

RP 03558

PROCEEDINGS OF THE INHOUSE REVIEW

P U L S E S

(including GRU & Biochemistry)

I C R I S A T

International Crops Research Institute for the Semi Arid Tropics
Patancheru 502 324, Andhra Pradesh, India.

APRIL 1986

P R E F A C E

Inhouse Review is an important event for the research programs, as it enables them to benefit from interdiscipline and intradiscipline interactions and to make a critical assessment of the accomplishments and short comings of the research program. It is a joint effort by the scientific community of the Institute to improve the quality of research, establish priorities and relevance, sharply focus the goals and fix the time schedule for their achievements.

The present review is intended to look to the progress made in each of the project and to incorporate in work plans suggestions emerging during discussions.

The proceedings indicate the projects, discussion, discussion highlights, and recommendations.

The detailed discussion reports prepared by the Rapporteurs were reviewed by Dr.M.S.S.Reddy and Dr.M.Singh, concerned Program/Subprogram Leaders and myself.

I wish to thank the Program/Subprogram Leaders and Project Scientists for preparing the project reports, the Participants for contributing in discussion, the rapporteurs for the preparation of discussion reports, Dr.M.S.S. Reddy and Dr.M. Singh for co-ordinating, and help in editing, Mr.C.P. Jaiswal of Statistics Unit for typing the final report and making it suitable for computerisation with the help of Mr.K. Sampath Kumar.

J.S. KANWAR
DIRECTOR OF RESEARCH

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1.	C-101(77)IC	International Trials for Dry Areas	KBS/HAVR/ MVR/SSL	Brd/Pat/ Phy/Ent	1
2.	C-102(85)IC	International trials for semi-arid tropics	HAVR/OS/ SCS/CLLG/ JK	Brd/Agr Agr/Ent	2
3.	C-103(85)IC	Breeding short duration desi chickpeas for stability and high yield.	OS/SCS/ MVR/SSL/ NPS	Brd/Pat/ Ent/Agr	5
4.	C-104(85)IC	Breeding long duration desi chickpea for stability and high yield - International	JK/CLLG/ CLLG/SSL NPS/MVR	Brd/Pat Ent/Agr	6
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8.	C-108(85)IC	Breeding chickpeas for adaptation to early and late planting, and to increased inputs.	CLLG/OS/ MVR/NPS SS	Brd/Agr Pat/ Ent	10
9.	C-109(85)IC	Studies on genetics and breeding methods of chickpea	OS/SCS CLLG/JK	Brd	11
10.	C-110(85)IC	Climatic adaptation in chickpea.	NPS	Agr	12
11.	C-111(85)IC	The alleviation of drought effects on growth symbiotic nitrogen fixation capacity and yield of chickpea.	NPS/ OPR	Agr	15
12.	C-112(85)IC	Detection and evaluation of genetic variation in symbiotic nitrogen fixation in chickpea.	OPR	Agr	17
13.	CP-113(85)IC	Identification of situations where chickpea and pigeonpea respond to Rhizobium inoculation.	CJ/ JVDKKR/ OPR	Agr	19
14.	CP-114(85)IC	Maintenance, multiplication and distribution of rhizobial germplasm of chickpea and pigeonpea.	OPR/ JVDKKR	Agr	22
15.	CP-115(85)IC	Detection and alleviation of mineral nutrient deficiencies and soil chemical toxicities in chickpea and pigeonpea	CJ/NPS YSC/OPR/ JVDKKR	Agr	24
16.	CP-116(85)IC	Adaptation of chickpea and pigeonpea to low levels of available soil phosphorus and soil moisture.	JA/ NA/ KO/ CJ	Agr	27
17.	CP-117(85)IC	Studies on the pathogens causing wilts and root rots of chickpea and pigeonpea	MPH	Path	29
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20.	CP-120(85)IC	Screening for disease resistance in chickpea and pigeonpea	MVR/LS/ BAVR	Pat	35
21.	CP-121(85)IC	Studies on the nematode diseases of pigeonpea and chickpea	YLN	Pat	37

