Progress Report
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Pearl Millet Germplasm Collection from Rayalaseema Region of Andhra Pradesh India

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C O N T E N T S

PEARL MILLET GERMPLASM COLLECTION FROM RAYALASEEMA REGION OF ANDHRA PRADESH, INDIA[1]

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SUMMARY

A pointed pearl millet germplasm collection trip to drought prone Rayalaseema region of Andhra Pradesh was effected during October 1980 (severe drought year) to collect traditional cultivars of pearl millet which had survived a long and severe stress. The collecting team consisted of millet physiologists and germplasm botanist. During this trip, in addition to the random samples from the farmers fields, biased samples of agronomically good plants with desirable head types and tillering habit were collected from fields which were subjected to severe drought stress under farmer's field conditions. Drought prone millet growing areas of Kurnool, Anantapur and Cuddapah districts were covered and 142 samples collected of which 108 are pearl millet.

1. UNDP supported germplasm collection project.
2. Botanist, Genetic Resources, Principal Millet Physiologist and Plant Physiologist, respectively.

INTRODUCTION AND OBJECTIVES

Rayalaseema region in Andhra Pradesh grows pearl millet, *Pennisetum americanum* (L.) Leeke over an estimated area of 138,161 ha. It is concentrated in Anantapur (59,184), Chittoor (31,864), Kurnool (24,440) and Cuddapah (22,672) districts (Bureau of Economics and Statistics, Hyderabad, A.P.). Severe drought is a recurrent feature in this area and this year as of July 21, only a single rain of sufficient quantity for sowing had been received on May 28-29. A very few fields were sown then and nothing has been sown since. Millet in these areas was under severe stress for atleast four weeks, which offered an excellent opportunity to collect traditional cultivars of pearl millet, which we knew had survived a long and severe stress. Hence, it was suggested by Dr. Bidinger to have a pointed collection for drought resistant types in Rayalaseema region, which was accepted by Dr. Mengesha. Dr. F.R. Bidinger and Dr. Mahalakshmi made a general survey around Anantapur in late June and planned the collection trip. Wherever necessary, the local Agricultural Officers were consulted to identify millet growing areas.

The collection trip was made with the following objectives:

1. To make a pointed collection for drought resistant types and to select good looking plants with desirable head characters and good tillering ability from the fields which had experienced severe stress.
2. To collect local *Setaria* cultivars and

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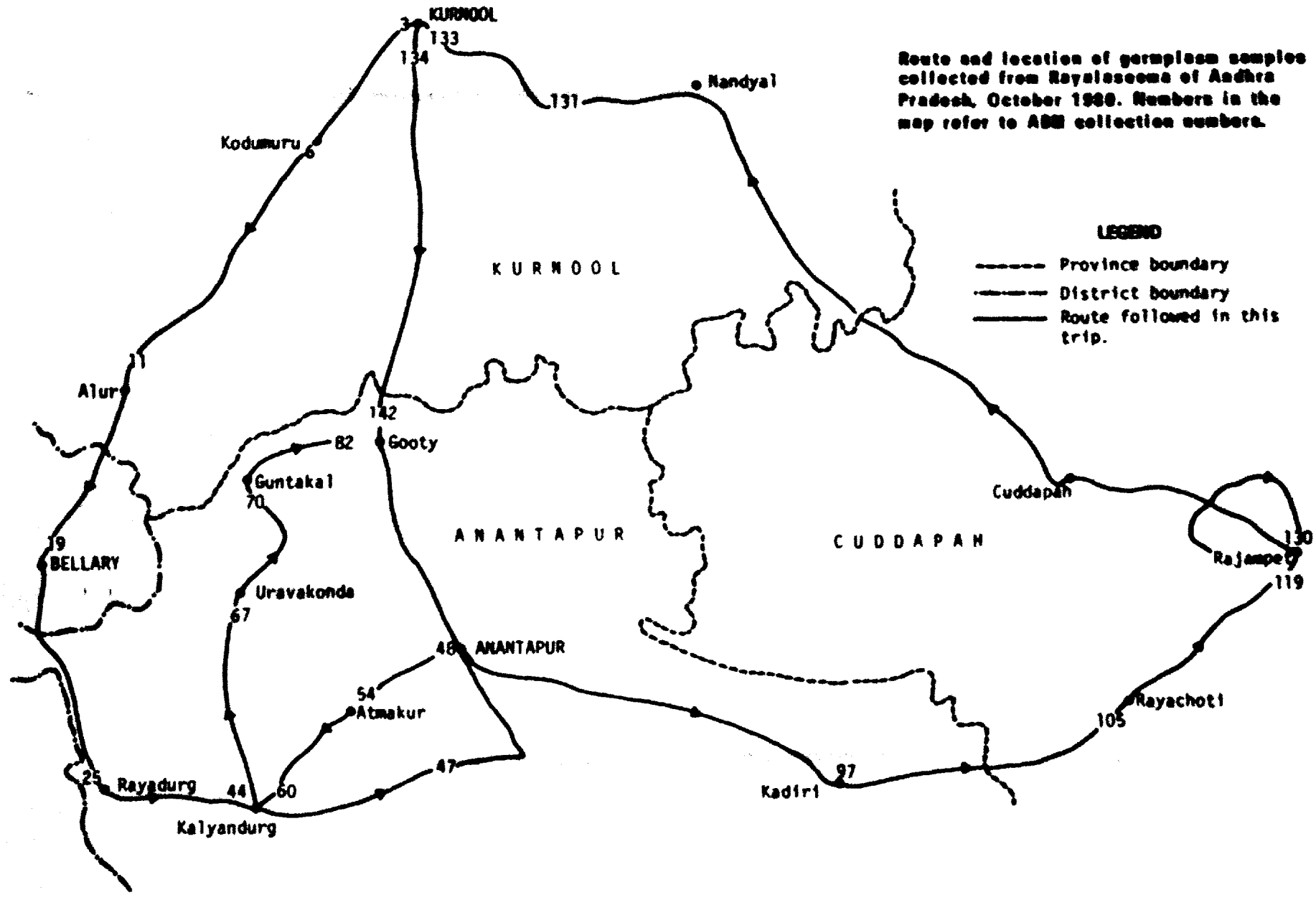

