

**GERMPLASM EXPLORATION
AND
COLLECTION LABORATORY**

GERMPLASM COLLECTED DURING 1995-96

S.NO.	CROP	AREA	PERIOD	SAMPLES COLLECTED
1.	Chickpea and Lentil	Punjab	April-May, 1995	162
2.	Fruit Germplasm	Northern Areas	August, 1995	89
3.	Legumes and Vegetables	Punjab	October, 1995	99
4.	Legumes and Forage	Punjab and NWFP	April-May, 1996	108
5.	Fodder and Forage	Punjab	April, 1996	304
6.	Cereals	Baluchistan & Northern Areas	May, June, July	Being conducted

Number of Samples Collected During the Expedition (S. No1.)

S.No.	Crop Species	No.of Samples	Frequency (%)
1.	Chickpea (<i>Cicer arietinum</i> L.)	58	37.67
2.	Lentil (<i>Lens culinaris</i> L.)	83	53.90
3.	Brassica (<i>Brassica</i> spp.)	6	3.90
4.	Barley (<i>Hordeum vulgare</i> L.)	4	2.60
5.	Millet (<i>Pennisetum americanum</i> L.)	1	0.65
6.	Sorghum (<i>Sorghum bicolor</i> L.)	1	0.65
7.	Oats (<i>Avena sativa</i> L.)	1	0.65
Total		154	100.00

Number of Samples of Fruit Germplasm Collected During the Expedition (S. No.2)

S.No.	Crop Speeices	Phase- I	Phase- II	Total	Frequency (%)
1.	Pyrus spp.	30	0	30	33.71
2.	(Prunus vulgaris Lam Prunus armeniaca L.)	9	30	39	43.82
3.	Prunus domestica L.am)	6	1	7	7.87
4.	Prunus persica L.. Batsch (Prunus vulgaris Mill)	0	3	3	3.37
5.	V itis spp.	2	1	3	3.37
6.	Diospyros lotus L..	1	0	1	1.13
7.	Phaseolus vulgaris L..	2	0	2	2.25
8.	Triticum aestivum L..	2	0	2	2.25
9.	Hordeum vulgare L..	1	0	1	1.13
10.	Zea mays L..	1	0	1	1.13
Total		54	35	89	100.00

Summary of Samples Collected During the Expedition (S. No.3)

Sr.No.	Crop Species	Number of Samples	Frequency (%)
1.	Brassica	3	3.03
2.	Ladyfinger	3	3.03
3.	Maithi	3	3.03
4.	Spinach	4	4.04
5.	Rawan	2	2.02
6.	Sanhemp	1	1.01
7.	Peas	7	7.07
8.	Sesame	1	1.01
9.	Kaddu	4	4.04
10.	Lobia	1	1.01
11.	Coriander	7	7.07
12.	Chillies	21	21.22
13.	Raddish	4	1.01
14.	Cucumber	1	4.04
15.	Tindi (desi)	2	2.02
16.	Onion	2	2.02
17.	Cucurbits	2	2.02
18.	Mash	19	19.19
19.	Turnip	1	1.01
20.	Cauliflower	1	1.01
21.	Carrot	1	1.01
22.	Garlic	3	3.03
23.	Sonf	1	1.01
24.	Bitergoard	2	2.02
25.	Halwa kaddu	2	2.02
26.	Broadbean	1	1.01
Total		99	100

FUTURE PLANS FOR EXPLORATION AND COLLECTION 1996-97

S.NO.	CROP	AREA	BUDGET (Rs. in million)
1.	Maize Germplasm	NWFP and Northern Areas	0.1
2.	Millet and Sorghum	Sindh, Punjab and Baluchistan	0.1
3.	Barley	Northern Areas	0.1
4.	Fibre Crops	Punjab and NWFP	0.1
5.	Vigna species	Punjab, NWFP and Azad Kashmir	0.1
6.	Forage Legumes	NWFP, Northern Areas and Baluchistan	0.2
7.	Vegetable	NWFP, Azad Kashmir and Northern Areas	0.1
8.	Minor Millets	NWFP and Northern Areas	0.1

**GENEBANK AND SEED
PRESERVATION LABORATORY**

GENEBANK & SEED PRESERVATION LABORATORY

On Going:

1. Storage of crop germplasm under Active and Base collection. (Rs.0.4 million)
2. Viability testing of conserved and new germplasm. (Rs.0.1 million)
3. Effect of temperature and seed moisture content on seed viability during storage (Rs.0.02 million)
4. Seed storage of recalcitrant species under different temperature and moisture contents. (Rs.0.02 million)

CROP GERMPLASM DISTRIBUTION

S.NO.	CROPS	NO. OF ACCESSION	SUPPLIED TO
1.	Sorghum & Millet	156	Fodder Research Institute, Sargodha.
2.	Safflower	325	NODP (Islamabad and Sindh).
3.	Brassica	70	AEARC, Tandojam.
4.	Food Legumes	70	Agriculture Univ., Peshawar
5.	Cucumis	24	Seed Science, NARC.
6.	Guar	15	Quaid-e-Azam Univ., Islamabad.

GERMPLASM BEING UTILIZED IN BREEDING PROGRAMMES

1. Maize germplasm for early maturity.
2. Rice germplasm for insect resistance (White backed Plant Hopper).
3. Cowpea for resistance to blackeye cowpea mosaic virus.
4. Chilly germplasm (exotic) for high yield and uniform maturity.
5. Safflower germplasm (exotic) for thornless.
6. Wild lentil germplasm for a-biotic stresses.

ADDITION OF GERMPLOSM IN THE
GENEBANK DURING 1995-96

S.NO.	SOURCE	NO. OF ACCESSIONS	PERCENTAGE OF THE TOTAL COLLECTIONS
1.	Local Collections	1212	9 %
2.	Introduced from Abroad	1903	14 %
3.	No. of Accessions from Research Institutes	150	1 %

CROP GERmplasm INTRODUCED

S.NO.	CROP SPECIES	NO. OF SAMPLES	SUPPLIED TO <i>By</i>
1.	Barley	388	ICARDA, Syria
2.	Wild Lentil	60	ICARDA, Syria
3.	Lentil	29	ICARDA, Syria
4.	Forages	40	ICARDA, Syria
5.	Vicia spp.	66	ICARDA, Syria
6.	Lathyrus	58	ICARDA, Syria
7.	Wild Chickpea	57	ICARDA, Syria
8.	Chickpea	505	W.S.U., USDA, USA
9.	Lentil	278	W.S.U., USDA, USA
10.	Wheat	20	NIAR, Japan
11.	Barley	22	NIAR, Japan
12.	Phaseolus	4	NIAR, Japan
13.	Mungbean	20	NIAR, Japan
14.	Cowpea	4	NIAR, Japan
15.	Safflower	362	NGRI, USADA, USA
16.	Cotton	95	CRI, Faisalabad
TOTAL:		2008	

IN VITRO PRESERVATION
LABORATORY

IN VITRO PRESERVATION LABORATORY

- Project Title:** Maintenance of vegetatively propagated crops on minimal growth media.
- Experiment:** Maintenance of meristem tip cultures of potato.
- Experiment:** Maintenance of meristem tip cultures of sweet potato.
- Experiment:** Propagation and conservation of sugarcane.
- Experiment:** Invitro conservation studies on Medicinal/Forage plants
Artemisia quettensis.
- Project Title:** In vitro preservation of fruit trees genuplasm.
- Experiment:** In vitro propagation and conservation of citrus.
- Experiment:** In vitro propagation and conservation of apricot through shoot tips and lateral buds.

Protocols established for different crops in the In vitro Preservation Lab., PGRI

Crops	Culture establishment stage		Multiplication stage			Rooting stage		Acclimatization	
	weeks	Explant/ size	Basal medium + hormones	Weeks	No. of shoots	Media etc.	Weeks	Stage	Weeks
Artemisia	4-6	Shoot tip/ 0.3-0.5mm	MS + BA (0.4- 1.0mg/l) + NAA (0.05-0.1mg/l)	4-6	50-70	MS + diffused light	2-4	Directly to pots (proliferated shoots)	3-4
Apricot	4-6	Shoot tip/ 0.3-0.5mm	AP + BA 4.0mg/l	4-6	3-30	-	-	-	-
Sugarcane	2-4 (in dark)	Buds/ 0.5-0.7mm	MS + BA (1.0- 1.125mg/l)	4-6	50-144	MS + 7-9% sugar	1-4	Rooted plantlets	2-4
Sweet potato	3-5	Meristem tip/0.5- 0.7mm	MS + BA 0.3mg/l + NAA 0.03mg/l	2-4	8-20	MS ± hormones	1-3	3-6weeks sub-cultured shoots to pot	3-4
potato	4-6	Meristem tip/0.5- 0.7mm	MS + BA 0.1mg/l + NAA 0.05mg/l	3-4	10-15	MS only	1-3	5-6weeks sub-cultured shoots to pot	3-4

MS = Murashige and Skoog (1962) medium. AP = AlMehdi and Parfitt (1986) medium. BA = Benzyl adenine.