22. CP-122(85)IC	Studies of <i>Heliothis</i> population to support the pest management programs, and to rear <i>Heliothis</i> for experiments.	WR/ DRD	Ent	39
23. CP-123(85)IC	Studies leading to integrated pest management on pigeonpea and chickpea including the augmentation of natural control elements	SS	Ent	42
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25. C-125(85)IC	Grain quality improvement in chickpea	US/JK/ OS/SCS/ CLLG	BN/ Brd/ C	46
26. C-126(85)IC	Investigate host plant resistance in chickpea using chemical/biochemical methods	RJ	BN/ Pat/ C	49
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29. P-102(85)IC	Development of short duration cultivars and superior breeding lines for stability and grain production	SCG/ MVR/ SSL/ YSC/	Brd/ Pat/ Agr/ Ent	53
30. P-103(85)IC	Development of medium duration cultivars and superior breeding lines for stability and grain production.	KCJ/ MVR/ SSL	Brd/ Pat/ Ent	56
31. P-104(85)IC	Development of long duration cultivars and breeding population for stability and grain production	Breeder/ MVR/SSL/ LS/NPS	Brd/ Pat/ Ent	58
32. P-105(85)IC	Development of hybrids and their seed production technology	KBS/ MVR	Brd/ Pat/ Ent	59
33. P-106(85)IC	Breeding for special traits (new variability; high protein	KBS/LS/ LS/US/ CJ	Brd/ BN/	61
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35. P-108(85)IC	The alleviation of drought and waterlogging effects on growth symbiotic nitrogen fixation capacity and yield of pigeonpea	YSC/ JVDKKR	AGR	67
36. P-109(85)IC	Detection and evaluation of genetic variation in symbiotic nitrogen fixation in pigeonpea.	JVDKKR	AGR	69
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P R O G R A M

INHOUSE REVIEW - PULSES IMPROVEMENT PROGRAM

4-7 FEBRUARY 1986

TUESDAY, FEBRUARY 4TH

**Chairman
Rapporteur**

**J.S. Kanvar
H.A. van Rheenen**

0900	INTRODUCTORY REMARKS	..	L.D. Swindale
0905	PROGRAM OVERVIEW	..	Y.L. Nene
0915	PULSES AGRONOMY OVERVIEW	..	C. Johansen

**Chairman
Co-Chairman
Rapporteur**

**J.S. Kanvar
C.K. Ong
M. Natarajan**

**0930-
1200** **REVIEWS PULSE AGRONOMY PROJECTS I**

C-110(85)IC	..	N.P. Saxena
C-111(85)IC	..	N.P. Saxena
C-112(85)IC	..	O.P. Rupela
C-113(85)IC	..	C. Johansen
C-114(85)IC	..	Rupela and Kumar Rao

**1400-
1645** **REVIEWS PULSE AGRONOMY PROJECTS II**

CP-115(85)IC	..	C. Johansen
CP-116(85)IC	..	J. Arihara
CP-107(85)IC	..	Y.S. Chauhan
P-108(85)IC	..	Y.S. Chauhan
P-109(85)IC	..	J.V.D.K. Kumar Rao