Route and location of germplasm samples collected from Rayalaseema of Andhra Pradesh, October 1980. Numbers in the map refer to ABH collection numbers.

3. To gather information on the cultural practices, processing and utilization of pearl millet in this area.

The collecting team consisted of

1. Dr. F.R. Bidinger, Principal Millet Physiologist, ICRISAT
2. Dr. V. Mahalakshmi, Plant Physiologist, ICRISAT
3. Dr. S. Appa Rao, Botanist, Genetic Resources, ICRISAT
4. Mr. G. Basi Reddy, Technical Assistant, who is from this area served as a local guide.

COLLECTION STRATEGY AND ITINERARY

The trip was planned to coincide with the maturity of the early sown fields. The route followed, areas covered and location of the samples is sown in the map.

During this trip, millet areas in Kurnool, Anantapur and Cuddapah were covered. Wherever possible, a general sample to represent the crop variability in a field was collected by taking the top 5 cm portion of the head from about 30 heads. A biased sample was also taken by selecting apparently good looking plants with good head characters and tillers from fields under severe drought stress. In some places market samples were also purchased. Wherever possible sorghum and *Setaria* were also collected.

7 October, 1980 - Hyderabad - Kodumuru - Alur - Bellary
8 " " - Bellary - Rayadurg - Kalyandurg - Togarakunta - Anantapur
9 " " - Anantapur - Atmakuru - Kalyandurg - Uravakonda - Guntakal - Gooty - Anantapur
10 " " - Anantapur - Kadiri - Rayachoti - Rajampet
11 " " - Rajampet - Cuddapah - Naniyal - Kurnool - Hyderabad

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VARIABILITY, UTILIZATION AND CULTURAL PRACTICES

Variability

The variation in pearl millet in the Rayalaseema region is not really large and many of the accessions collected look alike. Since commercial hybrids and advanced generations are grown in a few pockets, intercrossing of these with the locals and physical mixtures of these two were common. Because of severe drought almost throughout the area, plant height and spike length were drastically reduced and so it is not possible to observe the normal expression. In addition, there was considerable variation in the stage of development because of widely separated planting dates (rain) and due to the retarding effects of stress on development. However, farmers call their local pearl millet by different names in different areas which are as follows:

1. Javara sajja: Common around Bellary. The heads are conical, medium compact and the grain is of medium size. We were informed that this type (ABM-19, 23, 37 and 137) matures in about four months time.