NAA = Naphthalene acetic acid.

Germplasm preservation by in-vitro culture in PGRI

Name of plant No.	in-vitro preservation	Length of preservation
Artemisia	1	6months
Sugarcane	18	8
Sweet potato	13	9
Potato	3	9

FUTURE PLAN

WORK TO BE CONTINUED.

1. MAINTENANCE OF FIELD GENE BANK FOR ROOTSTOCK ESTABLISHMENT.
2. GERMPLASM OF FRUITS, VEGETABLES AND FORAGE/MEDICINAL PLANTS CONSERVATION STUDIES WILL FOLLOW THE INITIAL PROTOCOL TECHNIQUES.
3. INVITRO PROPAGATION OF CITRUS, APRICOT, SUGARCANE AND ARTEMISIA QUETTENSIS.

NEW EXPERIMENTS

1. IN VITRO CONSERVATION OF MANGO GERMPLASM.
2. MICRO PROPAGATION OF ^uGAVA ON MINIMAL GROWTH MEDIA.

GERMPLASM EVALUATION
LABORATORY

EVALUATION LABORATORY

LIST OF PROJECTS DURING 1995-96

1. Multiplication and preliminary evaluation of barley (H. vulgare) germplasm
2. Multiplication and characterization of rice (Oryza sativa) collections at NARC
3. Preliminary evaluation of wheat (Triticum aestivum) germplasm
4. Multiplication and characterization of different brassica species
5. Characterization and preliminary evaluation of chickpea (Cicer arletinum) germplasm (Collaboration with Pulses).
6. Preliminary evaluation of sorghum (Sorghum bicolor) germplasm
7. Morphological/biochemical characterization of lentil (Lens culinaris) germplasm (Collaboration with Pulses).
8. Preliminary evaluation of mash (Vigna mungo) germplasm
9. Variation for total seed protein in wild wheat as revealed by SDS-PAGE
10. Multiplication of wild lentil and chickpea species in hydroponic
11. Characterization and evaluation of wheat germplasm (Triticum aestivum) based on morphological and storage protein variation.
12. Screening of local rice germplasm against leafhopper (Cnaphalocrocis medinalis) (Collaboration with Rice)
13. Germplasm multiplication of various crop species

MULTIPLICATION OF GERMPLASM 1995-96

S.NO.	CROP	NO. OF ACCESSIONS
1.	Mung	325
2.	Maize	100
3.	Cowpea	138
4.	Aegilops	43
5.	Wild Chickpea	37
6.	Wild Lentil	54
7.	Wheat and Barley	1850
8.	Sorghum and Millet	200
9.	Chickpea	650

LIST OF GERMPLASM EVALUATED 1995-96

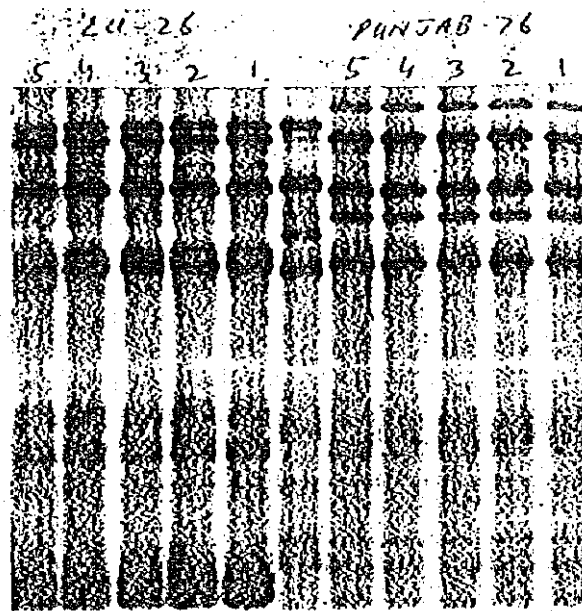
S.NO.	CROPS	NO. OF ACCESSION	CHARACTER STUDIED
1.	WHEAT	1238	21
2.	BARLEY	397	12
3.	RICE	239	13
4.	SORGHUM	371	17
5.	MASH	450	11
6.	CHICKPEA	250	15
7.	BRASSICA	74	15