WEDNESDAY, FEBRUARY 5TH

	Chairman	J.S. Kanvar
	Co-Chairman	R.V. Gibbons
	Rapporteur	K.C. Jain
0900	CHICKPEA BREEDING OVERVIEW	H.A. van Rheenen
0910	REVIEW	
	C-102(85)IC ..	H.A. van Rheenen
0940-	REPORTS	
1030		
	C-101(85)IC ..	H.A. van Rheenen
	C-103(85)IC ..	O. Singh
	C-104(85)IC ..	J. Kumar
	C-105(85)IC ..	H.A. van Rheenen
	C-106(85)IC ..	S.C. Sethi
	C-107(85)IC ..	H.A. van Rheenen
	C-108(85)IC ..	C.L.L. Govda
	C-109(85)IC ..	O. Singh
	Chairman	J.S. Kanvar
	Co-Chairman	C. Johansen
	Rapporteur	P. Subrahmanyan
1030-	CHICKPEA IN BIOCHEMISTRY OVERVIEW	R. Jambunathan
1035		
	REPORT	
	C-125 (85)IC ..	Umaid Singh
	Chairman	J.S. Kanvar
	Co-chairman	Y.L. Nene
	Rapporteur	V. Ramanatha Rao
1100-	CHICKPEA IN GRU OVERVIEW	H.H. Mengesha
1105		
1105-	REPORTS	
1200		
	GR-111(85)IC ..	R.P.S. Pundir
	GR-112(85)IC ..	R.P.S. Pundir
	GR-113(85)IC ..	R.P.S. Pundir
	GR-117(85)IC ..	R.P.S. Pundir

Chairman	J.S. Kanvar
Co-chairman	J.R. Vitcombe
Rapporteur	Onkar Singh

1400	PIGEONPEA BREEDING OVERVIEW	Laxman Singh
1410	REVIEWS	

P-101(75)IC	..	D.G. Paris
P-102(85)IC	..	S.C. Gupta
P-103(85)IC	..	K.C. Jain
P-104(85)IC	..	K.B. Saxena
P-105(85)IC	..	K.B. Saxena

THURSDAY, FEBRUARY 6TH

Chairman	J.S. Kanvar
Co-Chairman	J.R. Vitcombe
Rapporteur	Onkar Singh

0900-0940	PIGEONPEA BREEDING REVIEW	Continuing
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P-106(85)IC	..	K.B. Saxena
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Chairman	J.S. Kanvar
Co-chairman	Y.L. Nene
Rapporteur	K.B. Saxena

0940-0945	PIGEONPEA IN GRU OVERVIEW REPORTS GRU PIGEONPEA PROJECTS	M.H. Mengesha
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GR-109(85)IC	..	P. Remanandan
GR-110(85)IC	..	P. Remanandan
GR-116(85)IC	..	P. Remanandan

1030	BIOCHEMISTRY INPUT TO PIGEONPEA OVERVIEW REPORT	R. Jambunathan
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1035	P-111(85)IC	U. Singh
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Chairman	J.S. Kanvar
Co-chairman	S.B. King
Rapporteur	V.K. Mehan

1045-1050	PULSE PATHOLOGY OVERVIEW REVIEW	Y.L. Nene
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1200	CP-121(85)IC	Y.L. Nene
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REPORTS

	CP-117(85)IC	..	M.P. Bavare
	CP-118(85)IC	..	Y.L. Nene
	CP-119(85)IC	..	A.M. Ghanekar
	CP-120(85)IC	..	M.V. Reddy
	CP-126(85)IC	..	R. Jambunathan
	Chairman		J.S. Kanvar
	Co-chairman		Y.L. Nene
	Rapporteur	.	V. Ramanatha Rao
1400	PULSE ENTOMOLOGY OVERVIEW REVIEWS		W. Reed
	CP-122(85)IC	..	W. Reed
	CP-123(85)IC	..	S. Sithanatham
	CP-124(85)IC	..	S.S. Lateef
	CP-110(85)IC	..	S. Sithanatham
1520	Plans - Asian Grain Legume Program		D.G. Paris

OPENING & INTRODUCTORY REMARKS

Dr.L.D.Swindale in his opening remarks mentioned that some important principles are involved in international research. Projects when looked in detail should project programs and programs should project the Institute. He emphasized greater need for grain legume production and stressed that project formulations should be related to Asian Grain Legume program. There is need for improving yields in India. Results should be useful in National Programs and Developmental Programs.

Talking about Inhouse Review he mentioned that this gives opportunity for participation of scientists from all the programs and helps in interaction for planning useful and sound research projects, which is very essential for the Institute.

