

Work Plan for 1995-96

- Data entry of germplasm records.
- Editing/matching of passport data with Genebank data.
- Generation of Reports of passport data in different formats.
- Development and publishing of catalogues for major crops.
- Revision of catalogues.
- Analysis of data.
- Establishment of network system.

LIST OF PROJECTS DURING 1994-95

- Multiplication and characterization of local rice (*O. sativa*) germplasm.
- Characterization and preliminary evaluation of maize (*Z. mays*) collection.
- Preliminary evaluation of wheat (*T. aestivum*) germplasm.
- Characterization of mung (*V. radiata*) and mash (*V. mungo*) germplasm.
- Multiplication and characterization of chickpea (*C. arietinum*) accessions.
- Multiplication and preliminary evaluation of barley germplasm.
- Multiplication and characterization of sorghum germplasm.
- Characterization of different Brassica species under field conditions.
- Standardized the protocol of SDS-Polyacrylamide Gel Electrophoresis (SDS - PAGE) for total seed protein.
- Protocol for biochemical evaluation (protein/isozymes) of lentil and chickpea was standardized.

PROJECT No. 1

Experiment Title: Multiplication and characterization of local rice (*O. sativa*) germplasm.

- Objective:
- To determine the amount of genetic variation present in the local material.
 - To multiply seed for conservation and distribution.

Progress Achieved: A set of 544 accessions of local rice germplasm were characterized for the following traits.

Quantitative

Days to flowering
Days to maturity
Plant height
Panicle length
Branches/panicle
Productive tiller

Qualitative

Panicle type
Leaves pattern
Panicle exertion
Awn colour
Auricle colour
Ligule colour
Awn/Awnless

Means, ranges, C.Vs and standard deviations for rice germplasm evaluated at NARC

Descriptor	Mean	Min.	Max.	C.V.(%)	S.D.
Days to flowering	112.27	71.00	199.00	15.10	16.95
Days to maturity	155.62	133.00	203.00	11.70	18.21
Plant height (cm)	178.22	60.00	285.00	18.53	33.03
Panicle length(cm)	22.36	09.00	36.00	19.34	04.32
Branches/panicle	11.78	05.00	25.00	22.18	02.61
Productive tillers	09.75	04.00	41.00	46.34	04.52

Frequency distributions for various qualitative traits of rice germplasm evaluated at NARC.

Descriptors	Frequency	(% age)
Panicle type		
Compact	268	49.26
Intermediate	145	26.65
Open	131	24.09
Awning		
Awn	158	29.04
Awnletted	136	25.00
No awn	250	45.96
Awn colour		
White	222	40.81
Red/black	072	13.60
No awn	250	45.59
Leaves pattern		
Erect	008	01.47
Drooping	536	98.53
Panicle exertion		
Fully exerted	298	54.78
Not exerted	246	45.22
Ligule colour		
White	542	99.63
Red	002	0.37
Auricle colour		
White	542	99.63
Red	002	0.37

PROJECT NO.2

Experiment Title: Multiplication and preliminary evaluation of maize collections.

Objectives:

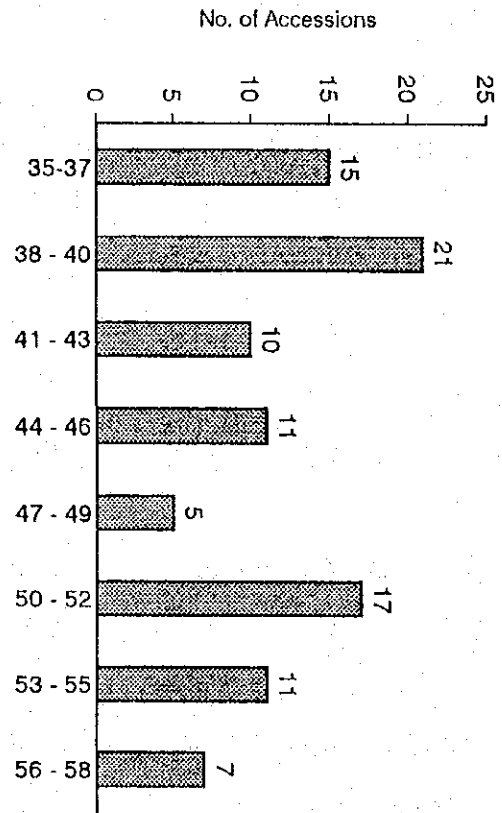
- To multiply seed for stock conservation.
- To identify the amount of genetic variation present in the germplasm.

