	6	118	54	217	55	143	
ICMS 8010	4	1720	7	116	55	228	59	150	1
ICMS 8014	6	1630	8	110	54	220	55	157	1
MBH 137	14	1520	9	103	54	208	61	206	1
ICMS 8147	8	1440	10	98	56	205	66	165	1
IVC-P8004	10	1370	11	93	56	217	26	90	1
SC1 P8001	12	1330	12	90	55	213	39	108	
IVC 80135	11	1070	16	73	56	180	29	57	1
ICMS 8133	7	1060	17	71	54	231	39	83	1
IVC-P8001	9	1020	18	69	56	223	48	94	1
UCC 1	16	1000	19	68	56	179	39	98	1
ICMS 8008	3	980	20	66	55	184	57	121	1
Controls									
BJ 104	19	1220	13	83	53	159	48	181	1
ICMS 7703	21	1140	14	77	55	242	48	146	1
WC-C75	20	1130	15	76	55	199	27	98	1
Local check	22	840	21	57	55	181	54	124	1
SE		±306			±0.7	±7.8	±9.5	±25.1	-
Mean		1480			55	205	46	132	1.0
CV(%)		36			2	7	35	33	-

Table 34. Trial data from Dadu Sind, Pakistan.

Entry	Entry no.	Grain yield			Time to 50% bloom (d)	Plant height (cm)	Plant count (10^{-3} ha^{-1})	Head count (10^{-3} ha^{-1})
		Kg ha^{-1}	Rank	% of mean				
KCH 1754	15	2430	1	159	57	202	86	111
IVC-P8004	10	2270	2	149	54	252	95	125
ICMS 8010	4	1820	3	119	53	202	66	85
ICH 448	2	1730	4	113	54	188	60	87
UCH 10	17	1700	5	111	58	188	44	65
ICMS 8008	3	1690	6	111	54	203	70	89
IVC-P8001	9	1660	8	109	55	238	57	80
ICMS 8147	8	1660	9	108	52	228	71	93
MBH 137	14	1550	10	101	47	216	46	70
UCH 12	18	1550	11	101	55	185	63	87
MC 81121	13	1520	12	99	56	223	66	85
ICMS 8133	7	1490	13	97	55	212	61	81
SC1 P8001	12	1350	15	88	53	188	51	66
IVC 80135	11	1280	17	84	56	225	56	71
UCC 1	16	1250	18	82	56	225	58	75
ICMS 8013	5	1170	19	77	55	205	68	91
ICMS 8014	6	1130	21	74	57	210	55	74
ICH 446	1	870	22	57	54	177	46	67
Controls								
BJ 104	19	1690	7	111	46	190	91	114
ICMS 7703	21	1360	14	89	52	223	48	69
Local check	22	1320	16	87	53	220	84	109
WC-C75	20	1140	20	75	54	204	54	73
SE		±137			±1.3	±1.4	±4.2	±4.2
Mean		1530			54	209	63	84
CV(%)		16			4	1	11	9

Table 35. Trial data from Niamey, Niger.

Entry	Entry no.	Grain yield: Kg ha^{-1}	Grain yield: Rank	Grain yield: % of mean	Time to 50% bloom (d)	Plant height (cm)	Ear length (cm)	Plant count (10^{-3}ha^{-1})	Head count (10^{-3}ha^{-1})	DM %	Smut %
ICMS 8010	4	700	2	146	50	182	27	8	58	0	18
ICMS 8147	8	690	3	144	56	192	26	6	47	13	15
MC 81121	13	610	4	126	56	184	27	8	50	18	15
IVC-P8004	10	590	5	122	57	170	25	6	42	19	16
ICH 448	2	570	6	119	57	133	21	7	63	43	23
ICH 446	1	550	8	114	58	137	23	8	74	24	22
KCH 1754	15	530	9	111	59	156	37	8	55	32	12
IVC 80135	11	500	10	104	59	205	34	7	33	11	14
ICMS 8133	7	450	11	95	53	146	25	7	51	4	18
MBH 137	14	450	12	94	53	122	21	8	65	17	11
ICMS 8008	3	450	13	94	55	157	27	6	45	21	18
ICMS 8013	5	410	14	85	60	160	25	5	35	31	21
ICMS 8014	6	350	16	73	58	151	25	6	38	37	20
SC1 P8001	12	350	17	73	58	157	27	7	33	25	12
IVC-P8001	9	350	18	73	59	155	25	4	24	20	12
UCH 12	18	330	19	69	58	141	26	5	42	42	23
UCC 1	16	230	20	48	59	191	24	4	28	43	24
UCH 10	17	150	21	32	66	136	24	3	14	18	18
Controls											
Local check	22	1240	1	259	59	263	63	9	53	29	12
ICMS 7703	21	560	7	116	54	175	27	6	46	14	16
WC-C75	20	400	15	84	58	155	26	6	37	14	16
BJ 104	19	100	22	21	56	134	20	3	20	59	21
SE		±97			±2.1	±9.0	±2.4	±0.9	±7.7	±8.3	3.6
Mean		480			57	164	27	6	43	24.2	17.2
CV(%)		35			7	10	15	24	31	59	37

Table 38. Trial data from Maradi, Niger.

Entry	Entry no.	Grain yield: Kg ha^{-1}	Grain yield: Rank	Grain yield: % of mean	Time to 50% bloom (d)	Plant height (cm)	Plant height (10^{-3} ha^{-1})	Head count (10^{-3} ha^{-1})	DM %	Smut %
ICH 446	1	660	2	172	53	130	13	52	5	21
ICMS 8010	4	490	3	128	52	147	10	31	12	12
MBH 137	14	470	4	123	50	115	13	56	21	6
KCH 1754	15	460	5	119	54	152	12	35	22	11
ICMS 8133	7	440	6	114	52	134	9	31	25	23
ICH 448	2	440	7	114	54	125	12	38	20	36
ICMS 8013	5	420	8	108	56	130	10	31	29	25
SC1 P8001	12	390	9	102	55	127	9	24	31	17
IVC-P8004	10	370	10	95	54	138	10	24	20	13
IVC 80135	11	360	11	94	55	150	9	21	31	21
ICMS 8008	3	340	12	89	53	138	9	30	28	14
UCH 10	17	330	13	86	64	130	7	17	17	12
IVC-P8001	9	260	15	69	57	132	6	17	27	10
ICMS 8014	6	260	15	69	54	122	8	20	51	17
UCC 1	16	250	16	65	54	128	7	20	34	18
ICMS 8147	8	230	17	61	54	135	8	17	22	12
MC 81121	13	220	19	57	53	118	7	16	34	15
UCH 12	18	190	20	49	57	125	7	17	36	20
Controls										
Local check	22	890	1	232	57	193	9	29	19	6
BJ 104	19	440	7	114	50	125	10	52	27	17
WC-C75	20	320	14	82	54	132	9	22	19	12
ICMS 7703	21	230	18	59	55	125	7	16	31	12
SE		±94			±1.4	±5.8	±1.4	±6.4	±7.7	±4.4
Mean		380			54	134	9	28	25.5	15.9
CV(%)		42			4	7	28	40	53	48