Dr.J.S. Kanvar made it clear in his introductory remarks that all these programs were reviewed thoroughly and revised/regrouped on the recommendations of EPR reports and thorough discussions held. In this present Inhouse Review for most of the Projects only reports were presented and a few projects are reviewed for any changes that can be brought in for the improvement in approach and methodology to serve better use.

He advised that consultants' report should be considered while revising projects in Pulses on microbiology.

PROGRAM/SUBPROGRAM/SUPPORT PROGRAMS OVERVIEW

1. Dr. Y. L. Nene in his program overview emphasized the importance of interdisciplinary interaction and mentioned in this context the Pulses program's weekly seminars, Scientist's Meets, research reports' sharing and good support from GRU, Resources Management, Biochemistry and Statistics. In his overview he further mentioned that special attention was being given to the short duration pigeonpeas. For the medium and long duration, crop stability was the main goal. The Japanese Government has assisted in P response studies, while the Tropical Development and Research Institute (U.K.) has supported the Heliothis work. There has been close cooperation between the chickpea projects of ICRISAT Center, Syria and Pakistan. The next Chickpea Scientists' Meet will be held in Islamabad, Pakistan from 5-8 April 1986. The work at Gwalior has been going on satisfactorily, but at Hisar improvements are required. The possibility of growing winter chickpeas in Kashmir is being investigated, while the raising of an off-season nursery at Dharwar will be attempted this year.

Regarding the integration of the groundnut and pulses programs, Dr. Nene expressed his confidence that from the work point of view not much change is expected as the objectives of the program were clear and will remain unchanged.

2. Dr. B. A. van Rheenen presented an overview of the chickpea breeding subprogram. One project, C-102(85)IC, was to be reviewed and the progress of eight other projects was to be reported on. He mentioned that F2 trials are sent to cooperators as many showed interest in these early generation bulks. Plot sizes and number of replications have been increased for better interpretation of the results.
3. Dr. C. Johansen expressed his views on the role of the agronomy subprogram as
 - (i) to identify constraints caused by physical stresses e.g. regarding light, temperature and toxicities
 - (ii) to find ways to alleviate these constraints; to establish optimum cropping practices, and

- (iii) to arrive at recommendations of genotypes with improved traits. Genotypic and managerial improvement ought to go hand in hand.

It had been decided last year that a review of the Microbiology projects had to wait a consultancy, which had taken place meanwhile during October, 1985. Minor changes in workings and titles has resulted. Dr. Johansen mentioned the significant events that took place during the past year. These were: the arrival of the full team of Japanese experts; the transfer of Dr. N.P. Saxena to Gwalior; and the consultancy of Dr. P.S. Nutman and Dr. L.R. Frederick.

4. Dr. Y.L. Nene while giving an overview of the Pulse Pathology research at ICRISAT center emphasized that last year all projects in the Pulse Pathology subprogram were reorganized, and research concentrated on basic aspects such as epidemiology of important diseases of chickpea (*Fusarium* wilt, *Ascochyta* blight) and pigeonpea (*Phytophthora* blight, *Fusarium* wilt, Sterility mosaic). Research priority has also been given for identification of pathogenic races of *Ascochyta rabiei*, *Fusarium oxysporum* f.sp. *ciceri*, *Phytophthora drechsleri* f. sp. *cajani* and *Fusarium udum*. He mentioned that the Pulse Pathologists are working closely with breeders to screen breeding materials against several diseases of pigeonpea and chickpea in disease sick plots. Emphasis is being given for incorporation of multiple disease resistance in breeding materials.
5. Dr. V. Reed gave an overview of pulse entomology and presented project No. CP-122(85)IC. He summarized various aspects of *Heliothis* population studies with the aim to increase the yields in the farmers fields. He pointed out the future need for increased emphasis on host plant resistance particularly in North India and to limit their efforts on biocontrol. Dr. Dent's departure requires review of *Heliothis* project and the need for additional scientific staff.
6. Dr. Laxman Singh gave an overview of pigeonpea breeding program. He appreciated the efforts and continued interest of his predecessor Dr. D.G. Paris in the genetic improv of pigeonpea.