Progress Achieved: A total of 79 maize accessions were evaluated for 13 different characters under field conditions.

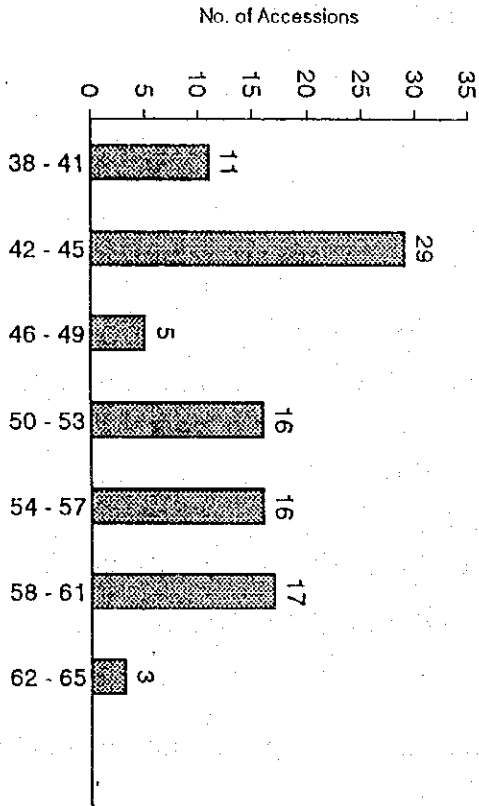
Means, ranges, C.V.s and standard deviations for maize accessions evaluated at NARC

Parameter	Mean	Min.	Max.	C.V.(%)	S.D.
Days to tasseling	44.80	35.00	58.00	15.51	6.95
Days to silking	49.94	38.00	65.00	14.72	7.35
Plant height(cm)	132.79	64.00	227.00	35.05	46.54
Ear height(cm)	58.30	10.00	137.00	56.83	33.15
No. of kernels/row	12.87	7.00	18.00	15.93	02.05
1000 Grain weight(g)	154.45	53.00	328.00	36.31	56.08

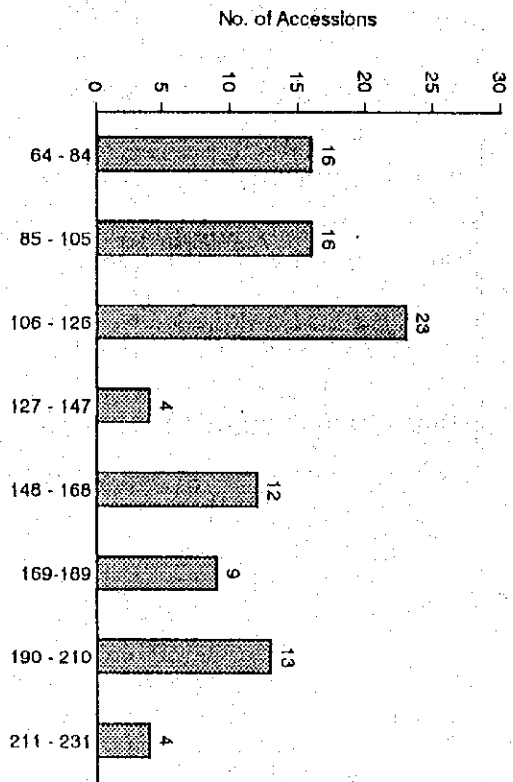
Distribution of days to tasseling for maize accessions evaluated at NARC



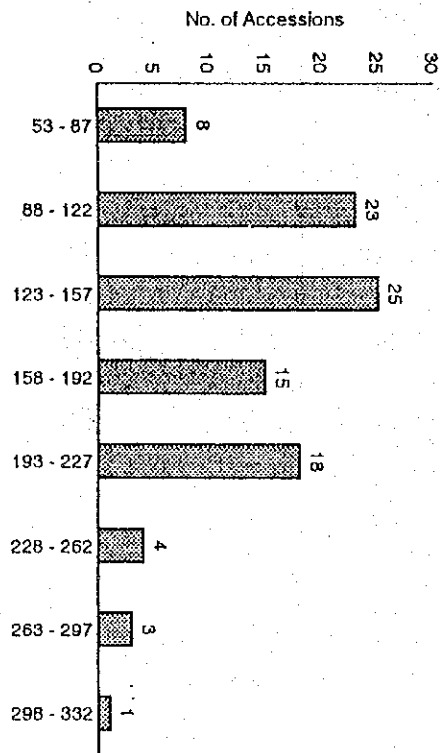
Distribution of days to silking for maize accessions evaluated at NARC



Distribution of plant height (cm) for maize accessions evaluated at NARC



Distribution of 1,000 Grain Weight (gm) for maize accessions evaluated at NARC



Frequency distribution for various qualitative traits of maize germplasm evaluated at NARC.