BIOCHEMICAL EVALUATION

S.NO.	CROP	NO. OF ACCESSIONS	BIOCHEMICAL MARKERS
1.	Aegilops	42	SDS-PAGE
2.	Wheat	74	SDS-PAGE
3.	Lathyrus	12	SDS-PAGE
4.	Cotton	13	Isozyme (PGI, PGM, AAT and Amylase)
5.	Mash	95	SDS-PAGE
6.	Lentil	20	SDS-PAGE
7.	Rice	15	SDS-PAGE
8.	Lentil	36	Isozyme (PGI, PGM, AAT and Amylase)
9.	Chickpea	10	PGI, PGM, AAT and Amylase
10.	Wheat		DNA extraction using CTAB method

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

Experiment Title: Morphological /biochemical characterization of lentil germplasm

- Objectives:
1. To assess genetic diversity in the local germplasm of lentil
 2. To identify germplasm for direct incorporation in the lentil varietal improvement programme.

Progress Achieved:

- Commercial cultivars of lentil (Masoor-85, Manshira-89, Masoor-93) and lines being tested in lentil National Uniform Yield Trial.
- Land races(333 accessions) of lentil collected from all over the country.
- World core collection (300) of lentil from USDA Pullman.
- 30 accessions of wild lentil.

Profile of the Lentil Genotypes for Morphological and Biochemical Characterization

Variety / Genotype	yc	gs	pgi-1	pgi-2	pgm-1	pgm-2	aat-1	aat-2	amylase
Masoor-85	+	+	+	+	+	+	+	+	+
Manshira-89	-	+	+	+	-	+	+	-	+
Masoor-93	+	+	+	+	+	+	+	+	+
NL-731	+	+	+	+	+	+	+	+	+
NL-96	+	+	+	+	+	+	+	+	+
NL-10-62	+	+	+	+	+	+	+	+	+
NL-73	+	+	+	+	+	+	+	+	+
NL-40-53	+	+	+	+	+	+	+	+	+
NL-71-2	+	+	+	+	+	+	+	+	+
89503	+	+	+	+	+	+	+	+	+
91516	+	+	+	+	+	+	+	+	+
91517	+	+	+	+	+	+	+	+	+
88522	+	+	+	+	+	+	+	+	+
Masoor-931	+	+	+	+	+	+	+	+	+
Masoor-932	+	+	+	+	+	+	+	+	+
Dashat	+	+	+	+	+	+	+	-	+

GERMPLASM MULTIPLICATION 1996-97

S.NO.	CROPS	NO. OF ACCESSIONS
1.	Maize	353
2.	Sorghum	488
3.	Setaria	146
4.	Panicum	48
5.	Wild Chickpea (Hydroponic)	37
6.	Wild lentil (Hydroponic)	54
7.	Chickpea	400
8.	Rice	239
9.	Barley	150

BIOCHEMICAL EVALUATION 1996-97

S.NO.	CROPS	NO.OF ACCESSIONS	BIOCHEMICAL MARKER
1.	Aegilops	42	Detailed evaluation of diversity for HMW-GS (SDS-PAGE).
2.	Lentil	200	Isozyme (AAT, PGM, PGI, SKDH, ADH, ME & SDS-PAGE).
3.	Chickpea	150	Isozyme (PGM, PGI, AAT & Amylases).
4.	Wheat	91	Variation for HMW-GS using SDS-PAGE.
5.	Apricot	40	Isozyme (MDH, ACPH, EST & PGM).
6.	Rice	150	DNA extraction by CTAB Amplification using PCR.
7.	Mash	100	SDS-PAGE:

GERMPLASM EVALUATION 1996-97

S.NO.	CROPS	NO.OF ACCESSIONS	CHARACTER TO BE RECORDED
1.	Maize	353	13 (Morphological traits)
2.	Chickpea	150	16 (Morphological traits)
3.	Rice	239	12 (Morphological traits)
4.	Rice	400	Screening for insect resistance (Leaf folder)
5.	Rice	200	Screening for salt tolerance in hydroponic
6.	Barley	400	Screening for salt tolerance under field conditions
7.	Wheat	600	Screening for disease resistance (Leaf rust & yellow rust)