2. Pedda sajja: Generally found around Kodumuru in Kurnool district. We were informed by the farmers that it (ABM-9) grows to over 2m tall, with 3-4 tillers and long compact heads. This was reported to mature one month later than BJ-104.

3. Thoka sajja: Common around Muttukuru and Bellary area. The spike is conical and curved resembling that of a tail. The grain is small and elliptical (ABM-16).

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Recognize me! I am Pearl millet 'Sharpie' (15 cm) height in 'Severe drought'

I can go even beneath the pebbles

*I am happy **with** a farmer who cares for **me***

A consolation! a few heads despite a severe drought

A shelter for harvested heads

Taste and blend just the way he likes it 'A Bajra roti'

4. Gooty type: Grows very tall with thick stems, producing 2-3 tillers, the heads are very stout, long and the seeds are bold (ABM-079 and 082). It appears to be a late type.

Utilization: Generally millet is consumed in two different ways:

1. Very thick porridge: After pounding to remove the glumes the grain is made into a flour either in a grinding mill or by rubbing between two stones. A thick porridge is made by adding flour to boiling water with constant stirring. This preparation is locally called "Mudda" or "Sankati".

2. Bread: A very thick unleavened bread called "Roti" is prepared by adding jaggery or sugar instead of onion and chillies.

Cultural practices

Pearl millet is grown occassionally as a sole crop. Most often it is mixed with red gram, green gram, gingelly, beans and sorghum. It is also commonly grown as strips with *Setaria*, groundnut or red gram. In general, poor, rocky or gravel soils are used for planting millet. Generally it is neither fertilized nor irrigated. Though it is mostly broadcast, line sowing is confined to strip cropping with groundnut or *Setaria*.

TRAVEL NOTES

7-10-1980: Hyderabad - Kodumuru - Alur - Bellary. Around Palyam in Mahboobnagar district, yellow sorghum with small, compact heads was

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collected which is called "Gundu Pacha Jonna". We reached Kurnool and met Mr. A. Nanjundappa, In-charge, Deputy Director of Agriculture, Kurnool and after discussion, decided the route to be covered. After Kurnool, around Peddapadu village, we came across pearl millet type with very stout heads intercropped with *Setaria* and pigeonpea. Around Kodumuru we collected rabi sorghum called "Gundu Pacha Jonna" which was being planted. In this area the traditional cultivars of pearl millet is called "Pedda Sajja" which means tall growing type. Around Bellary on the banks of river Hagari only commercial millet hybrids are grown and the traditional cultivars are no more.

8-10-1980: Bellary - Rayadurg - Kalyanadurg - Togara Kunta - Anantapur. South of Bellary grows pearl millet extensively on sandy soils but the crop was planted very late. BJ-104 and its advanced generations are very common. The local cultivars of pearl millet are called "Javara Sajja" and that of sorghum is called "Mungari Jonna". Around Rayadurg, pearl millet was grown mixed with pigeonpea, gingelly and groundnut. We came across a pigeonpea field where a few plants produced mature pods while rest of the crop was in flowering. Around Banpalle, the crop was very much stunted, because of no rains had fallen after sowing. Around Kalyandurg, millet is mostly grown with groundnut. In this area pearl millet heads are threshed by rolling a stone roller drawn by animals. Reached Anantapur in the evening and met Drs. Venkatanathachari, Senior Scientist and Anjaneyulu, Breeder, Agricultural Research Station, Anantapur with

whom we had useful discussion about the millet growing areas. Mr. Narayana Rao, Deputy Director, Drought Prone Area Project and Mr. K. Mohiuddin, Assistant Director of Agriculture, Anantapur helped us in identifying the millet growing areas around Anantapur.

Sorghum and millet drought nurseries of ICRISAT were observed late in the evening. All the experimental material in the research station was under severe stress. Sorghum showed severe wilting and tip burning. We decided to observe the crop in the early morning hours to look and score for recovery ability in millet. To our surprise, the millet crop showed no wilting symptoms and had completely recovered. Sorghum, however, showed severe wilting symptoms in the early hours suggesting that sorghum was unable to recover even during night. However, there was varying degrees of recovery suggesting possible genetic differences.