Descriptors	Frequency	(% age)
Stem colour		
Green	69	71.13
Purple	28	28.87
Sheath pubescence		
Sparse	60	61.86
Intermediate	37	38.14
Tassel type		
Primary	05	05.15
Primary-secondary	26	26.81
Primary-secondary-tertiary	66	68.04
Husk cover		
Poor	24	24.74
Intermediate	32	32.99
Good	41	42.27
Kernel row arrangement		
Regular	47	48.45
Irregular	19	19.59
Straight	24	24.74
Spiral	07	07.22
Kernel type		
Dent	15	15.46
Semi-dent	05	05.15
Semi-flint	04	04.13
Flint	64	65.98
Pop.	09	09.28

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Semi-flint	04	04.13
Flint	64	65.98
Pop.	09	09.28

PROJECT NO.3

Experiment Title: Preliminary evaluation of wheat germplasm

Objectives:

- To multiply seed for conservation and distribution.
- To assess the extent of genetic variation present in the wheat germplasm.

Progress Achieved Total 700 wheat accessions were planted at NARC and evaluated for 21 agro-morphological traits.

Summary of statistics on quantitative traits in wheat germplasm.

Descriptors	Min	Max	Mean	CV(%)	S.D.
Days to Heading	102.00	180.00	129.76	9.65	12.52
Days to maturity	149.00	210.00	180.68	10.66	19.25
Plant Height(cm)	58.40	161.66	120.49	15.73	18.96
Spike Length(cm)	5.60	18.00	10.85	19.91	2.16
Spikelets/Spike	11.20	26.60	19.90	11.53	2.29
Flag Leaf Length (cm)	13.30	46.10	27.29	17.05	4.65
Flag Leaf Width (cm)	0.50	03.96	01.64	34.12	0.56

Frequency distribution for various qualitative traits of wheat germplasm evaluated at NARC.

Descriptor State	No. of Observations	Frequency (%)
Growth Habit		
1 Winter	167	23.9
2 Faculative	155	22.1
3 Spring	378	54.0
Spike Density.		
1 Very lax	2	0.3
3 lax	128	18.3
5 Intermediate	312	44.6
7 Dense	213	30.4
9 Very dense	45	6.4
Auricle Color		
1 Creamy white	647	92.4
5 Green	36	5.2
9 Purple	17	2.4
Awnedness		
0 Awnless	41	5.9
3 Awnletted	90	12.8
7 Awned	569	81.3
Flag Leaf Position		
Erect	99	14.1
Semi erect	448	64.0
Drooping	153	21.9
Glume Hairiness		
0 Absent	588	84.0
3 Small	101	14.4
7 Hairy	11	1.6
Glume Color		
1 White	325	46.4
2 Brown to red	268	38.3
3 Purple	107	15.3

PROJECT NO.4

Experiment Title: Multiplication and preliminary evaluation of barley germplasm.

Objectives:

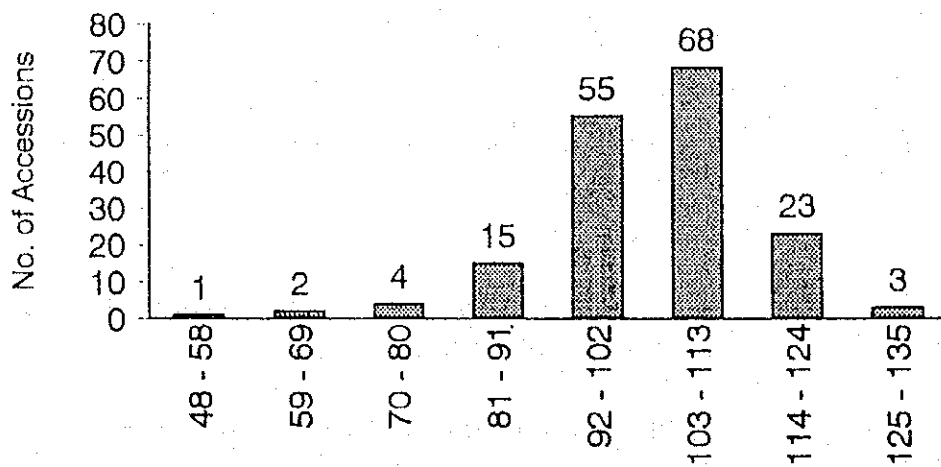
- To determine the amount of genetic diversity present in the barley germplasm.
- Multiplication of material for conservation.