NEW PROJECT'S (1996-97)

- Multiplication and characterization of maize (Z. mays) germplasm.
Investigators: M. Shahid Masood and M. Arif
Funds required: (Rs. 40,000)

- In-vitro screening of sorghum germplasm for drought/salt tolerance.
Investigators: M. Afzal
Funds required: (Rs. 50,000)

- Screening of wheat germplasm against leaf rust (P. recondita) and yellow rust (P. striiformis).
(Collaboration with CDRI)
Investigators: M. Afzal and Munawar Hussain
Funds required: (Rs. 60,000)

- Biochemical characterization of mung(V. radiata) and mash(V. mungo) using SDS-PAGE.
Investigators: A. Ghafoor
Funds required: (Rs. 70,000)

- Fingerprinting of Pakistani wheat cultivars using SDS-PAGE.
Investigators: M. Shahid Masood, M. Tahir and M. Arif
Funds required: (Rs. 100,000)

- Screening of local barley germplasm for salt tolerance.
Investigators: M.Shahid Masood
Funds required: (Rs. 30,000)

- Genetic diversity in lentil germplasm collected from various parts of Pakistan based on morphological and molecular genetic markers.
Investigators: Tayyaba Sultana, M.Tahir and M.Shahid Masood
Funds required: (Rs, 80,000)

- Geographical distribution of lentil in Pakistan as revealed by genetic markers. (Isozyme/SDS-PAGE)
Investigators: Tahira khanum, M.Tahir and M.Shahid Masood
Funds required: (Rs. 80,000)

- Assessment of genetic diversity in chickpea germplasm based on morphological and molecular genetic markers.
Investigators: Falik Noor, M.Tahir and M.Shahid Masood
Funds required: (Rs. 80,000)

- Screening of rice germplasm for salt tolerance and its interaction with biological stresses.
Investigators: Shazia Aslam, M.Saleem, and M.Shahid Masood
Funds required: (Rs. 50,000)

- DNA extraction and its amplification in rice using Polymerase Chain Reaction (PCR).
Investigators: M.Shahid Masood and M.Tahir
Funds required: (75,000)

- Screening of local rice germplasm against leafhopper (*Cnaphalocrocis medinalis*) (Collaboration with Rice)
Investigatos: M.Salcm, M.Ramzan, and M.Shahid Masood
Funds required: (Rs. 30,000)

- Variation in SDS-PAGE electrophoregrams of total seed protein in wheat and its wild (*Aegilops spp.*) relatives.
Investigators: M.Shahid Masood, and M.Tahir
Funds.required: (Rs. 75,000)

- Multiplication of wild lentil and chickpea germplasm in hydroponics. (Collaboration with Pulses)
Investigators: M.Shahid Masood and M.Tahir
Funds required: (Rs. 50,000)

**PLANT INTRODUCTION
AND SEED HEALTH**

PLANT INTRODUCTION AND SEED HEALTH LABORATORY,
PGRI

FUTURE PLAN OF WORK, 1996-97:

1. **EFFECT OF PATHOGEN (FUNGUS AND VIRUS) CONTAMINATION AT DIFFERENT TEMPERATURES ON SEED LONGEVITY (Continued nature, it will end in 2005)**
2. **STUDY ON SEED MYCOFLORA OF MAIZE, SORGHUM AND MILLET. (New project).**
3. **EVALUATION OF FUNGICIDES AS A SEED TREATMENT FOR THE ERADICATION OF SEED-BORNE INOCULUM OF CHICKPEA BLIGHT CAUSED BY ASCOCHYTA RABIEI (New project)**

ON-GOING PROJECTS (in collaboration with Pulses Research Instituteto be continued during 1996-97).