9-10-1980: Anantapur - Atmakur - Kalyandurg - Uravakonda - Guntakal - Cooty - Anantapur. Left Anantapur town and covered western part of Anantapur district. Around Atmakur, pearl millet is grown mixed with sorghum, pigeonpea and gingelly. The soils appear completely stony perhpas because of soil erosion. Near Atmakur, we came across a field where pearl millet was grown with sorghum and pigeonpea, with the sorghum severely affected by *Striga*. However, the pearl millet crop was very good with stout, long heads and bold seed (ABM-054). Near Kalyandurg,

pearl millet with many tillers and long, compact heads was collected (ABM-062). Around Uravakonda, the local sorghum is called "Pasara Jonna". Around Vajrakaroor, millet was good with long, stout, conical, compact heads (ABM-69). In this area, according to local custom, the farmers do not like to part with the produce before celebrating the harvest festival (Vijayadasmi which is on 18th October this year). Around Guntakal, hybrids are popular. Near Gooty the locals appeared conspicuously different (ABM-079), being very tall with thick stems and produce long stout heads with bold seed. Reached Anantapur late in the evening.

10-10-1980: Anantapur - Kadiri - Rayachoti - Rajampet. Left Anantapur in the early morning and covered Kadiri, Rayachoti and reached Rajampet. Upto Kadiri the soils are sandy but the surface appears stony. On reasonably good soils groundnut is planted and pearl millet is planted on poor soils. BJ-104 is common but the farmers feel that the locals are more drought resistant. Ear bug (*Cantheridine*) is a problem around this area. Around Kadiri and Seethampet, millet grows very tall, producing 3-5 tillers with compact conical heads. Hybrids and their advanced generations are popular in this area because of recurrent drought and frequent cases of complete crop failure, the farmers purchase seed either from a local merchant or from the agricultural department. At Kadiri we met with Mr. K. Subba Rao and Mr. L. Shankara Reddy, Assistant Directors of Agriculture who helped us to identify the important millet growing areas in this taluk. Around Rayachoti, hybrids were very popular and we could purchase mixtures of locals and hybrids from the local market.

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11-10-1980: Rajampet - Cuddapah - Nandyal - Kurnool - Hyderabad. Around Rajampet only hybrids are extensively grown, the local cultivars are grown by very few rich farmers for domestic consumption. In this area a nursery is grown with lift irrigation and 4-6 week old seedlings are transplanted in the furrows opened by a wooden plough. Farmers believe that the locals are better suited for transplanting. Before Kurnool pearl millet mixed with pigeonpea and *Setaria* was common, but bird damage was very severe. Left Kurnool in the evening and reached Hyderabad by midnight.

ACKNOWLEDGEMENTS

We are grateful to Dr. Venkatanathachari, Senior Scientist and Dr. Anjaneyulu, Breeder, ARS-APAU, Anantapur for their help during this trip. Thanks are due to Messers A. Nanjundappa, Deputy Director of Agriculture, Kurnool, Narayana Rao, Deputy Director of Agriculture, K. Mohiuddin, Deputy Director of Agriculture, Anantapur, K. Subba Rao, Assistant Director of Agriculture, Kadiri, L. Shankara Reddy, Assistant Director of Agriculture, Hindupur and The Assistant Agricultural Officer, Rajampet, who helped us in identifying the millet growing areas in their respective areas. Thanks are also due to Mr. G. Basi Reddy and Mr. Rajendran for accompanying and helping us.

Appendix

DETAILS OF SAMPLES COLLECTED FROM RAYALASEEMA REGION OF ANDHRA PRADESH DURING OCTOBER 1980

Collection No.	Crop	Location	Remarks
(1)	(2)	(3)	(4)
Samples ABM-001 to ABM-019 were collected on 7-10-80 enroute Hyderabad - Kodumuru - Alur - Bellary.			
ABM-001	SG	137 km S Hyderabad	mixed with PP
ABM-002	FM	80 km N Kurnool	threshing floor
ABM-003	PM	10 km W Kurnool	stout heads, with PP and ST
ABM-004	ST	- do -	with PM and PP
ABM-005	PM	30 km W Kurnool	-
ABM-006	PM	15 km W Kodumuru	with ST
ABM-007	SG	- do -	"Gundu Pacha Jonna", rabi sowing
ABM-008	PM	Palakurti	TF
ABM-009	PM	35 km W Kodumuru	"Pedda sajja"
ABM-010	ST	- do -	with PM
ABM-011	PM	110 km E Bellary	with SG
ABM-012	SG	-do -	mixture of red and yellow
ABM-013	PM	104 km E Bellary	TF, one kg sample
ABM-014	PM	90 km E Bellary	compact, long heads, 2-5 tillers with ST
ABM-015	ST	- do -	good crop with PM
ABM-016	PM	70 km E Bellary	"Thoka sajja"
ABM-017	PM	- do -	-
ABM-018	PM	67 km E Bellary	compact, long heads
ABM-019	PM	60 km E Bellary	"Javara sajja", TF, one kg sample