Progress Achieved: Total 171 barley accessions were evaluated under field conditions at NARC for 12 descriptors.

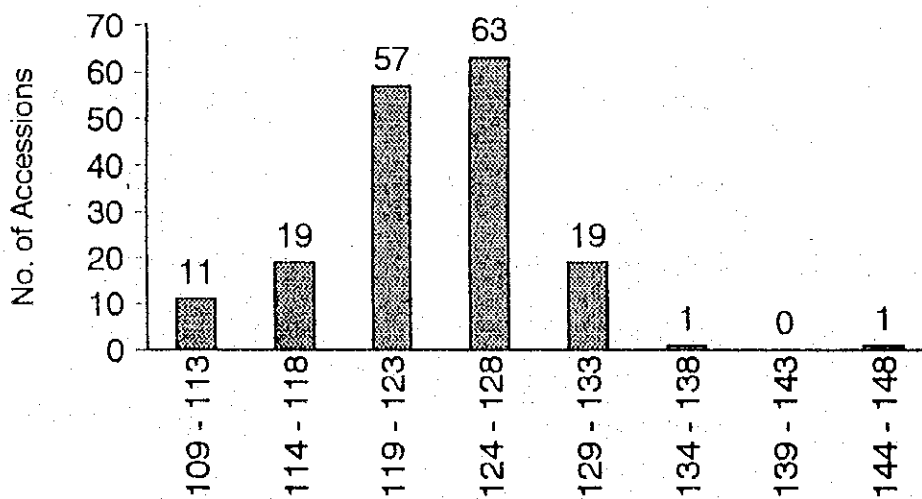
- Growth habit - Awned/Awnless
- Days to flowering - Kernel covering
- Days to maturity - Lemma colour
- Plant height - Grain colour
- Row number - 1000 grain weight
- No. of spikelets/spike - Lodging

Summary statistics for 171 barley accessions evaluated at NARC

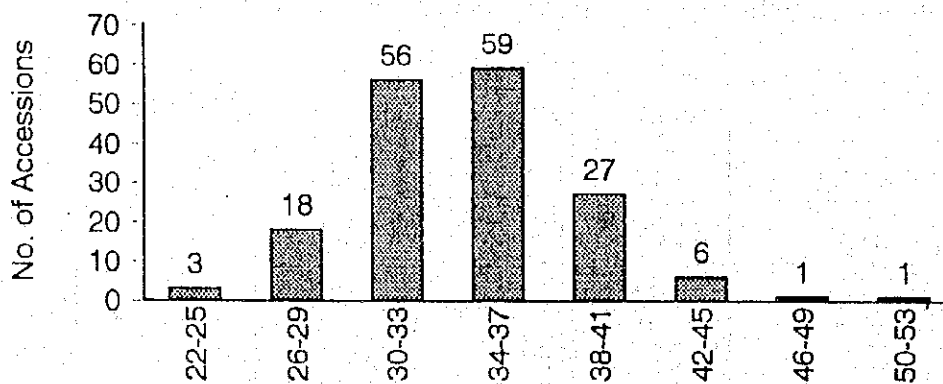
Parameter	Mean	Min.	Max.	C.V.(%)	S.D
Days to flowering	123.17	109.00	144.00	4.51	5.55
Days to maturity	164.00	161.00	171.00	1.86	3.06
Plant height (cm)	102.53	50.0	133.00	11.44	11.73
Spikelets/spike	23.27	14.00	27.00	11.40	02.65
1000 Grain weight(g)	34.41	24.25	51.19	12.47	4.29



Plant height (cm) for barley accessions grown at NARC



Days to flowering for barley accessions grown at NARC



1,000 Grain weight (gm) for barley accessions grown at NARC

PROJECT NO. 5

Experiment Title: Characterization of mung (V. radiata) and mash (V. mungo) local germplasm at NARC

- Objectives:
- To multiply sufficient quantity of seed for conservation and distribution.
 - To identify genotypes which have useful characteristics for further development.