1. **DEVELOPMENT OF DIAGNOSTIC TECHNIQUES FOR SEED-TRANSMITTED VIRUSES IN LEGUME CROPS GERMPLAS (CONTINUED)**
2. **EVALUATION OF LEGUME CROP GERMPLASM (Vigna species) TO DETECT SEED LOTS CONTAMINATED WITH SEED-BORNE VIRUSES (CONTINUED)**
3. **SCREENING OF LEGUME CROP GERMPLASM (chickpea and lentil) FOR RESISTANCE SOURCES (CONTINUED)**
4. **GENETIC OF INHERITANCE OF RESISTANCE IN COWPEA AGAINST BICMV (CONTINUED)**

RESEARCH SCIENTISTS INVOLVED IN THESE PROJECTS:

1. **Dr. Muhammad Bashir, SSO (Pulses)**
2. **Mr. Zafar Riaz, SO (PGRI)**
3. **Takao Mitsuda, (Consultant)**
4. **Dr. Zahoor Ahmed (PSO)**

SIGNIFICANT ACHIEVEMENTS SINCE 1994:

NEW VIRUSES DETECTED:

CROP	SOURCE	VIRUS
LENTIL	ICARDA	PSbMV CMV
CHICKPEA	ICARDA	CMV
PEAS	GERMANY	PSbMV
FABABEAN	AUSTRALIA	BBSV
URDBEAN (MASH)	LOCAL COLLECTION	ULCV
COWPEA	LOCAL COLLECTION	BICMV CABMV CSMV SBMV CPMoV
MOTHBEAN	LOCAL COLLECTION	ULCV
GROUNDNUT	LOCAL SAMPLES	PBNV PCV

EVALUATION OF GERMPLOSM FOR RESISTANCE:

CROP	NO. OF LINES EVALUATED	NO. OF LINES FOUND RESISTANT
CHICKPEA	200	14
LENTIL	40	5
COWPEA	50	10
PEAS	65	12

EFFECT OF PATHOGEN CONTAMINATION ON SEED LONGEVITY

Effect of blackeye cowpea mosaic virus (BIC MV) on seed
longevity in cowpea

Time	Germination					
	at 25 C		at 0 C		- 20 C	
	H	C	H	C	H	C
6 M	96	92	96	89	95	92
11 M	90	85	96	87	93	89
16 M	89	78	93	85	91	84

The initial germination % of cowpea seed was 96 % in H, and 94 in C.

Effect of *A. rabiei* on seed longevity in chickpea

Time	Germination					
	at 25 C		at 0 C		- 20 C	
	H	C	H	C	H	C
6 M	98	65	95	77	95	83
11 M	83	50	83	74	93	52
16 M	81	47	80	74	89	50

The initial germination % of cowpea seed was 98 % in H, and 83 in C.

DATA MANAGEMENT
LABORATORY

ACHIEVEMENTS

1. Data entry of almost 7593 accessions of Germplasm collection which is about 70% of the passport collection data.
2. Data edited, cross-checked and matched about 6113 accessions of passport data with genebank data.
3. Generated different types of reports of following crops:

Wheat, barley, rice, maize, sorghum, millet, chickpea, lentil, mash & mung, vegetables, fruits and oilseed crops, etc.
4. Published catalog of Wheat, Barley, Rice and Chickpea.
5. Establishment of LAN (Local Area Network) within Labs. and GIS (Graphic Information System) facility.

WORK PLAN

- Data entry of germplasm collections:-
Mash & Vegetables, Legumes & Forages
Fodder & Forages, Wheat
- Editing, matching and cross-checking of passport data with Genebank data.
- Report generation of passport data.
- Printing and publishing of catalogs of Mash/Mung, Lentil and Maize crop.
- Revision of catalog of Wheat, Barley, Rice and Chickpea.
- Data analysis.
- Completion of Network setup within PGRI.
- Generation of Crop Distribution Maps.
- Development of Integrated Information System for genebank.

PHYSICAL ACHIEVEMENTS

1. Established Local Area Network (LAN) system.
2. Fencing of one plot to protect from wild boar.
3. Additional equipments like Drying Chamber, Photographic room, Chemicals, PCR Machine etc.

EVENTS DURING 1995

1. National Workshop on "Conservation of Biodiversity for Sustainable Agriculture" March 12-13, 1995.
2. Joint Committee Meeting, August 29, 1995.
3. Crop Advisory Committees Meeting, October 11-12, 1995.

EVENTS DURING 1996-97

1. Joint Committee Meeting, August 21, 1996.
2. International Seminar on "Sustainable use of Genetic Resources for Food Security" October 2-3, 1996.
3. Crop Advisory Committees Meeting, October 2-3, 1996.
4. Training course on Genetic Resources, October 4-13, 1996.
5. Training course on Data Management and Analysis with Collaboration of IPGRI in November, 1996.