ABM: Names of the collectors abbreviated as
A - (Appa Rao), B - (Bidi :r) and M - (Mahalakshmi)

CP : Cowpea
FM : Finger millet
GN : Groundnut
HG : Horse gram
OC : Other crops
PM : Pearl millet
PP : Pigeonpea
SM : Sesamum
ST : Setaria
SG : Sorghum
MS : Market sample
TF : Threshing floor
AGH? : Advanced generation of hybrid
W : West
E : East
N : North
S : South
With : Grown as a mixed crop with

(1)	(2)	(3)	(4)

Samples ABM-020 to ABM-047 were collected on 8-10-1980 enroute Bellary - Rayadurg - Kalyandurg - Togara Kunta - Anantapur.

ABM-020	PM	18 km S Bellary	some sterile anthers observed
ABM-021	PM	21 km S Bellary	AGH?
ABM-022	PM	- do -	AGH?
ABM-023	PM	33 km S Bellary	"Jowara sajja"
ABM-024	SG	- do -	"Munnari Jonna"
ABM-025	PM	20 km N Rayadurg	with HG and CP
ABM-026	ST	- do -	with HG and CP
ABM-027	PM	15 km N Rayadurg	stress, good crop, with SM, PP, CP
ABM-028	OC	14 km N Rayadurg	*Cenchrous*
ABM-029	PM	- do -	with SG, ST and HG
ABM-030	ST	- do -	-
ABM-031	OC	- do -	little millet
ABM-032	PM	10 km N Rayadurg	with PP, CP, SM
ABM-033	PP	- do -	two early plants only
ABM-034	PM	2 km N Rayadurg	associated with *Atylosia*
ABM-035	PM	9 km S Rayadurg	severe stress
ABM-036	PM	- do -	hairy plants (35)
ABM-037	PM	15 km S Rayadurg	"Jowara sajja"
ABM-038	PM	25 km S Rayadurg	with SG and HG
ABM-039	PM	17 km N Kalyandurg	good tillering
ABM-040	SG	- do -	with PM
ABM-041	SG	12 km N Kalyandurg	with PM, PP and HG
ABM-042	PM	- do -	with SG
ABM-043	PM	10 km N Kalyandurg	with PP, SG and SM, soil surface with stones only
ABM-044	PM	Kalyandurg	with GN
ABM-045	PM	65 km N Dharmavaram	TF, with SG
ABM-046	SG	- do -	TF, with PM
ABM-047	PM	- do -	late, with SG and PP

Samples ABM-048 to ABM-082 were collected on 9-10-1980 enroute Anantapur - Atmakur - Kalyandurg - Uravakonda - Guntakal - Gooty - Anantapur.

ABM-048	PM	8 km W Anantapur	with SG and PP, severe bird damage
ABM-049	ST	- do -	with SG and PP
ABM-050	SG	- do -	with PM
ABM-051	PM	12 km W Anantapur	with PP
ABM-052	PM	18 km W Anantapur	with SG
ABM-053	SG	- do -	with PM
ABM-054	PM	Atmakuru	stout, long heads, with PP and SG, *Striga* infected

(1)	(2)	(3)	(4)
ABM-055	SG	Atmakuru	*Striga* observed
ABM-056	PM	25 km E Kalyandurg	soil surface with stones only
ABM-057	PM	15 km E Kalyandurg	rocky soils with PP and beans
ABM-058	SG	10 km E Kalyandurg	with PM and PP
ABM-059	PM	- do -	with SG and PP
ABM-060	PM	Kalyandurg	very good crop
ABM-061	SG	- do -	compact heads
ABM-062	PM	3 km N Kalyandurg	many tillers, long, compact heads
ABM-063	PM	35 km S Uravakonda	with PP and SG
ABM-064	PM	23 km S Uravakonda	with SG
ABM-065	SG	- do -	"Pasara Jonna"
ABM-066	PM	15 km S Uravakonda	-
ABM-067	PM	Uravakonda	sole crop
ABM-068	PM	8 km E Uravakonda	-
ABM-069	PM	Vajrakaroor	long, stout, conical, compact heads
ABM-070	ST	9 km S Guntakal	very good crop
ABM-071	PM	8 km S Guntakal	good crop
ABM-072	PM	5 km S Guntakal	stunted due to drought
ABM-073	PM	Guntakal	very good crop
ABM-074	PM	- do -	sole crop
ABM-075	PM	- do -	with GN
ABM-076	PM	5 km E Guntakal	with GN, withering
ABM-077	PM	10 km E Guntakal	with ST
ABM-078	ST	- do -	with PM
ABM-079	PM	14 km W Gooty	stout, long heads, bold seed, late type, "Gooty type"
ABM-080	ST	- do -	with PM
ABM-081	PM	20 km W Gooty	rocky soil
ABM-082	PM	22 km W Gooty	long, stout, cylindrical heads "Gooty type" very good crop