Progress Achieved: Out of 100 accessions planted 79 were able to germinate. The material was characterized for 11 agro-morphological traits under green house conditions.

Means, ranges, C.V.s and standard deviations for mung and mash germplasm. evaluated.

Parameter	Mean	Min.	Max.	C.V.(%)	S.D.
Days to flowering	51.86	35.00	80.00	21.94	11.38
Days to maturity	76.51	62.00	102.00	14.94	11.43
No. of pods/plant	27.29	09.00	56.00	40.05	10.93
Plant height(cm)	94.92	42.00	151.00	22.27	21.14
Pod length(cm)	06.17	03.00	10.00	23.34	01.44
Grain/pod	10.16	04.00	13.00	23.23	02.36

Frequency distributions for hairiness, pod bearing pattern, seed colour, luster and seed size for mung and mash germplasm evaluated at NARC.

Discriptors	Frequency	(% age)
Hairiness		
Hairy	75	94.94
Non-hairy	04	05.06
Pod bearing pattern		
Drooping	27	34.18
Straight	42	53.16
Intermediate	10	12.66
Seed colour		
Black	11	13.92
Green	29	36.72
Light green	30	37.97
Mottled	09	11.39
Seed luster		
Shining	02	02.53
Dull	77	97.47
Grain size		
Bold	17	21.52
Small	62	78.48

Variation for various quantitative traits in mung and mash germplasm characterized.

Range	Frequency	% age
Days to flowering		
35-40	10	12.66
41-46	15	18.99
47-52	20	25.32
53-58	11	13.92
59-64	12	15.19
65-70	07	08.86
71-76	02	02.53
77-82	02	02.53
Days to maturity		
62-67	20	25.32
68-73	21	26.58
74-79	13	16.46
80-85	09	11.39
86-91	05	06.33
92-97	04	05.06
98-103	07	08.86
Pods/plant		
09-14	07	08.86
15-20	19	24.05
21-26	15	18.99
27-32	15	18.99
33-38	08	10.13
39-44	08	10.13
45-50	05	06.33
51-56	02	02.53
Plant height		
42-55	04	05.07
56-69	03	03.80
70-83	13	16.46
84-97	25	31.65
98-111	18	22.78
112-125	11	13.92
126-139	02	02.53
140-153	03	03.80

PROJECT NO.6

Experiment Title: Multiplication and characterization of chickpea (Cicer arietinum L.) germplasm.

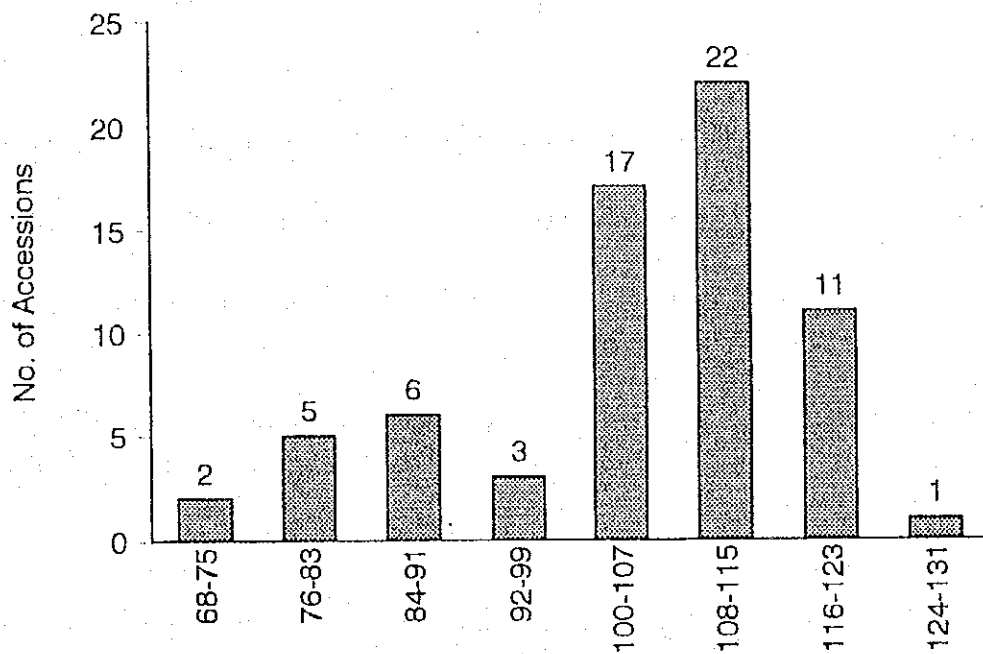
Objectives:

- To multiply seed for conservation and distribution.
- To have an idea of the genetic diversity present in the material.