FUTURE PLANS

1. Establishment of field genebanks for conservation of fruit germplasm (Citrus, Guava and Mango).
2. Evaluation of germplasm for biotic and abiotic stresses.
3. Germplasm collection of minor and neglected crops.
4. Conservation studies on recalcitrant species.

附属資料6. 参考PDM (詳細活動計画から作成)

パキスタン・イスラム共和国植物遺伝資源保存研究所計画

1996.10.

Narrative Summary プロジェクトの要約	Objectively Verifiable Indicators 指標	Means of Verification 指標データ入手手段	Important Assumptions 外部条件
<p>Overall Goal 指標目標</p> <p>パキスタン・イスラム共和国における作物改良が促進される。</p>			
<p>Project Purpose プロジェクト目標</p> <p>穀物、豆類を中心に作物遺伝資源の収集、評価、保存、記録及び配付等の活動が強化され、その効果的な手法が確立される。</p>			
<p>Outputs 成果</p> <p>1. 探索・収集</p> <p>1-1. 遺伝的多様性が評価され、植物遺伝資源の分布地図が作成される</p> <p>1-2. 主要作物について収集優先度が決定する</p> <p>1-3. 効果的な収集方法が確立する</p> <p>2. 導入及び種子病理</p> <p>2-1. 外国から優先度の高い遺伝資源が導入される</p> <p>2-2. 主要な種子伝染病原体が同定され、効果的な記載システムが確立する</p> <p>2-3. 種子寿命に及ぼす種子伝染性病原体の影響が明らかになる</p> <p>2-4. 種子伝染性病原体の汚染が少ない増殖方法が検討される</p>	<p>1-1. 作成した地図の検討</p> <p>1-2. 優先度表の作成</p> <p>1-3. 確立した手法の検討</p> <p>2-1. 導入した遺伝資源の検討</p> <p>2-2. 確立されたシステムと好評成果の検討</p> <p>2-3. 好評成果の検討</p> <p>2-4. 好評成果及び改良した方法の検討</p>		

<p>3. 種子及び試験管内保存</p> <p>3-1. 種子保存のための最適条件が確立する</p> <p>3-2. 難貯蔵性種子の貯蔵年限を長くする条件が検討される</p> <p>3-3. 現保存条件における各種種子の寿命が推定される</p> <p>3-4. 栄養繁殖の作物について、試験管内保存技術が開発される</p> <p>3-5. 超低温保存技術の移転が行われる</p>	<p>3-1. 改善した方法の検討</p> <p>3-2. 推定方法の検討</p> <p>3-3. 確立した技術及び好評成果の検討</p> <p>3-4. 調査した超低温保存技術の検討</p>	
<p>4. 増殖・再増殖</p> <p>4-1. 他殖性作物の種子増殖のための適切な方法が見いだされる</p> <p>4-2. 活性低下した遺伝資源が増殖され更新される</p>	<p>4-1. 確立した技術の検討</p> <p>4-2. 改良した技術の検討</p>	
<p>5. 評価</p> <p>5-1. 多くの植物種について形態形質等の一次評価が実施される</p> <p>5-2. 環境的並びに生物学的ストレスに対する評価が実施される</p> <p>5-3. 生化学的評価手法による遺伝的多様性の同定と分類が行われる</p>	<p>5-1. 評価様式の検討</p> <p>5-2. 評価結果の検討</p> <p>5-3. 好評結果の検討</p>	
<p>6. 情報管理</p> <p>6-1. 遺伝資源管理データベースシステムが確立する</p> <p>6-2. パスポートデータ及び評価データを入力し、利用が促進される</p> <p>6-3. 保存遺伝資源の有効利用が促進される</p>	<p>6-1. 確立したデータベースシステムと様式の妥当性の検討</p> <p>6-2. 好評価情報の検討</p> <p>6-3. 出版した目録の検討</p>	
<p>7. ジーンバンク管理</p> <p>7-1. ジーンバンクの効果的運営が図られる</p> <p>7-2. 国内研究機関との連携が強化される</p>	<p>7-1. ジーンバンク運営状況の検討</p> <p>7-2. ワークショップ、セミナーでの報告及び勧告について検討</p>	