In early-maturity group, the main objectives have been to develop high yielding lines for dry seed and green vegetable with high protein and resistance to diseases and insects, and hybrids with over 20% yield advantage. In medium-maturity group, the main emphasis has been on developing determinate and indeterminate types with high and

stable yield through resistance to diseases and insects. In late-maturing group, efforts have been made to develop and identify stable dwarf-type variants. A lot of efforts have gone into the production and maintenance of quality seed of elite lines through isolation, and large quantities of breeder's seeds have been made available.

The work plan for next year includes continued emphasis on stable and high yield, development of dwarf and conventional types as monocrops responsive to high inputs, population improvement through increased contribution of various yield components, and testing of materials in new and unconventional areas.

7. Dr.R. Jambunathan presented the overview of research on grain quality improvement in chickpea and pigeonpea. He gave a brief review of protein analysis of samples received from the Genetic Resources Unit and Pulse Improvement Program, and mentioned that Biochemistry has excellent relationship with both the programs and monthly report contributed by Biochemistry is also routinely included in the Pulse Improvement Program monthly report. He stressed the need to obtain additional information in the following areas:

- (i) food quality evaluation of products prepared from chickpea, and pigeonpea, and
- (ii) variability of protein content in chickpea and pigeonpea.

8. Dr.M.H. Mengesha while reviewing Germplasm Resources in Chickpea and Pigeonpea informed that the chickpea and pigeonpea germplasm, like the other crop genetic resources, is meant for the utilisation of chickpea and pigeonpea scientists. He felt that the last years efforts to review and reorganise ICRISAT research projects has helped in streamlining GRU research projects.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : C-101(77)IC
2. Project Title : International trials for dry areas
3. Project Scientists : K.B. Singh
H.A. van Rheenen
M.V. Reddy
S.S. Lateef
4. Period covered by the report : February 1985 - January 1986
5. Discussion

H.A. van Rheenen reported the progress of this project

J.S. Kanwar : A report be prepared indicating the increase in yield due to the introduction of new varieties along with their special characteristics.

Y.L. Nene : Most of the ICRISAT lines released or in pre-release stage are resistant to Ascochyta blight.

M.H. Mengesha : Whether ICRISAT work at ICARDA is the part of ICRISAT's international mandate? It will be desirable to look into this matter and tighten some of the loop-holes in this important collaborative effort.

Y.L. Nene : Chickpea Breeder's position at ICARDA is ICRISAT's position and this is a collaborative program between ICRISAT and ICARDA.

6. Discussion Highlights

- o A report be prepared indicating the increase in yield due to introduction of new varieties in each of the countries along with the special characteristics of the varieties.
- o More sets of trials from Syria are being contributed than from ICRISAT Center.

7.

Report on the status of countrywise yield increase be prepared. More sets of material from ICRISAT Center be contributed.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : C-102(85)IC
2. **Project Title** : International trials for semi-arid tropics
3. **Project Scientists** : H.A. van Rheenen
Onkar Singh
S.C. Sethi
C.L.L. Govda
J. Kumar
4. **Period covered by the report** : February 1985 - January 1986
5. **Discussion** :

H.A. van Rheenen presented the progress of this project. This project was reviewed in view of the changes that have been made since the last In-house Review. From 1985-86 season F3 multilocation trials have been discontinued but F2 trials have been continued because many cooperators expressed interest in these early generation bulks. He also mentioned that plot sizes and number of replications have been increased for better interpretation of results.

R.W.Gibbons : What is the efficiency of lattice design over augmented design?

H.A. van Rheenen : Augmented design was used in consultation with Nurari Singh. So far comparisons have not been made.

M.Singh : The efficiency of augmented design compared to lattices could be made only after assessment by analysing the data. If collaborators will analyze as RBD, then proposed design could be analysed as RBD with adjusted values for each replication of augmented design, but lattices do not provide any adjustment for incomplete blocks from lattices.