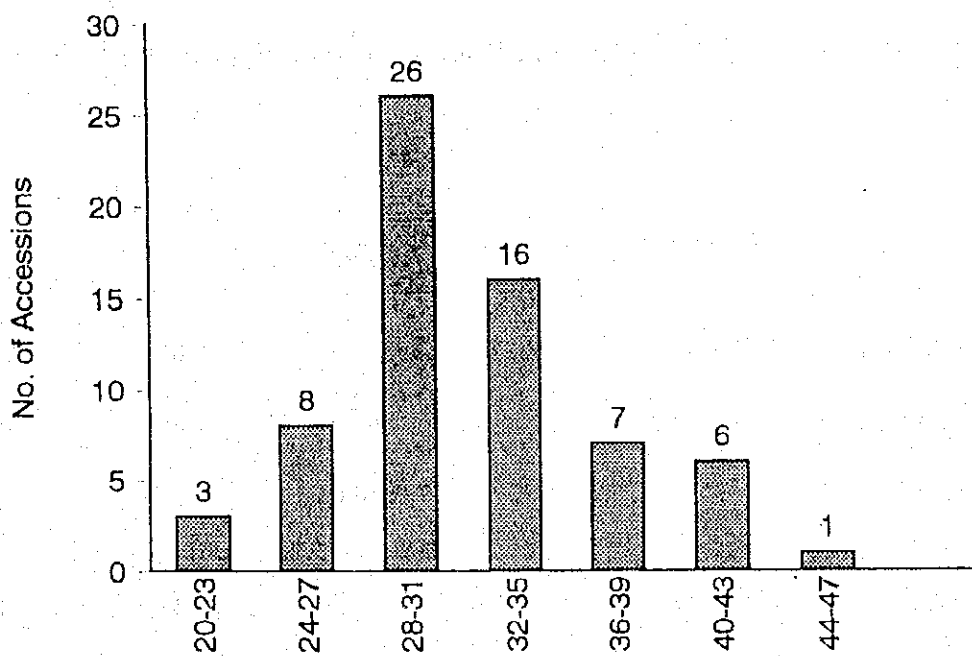
Progress Achieved: A set of 100 chickpea collection were grown in pots under green house condition. The material was evaluated for the following traits: days to flowering, plant height, number of fertile pods per plant, number of unfertile pods per plant, growth habit and flower colour

Means, ranges, C.V.s and standard deviations for chickpea germplasm evaluated.

Descriptor	Mean	Min.	Max.	C.V.(%)	S.D.
Days to flowering	105.28	68.00	128.00	13.12	13.66
Plant height (cm)	31.66	20.00	44.00	16.09	5.10
No. of fertile pods/plant	16.25	03.00	47.00	68.68	11.16
No. of unfertile pods/plant	9.42	00.00	47.00	72.82	6.86



Distribution of days to flowering for chickpea accessions characterized at NARC.



Distribution of plant height (cm) for chickpea accessions characterized at NARC.

PROJECT NO.7

Experiment Title: Multiplication and characterization of sorghum germplasm.

Objectives:

- To characterize the germplasm for agro-morphological traits.
- To increase the seed stock for conservation and distribution.

Progress Achieved: Total 100 accessions were planted in the field. Only 79 entries were able to germinate. The material was characterized for 15 descriptors.

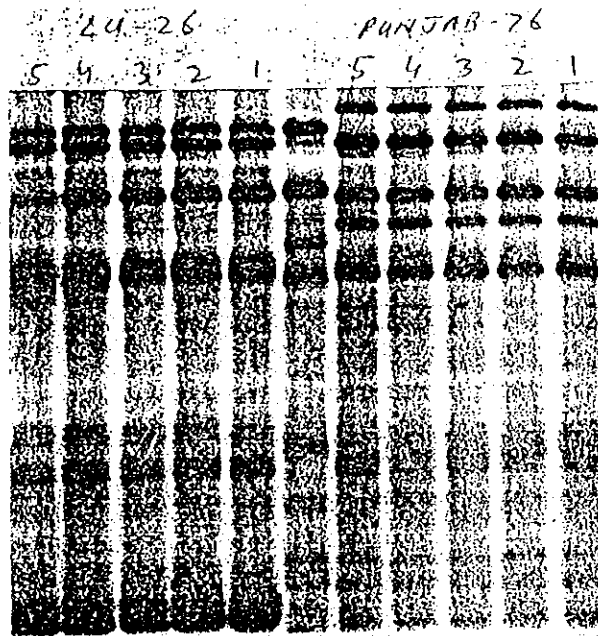
Days to flowering	Endosperm colour
Plant height	Lodging
Leaf midrib colour	Stalk juiciness
Inflorescence compactness	Grain covering
Glume colour	Inflorescence Length
Awns	Inflorescence width
Grain colour	100 grain weight
Grain luster	