Activities 活動	Inputs 投入
<p>1-1. パスポートデータ及び多くのパキスタンでの収集データに基づき、種々の植物遺伝資源について分布地図を作成する。</p> <p>1-2. 遺伝的浸食の程度及び作物の重要性を考慮して、植物種・探索地域の優先度を評価する</p> <p>1-3. 収集活動を通じて収集時の記録項目、方法、収集品の適切な処理、パスポートデータの整理入力まで、遺伝資源の組織的な収集方法を確立する。</p>	<p>〈日本側〉 長期専門家 ・ チームリーダー ・ 業務調整員 ・ 専門家 a. 種子病理 b. 種子保存 c. ジーンバンク管理</p>
<p>2-1. 国内で収集できない有用遺伝資源の外国からの導入を促進する</p>	<p>短期専門家 プロジェクトの円滑な実施のため、必要に応じ派遣</p>
<p>2-2. 形態的及び生化学的手法を用いて、植物遺伝資源種子の伝染性病原体による汚染を同定記載する</p>	<p>パキスタン人の本邦研修</p>
<p>2-3. ジーンバンク保存種子の寿命に及ぼす特定種子伝染性病原の影響を調査する</p>	<p>機材供与</p>
<p>2-4. 適切な保護手段のもとに、汚染された特定作物の遺伝資源を圃場または温室で増殖し、増殖条件が種子汚染の発生に及ぼす影響を検討する</p>	<p>・ プロジェクトの活動に必要な機械、装置 ・ プロジェクトの活動に必要な参考図書及び印刷物 ・ 相互に合意したその他必要な資機材</p>
<p>3-1. 特定植物種について種子の最適貯蔵条件を調べ、種子保存の改善を図る</p>	
<p>3-2. 果樹種子を種々の貯蔵温度及び種子含水率で保存し、発芽率を調べて保存条件の検討を行う</p>	
<p>3-3. 旧種子庫から移管した種子と新たに収集した種子の発芽率及び寿命を追跡し比較する。遺伝資源の適切な保存のため、抽出調査を実施する</p>	
<p>3-4 甘藷、果樹など栄養繁殖作物の試験管内培養技術を検討する</p>	

	Pre-conditions	前提条件
<p>3-5. 植物遺伝資源の超低温での長期保存方法を研究する</p> <p>4-1. 他殖性作物における遺伝的歪みを最小にする種子増殖方法を研究する</p> <p>4-2. 活性低下または、増殖困難な遺伝資源の増殖方法を検討する</p> <p>5-1. 優先度の高い作物種の評価形質をIPGRIあるいは国内基準を参考に決定する</p> <p>5-2. 耐旱性、耐塩性、耐病害虫性などのストレス評価技術を確認する</p> <p>5-3. 酸素、蛋白質、DNAの電気泳動による生化学的評価を実施する</p> <p>6-1. パスポートデータ、在庫データ、評価データのデータベースを構築する</p> <p>6-2. 保存遺伝資源のパスポートデータ、評価データをデータベースシステムへ入力し、それらの情報を印刷発行する</p> <p>6-3. 遺伝資源保存目録を出版する</p> <p>7-1. ジーンバンク運営及び研究上の優先度を決定し活動分野間の協力を通じてジーンバンクの運営を強化する</p> <p>7-2. ワークショップ、セミナー及びアドバイザリー委員会を開催し、植物遺伝資源にかかわる国内研究機関との連携を図る</p>	<p>(パキスタン側)</p> <p>カウンタースタッフ</p> <ul style="list-style-type: none"> ・ 遺伝資源保存研究所 (GRPRL) 所長 ・ 遺伝資源保存研究所 (GRPRL) 副所長 ・ 次の分野の専任 (フルタイム) のカウンタースタッフ <ul style="list-style-type: none"> a. 種子病理 b. 種子保存 c. ジーンバンク管理 d. 相互に必要と合意したその他の分野 <p>管理人員</p> <ul style="list-style-type: none"> ・ 管理職員 ・ 技術者及び実験室助手 ・ 事務員 ・ タイピスト ・ 運転手 ・ 相互に必要と合意したその他の職員 <p>土地、建物及びその他必要な施設</p> <ul style="list-style-type: none"> ・ 当該プロジェクトのための土地、建物及び施設 ・ 日本政府が供与する機械、装置及び資材の設置、保管のために必要な部屋とスペース ・ 相互に必要と合意したその他の施設 	



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