Samples ABM-083 to ABM-119 were collected on 10-10-1980 enroute Anantapur - Kadiri - Rayachoti - Rajampet

ABM-083	PM	10 km S Anantapur	-
ABM-084	PM	- do -	-
ABM-085	ST	- do -	-
ABM-086	PM	15 km S Anantapur	-
ABM-087	PM	18 km S Anantapur	-
ABM-088	PM	22 km S Anantapur	-
ABM-089	PM	25 km S Anantapur	-
ABM-090	PM	30 km N Kadiri	-

(1)	(2)	(3)	(4)
ABM-091	PM	25 km N Kadiri	-
ABM-092	PM	25 km N Kadiri	-
ABM-093	PM	15 km N Kadiri	-
ABM-094	PM	10 km N Kadiri	-
ABM-095	ST	- do -	-
ABM-096	PM	- do -	-
ABM-097	PM	8 km N Kadiri	with CP, SM, early samples from late crop
ABM-098	PM	2 km S Kadiri	good conical compact heads
ABM-099	PM	5 km S Kadiri	conical, compact heads, 2-3 tillers, with beans
ABM-100	PM	- do -	-
ABM-101	PM	12 km S Kadiri	-
ABM-102	PM	20 km S Kadiri	with SG, PP
ABM-103	PM	30 km W Rayachoti	AGH?
ABM-104	PM	25 km W Rayachoti	-
ABM-105	PM	Rayachoti	MS
ABM-106	PM	- do -	MS
ABM-107	PM	- do -	MS
ABM-108	PM	- do -	MS
ABM-109	PM	- do -	MS
ABM-110	PM	- do -	MS
ABM-111	PM	- do -	MS
ABM-112	PM	- do -	MS
ABM-113	PM	- do -	MS
ABM-114	PM	- do -	MS
ABM-115	PM	5 km E Rayachoti	AGH?
ABM-116	PM	10 km E Rayachoti	-
ABM-117	PM	Seethampet	conical, compact heads, 2-3 tillers
ABM-118	PM	- do -	-
ABM-119	PM	30 km W Rajampet	-

Samples ABM-120 to ABM-133 were collected on 11-10-1980 around Rajampet - Nandyal - Kurnool

ABM-120	PM	2 km S Rajampet	-
ABM-121	PM	5 km S Rajam	transplanted
ABM-122	PM	15 km S Rajampet	transplanted
ABM-123	PM	- do -	stout heads
ABM-124	PM	- do -	-
ABM-125	PM	- do -	-
ABM-126	PM	- do -	-
ABM-127	PM	Rajampet	crossed with BJ-104

(1)	(2)	(3)	(4)
ABM-128	PM	Rajampet	thick, short, conical
ABM-129	PM	- do -	thick, long
ABM-130	PM	- do -	stout heads
ABM-131	PM	Nandyal to Kurnool	with PP and ST, damage by birds
ABM-132	PM	10 km S Kurnool	with SG
ABM-133	SG	- do -	with PM

Samples ABM-134 to ABM-142 were collected on 26-10-1980 enroute Gooty to Anantapur

ABM-134	PM	Reddapet	with PP, SG
ABM-135	PM	Mutur	-
ABM-136	PM	2 km N Gooty	with PP, GN
ABM-137	PM	Gooty	"Jowara sajja" good crop, with GN
ABM-138	PM	Potudodli	with SG, PP
ABM-139	PM	Udumulapet	MS
ABM-140	PM	Madarupurai	with ST
ABM-141	PM	- do -	-
ABM-142	OC	- do -	*Atyloeia*