Summary statistics for 79 accessions of (*Sorghum bicolor*) germplasm evaluated at NARC

Descriptor	Minimum	Maximum	Mean	Standard Deviation	Standard Error
Plant Height(cm)	123.00	278.00	190.59	30.72	3.478
Days to Flowering	51.00	86.00	62.21	7.02	0.794
Inflorescence Length(cm)	8.07	33.00	16.01	7.09	0.802
Inflorescence Width (cm)	5.00	13.00	7.59	2.07	0.234
Grain Weight(g)	1.94	4.19	2.54	0.45	0.051

BIOCHEMICAL EVALUATION OF GERMPLASM

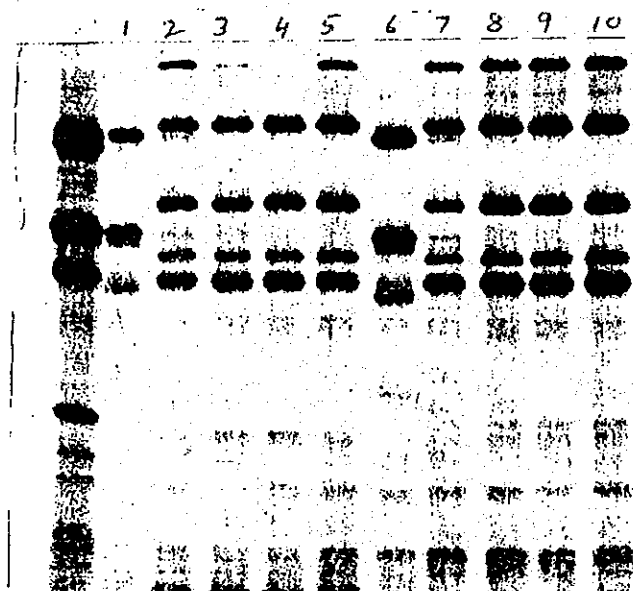
- Storage proteins
- HMW glutenin subunits encoded at three gene



Variation in SDS-PAGE electrophoregrams of seed storage proteins from two wheat varieties

USES:

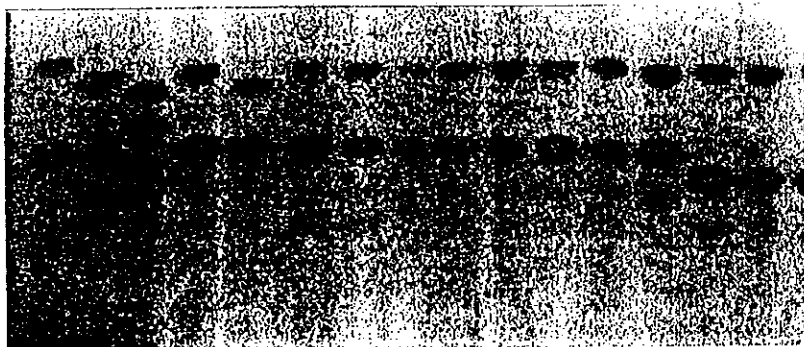
- Assessment of genetic variability
- Varietal identification
- Selection of genotypes with good bread making quality
- Linkage of bio-chemical markers with economically important traits



Variation in SDS-PAGE electrophoregrams of seed storage proteins from wheat land race Pak 15684

BIOCHEMICAL EVALUATION OF LENTIL GERMLASM

- Isozyme analysis
- Protocol has been established for various isozyme (PGM, PGI, LAP, AAT etc.)