J.S.Kanvar: To how many countries these nurseries are sent?

H.A. van Rheenen : During the past year these nurseries were sent to 13 countries.

J.S.Kanvar : Are you satisfied with feed-back on these nurseries?

H.A. van Rheenen: Data from about 60% of the trials sent were received. We would like to have results from all cooperators.

J.S.Kanvar : More number of trials are sent by ICARDA. Why less trials are sent by ICRISAT?

H.A. van Rheenen: We give the choice to co-operators. After receiving seed request forms from them, we send the material.

K.N. Rai : The lattice designs are more effective in taking care of soil heterogeneity factors by smaller incomplete blocks than it could be possible by augmented design. Once the option for replication has been introduced, it may be better to use simple lattice with two replications rather than augmented design with two replications.

H.A. van Rheenen: Discussed with Statistician (M. Singh) before finalisation of trials.

M. Singh: Lattices are generally better but results need to be seen before conclusions can be drawn.

C. Johansen :

- (i) Who is responsible for the data analysis in view of changed designs?
- (ii) What environmental parameters are asked and received from cooperators?

H.A. van Rheenen:

- (i) Raw data are returned to ICRISAT for analysis.
- (ii) Information on soil type, temperature and rainfall is requested.

J.S. Kanwar : Are we up-to-date in the analysis of data and how it is circulated?

H.A. van Rheenen: The analysis of data is up-to-date and we send analysed results to cooperators.

J.S. Kanwar : We should internationalise our efforts and analysed results should be sent to cooperators and other scientists in countries interested in chickpea research.

H.A. van Rheenen : We are doing it and will do it.

R.V. Gibbons : What is the reason for discontinuation of F3 trial?

H.A. van Rheenen : All the F2 and F3 populations are now being screened in disease nurseries. That is one of the reasons we have discontinued these trials. Another reason is the disappointing results of early generation bulk yield testing.

L. Singh : If disease and insect nurseries have the objective to record reaction in different geographical areas then they should be conducted under artificial epiphytotic conditions. If otherwise, they could be included in the yield tests/nurseries.

Y.L. Nene : The objective is to find out the race situation in different diseases. The cooperators are encouraged to plant in artificially created disease nurseries.

6. Discussion Highlights :

- o The possibility of increase in the number of trials and introducing into more SAT countries (particularly in Africa) be explored.
- o The project has trials on breeding, pathology and entomology. Details be collected on all aspects.
- o Feed back from cooperators needs improvement.
- o The data received be analysed at Patancheru and analysed results made available to all cooperators and other scientists in countries interested in chickpea research and thus internationalise our efforts.
- o The data could however be analysed by the cooperators also for their own use.
- o Cooperators be encouraged for screening the disease and insect nurseries in artificial epiphytotic conditions.
- o Cooperators can select materials from these nurseries for their use.

7. Conclusions :

The work plans be revised in view of the above discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project : C-103(85)IC
2. Project Title : Breeding short duration desi chickpeas for stability and high yield.
3. Project scientists : Onkar Singh
S.C. Sethi
M.V. Reddy
S.S. Lateef
N.P. Saxena
4. Period covered by report : February 1985 - January 1986

5. Discussion :

Onkar Singh reported the progress of this project.

B.V.S. Reddy : Are we screening all the material in wilt nursery?

O. Singh : From 1982 we decided to screen all the advanced lines in disease nurseries. All the lines entered in All India Coordinated trials have wilt resistance.

M.H. Mangeshkar : Is this project only meant for India?

O. Singh : This project is meant to cater environments similar to Patancheru conditions in India and elsewhere.

6. Discussion Highlights :

- o Possibility of conducting yield trials in countries (other than India) interested in short duration desi chickpea types be looked into.

7. Recommendations :

The point suggested in discussion highlights be incorporated into work plan.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : C-104(85)IC
2. Project Title : Breeding long duration desi chickpeas for stability and high yield - International
3. Project Scientists : J. Kumar
C.L.L. Govda
S.S. Lateef
N.P. Saxena
M.V. Reddy
4. Period covered by the report : February 1985 - January 1986
5. Discussion :

Onkar Singh reported the progress of this project.