Variation among various accessions/genotypes of lentil for Phosphoglucose mutase

USES

- Assessment of genetic variability
- Varietal identification
- Linkage of bio-chemical markers with economically important traits

ON-GOING PROJECT 1995-96

- Multiplication and preliminary evaluation of rice (*O. sativa*) germplasm.
- Characterization and preliminary evaluation of barley (*H. vulgare*) germplasm.
- Multiplication and characterization of chickpea (*C. arietinum*) germplasm.
- Preliminary evaluation of mung (*V. radiata*) germplasm.
- Preliminary evaluation of mash (*V. mungo*) germplasm.
- Multiplication and characterization of maize (*Z. mays*) germplasm.
- Multiplication and characterization of sorghum (*Sorghum bicolor*) collections
- Preliminary evaluation of wheat (*T. aestivum*) germplasm.

ACHIEVEMENTS

- Total 544 accessions of rice germplasm were multiplied and evaluated for 14 agro-morphological traits. Another set of 300 accessions are being evaluated.
- A set of 100 mung and mash accessions were multiplied and evaluated for 11 different traits. A new set of 900 accessions have been planted for evaluation.
- A total of 280 chickpea collection were multiplied and evaluated for 14 descriptors.
- Brassica germplasm (130) was characterized for 15 different characters.
- Total 425 accessions of barley germplasm have been multiplied and evaluated for 12 different traits.
- Total 300 accessions of maize germplasm were multiplied and evaluated for various morphological traits.
- A set of 35 collection of two *Aegilops* spp. were multiplied at NARC.
- About 100 sorghum accessions have been characterized. Another set of 570 collections are in the process of evaluation.
- Total 1200 accessions of wheat germplasm have been multiplied and evaluated for 21 descriptors.
- Standardized the protocol of SDS - Polyacrylamide Gel Electrophoresis for total seed protein.
- Protocol for biochemical evaluation (protein/isozymes) of lentil and chickpea was standardized.

LIST OF PUBLICATIONS

1. Afzal M., M. Kawase. H. Nakayama and K. Okuno (1994). Variation in electrophoregrams of total seed storage and waxy protein in Foxtail millet. *Breeding Science (Supple-2)* 44:624.
2. Masood M.S.; K. Okuno and R. Anwar. 1994. Inter and Intra-specific variation in SDS- PAGE electrophoregrams of total seed protein in wheat, barley and their wild relatives. Paper presented in the National Seminar on "Genetic resources of cereal and their utilization in Pakistan. 8-10 Feb., 1994.
3. Masood, M.S.; K. Okuno and R. Anwar. 1994. Varietal classification of rice (*Oryza sativa*) based on Random Amplified Polymorphic DNAs (RAPDs). Paper presented in the National Seminar on "Genetic resources of cereal and their utilization in Pakistan. 8-10 Feb., 1994.
4. Okuno, K; H. Yashida and M.S. Masood. 1994. Geographical distribution of wild relatives of cultivated wheat and barley in Central Asia and Variation in total seed protein by SDS- Polyacrylamide gel electrophoresis. *Japanese J. of Breeding Science (suppl.1)* 44:272.
5. Anwar R., M.S. Masood and M. S. Bhatti. 1993. Role of Plant Genetic Resources in food security. *Progressive farming* 13(5):14-18.

NEW PROJECTS (1995-96)

- Multiplication and characterization of lentil (*Lens culinaris*) germplasm (Collaboration with Pulses Programme)
- In-vitro screening of sorghum germplasm for drought/salt tolerance.
- Screening of wheat germplasm against leaf rust (*P. recondita*) and yellow rust (*P. striiformis*) (Collaboration with CDRI)
- Characterization and geographical distribution of genetic diversity in *Setaria italica*, *Vigna radiata* and *Triticum* spp. using SDS - PAGE.
- Biochemical characterization of mung(*V. radiata*) and mash (*V. mungo*) using SDS-PAGE.
- Biochemical evaluation (protein/isozyme) of lentil and chickpea germplasm.(Collaboration with Pulses Programme)
- Characterization and evaluation of wheat germplasm (*Triticum aestivum*) based on morphological and storage protein variation.
- Screening of local rice germplasm against leafhopper (*Cnaphalocrocis medinalis*) (Collaboration with Rice Programme)
- Variation in SDS-PAGE electrophoregrams of total seed protein in wheat and its wild (*Aegilops spp.*) relatives.
- Multiplication of wild lentil and chickpea germplasm in hydroponics. (Collaboration with Pulses Programme)
- Identification of marker proteins in sorghum for drought/salt tolerance utilizing SDS-PAGE.
- Characterization and multiplication of cowpeas germplasm.
- Evaluation of rice bean germplasm.

JICA