R.W. Gibbons Whether it will be appropriate to mention word "International" at the end of the project title.

M.H. Mengesha : Both the projects (C-104 and C-105) should have word "International" to emphasize their international importance.

J.P. Moss : Why selection was not made in P2 and P3 bulks? What is the reason for use of wild species for transfer of Ascochyta blight resistance.

O. Singh : When these trials were in the field, we reorganized our projects and made it mandatory not to advance any wilt susceptible material. Some wild Cicer species appear to have a high degree of resistance to A. blight but this is yet to be confirmed.

6. Discussion Highlights :

o Extension screening of germplasm/breeding lines might help identify resistance sources in Cicer arietinum in addition to making attempts in crossing with wild species.

7. Recommendations :

The current project should take up extensive screening of cultivated species. Transfer of resistance from wild species may be cumbersome, but should be attempted as well.

ICRISAT RESEARCH PROJECT

1. **Project** : C-105(85)IC
2. **Project Title** : Breeding long duration desi chickpeas for stability and high yield.
National: Pakistan with emphasis on ascochyta blight resistance.
3. **Project Scientists** : H.A. van Rheenen
M.S. Rahman
M.V. Reddy
4. **Period covered by the report** : January 1985 - January 1986

5. **Discussion**

H.A. van Rheenen reported the progress of this project. No discussion was held.

6. **Discussion Highlights** : Nil

7. **Recommendations** :

Work planned be carried out

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : C-106(85)IC
2. Project Title : Breeding kabuli chickpeas for stability and high yield in semi-arid tropics.
3. Project Scientists : S.C. Sethi
J. Kumar
M.V. Reddy
S.S. Lateef
N.P. Saxena
4. Period covered by the report : February 1985 - January 1986

5. Discussion :

H.A. van Rheenen presented the progress report.

R.V. Gibbons : Name the countries interested in this kind of material in the SAT region.

H.A. van Rheenen Countries such as India, Ethiopia, Pakistan, Bangladesh and Nepal have interest in this type of material.

L. Singh : Kabuli types will have potential in Mexico and in irrigated areas in India as cash crop as an alternative choice in wheat growing regions of east and Central India.

5. Discussion Highlights :

- o Early maturing and good seed size Kabuli types be developed. These may have preference in India, Pakistan, Bangladesh, Nepal, Ethiopia and Mexico.
- o Possibility of Kabuli types under irrigation as cash crop as an alternative choice for wheat growing regions in east and central India be explored.

7. Recommendations :

The above Discussion Highlights be taken note of for improving work plan.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project** : C-107(85)IC
2. **Project Title** : Breeding kabuli chickpeas for stability and high yield in dry areas
3. **Project Scientists** : K.B. Saxena
M.C. Saxena
E.A. van Rheenen
M.V. Reddy
4. **Period covered by the report** : February 1985 - January 1986

5. **Discussion**

H.A. van Rheenen reported the progress of this project.

No discussion was held.

6. **Discussion Highlights** : Nil

7.

Work planned be carried out.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : C-108(85)IC
2. Project Title : Breeding chickpeas for adaptation to early and late planting, and to increased inputs.
3. Project Scientists : C.L.L. Govda
Onkar Singh
M.V. Reddy
N.P. Saxena
S. Sithanathan
4. Period covered by the report : February 1985 - January 1986

5. Discussion :

Onkar Singh presented the progress of this project.

R.W. Gibbons: : Has ICRISAT any research station for this type of work?

O. Singh : We do not have intensive work at any other location except at Patancheru, but scientists at A.R.S. Gulbarga are interested in this type of material.

R.W. Gibbons : What is the input of agronomist (N.P.) in this type of work?

N.P. Saxena : Some chickpea genotypes were evaluated in agronomy trials and P-1329 and P1067-1 have yielded significantly higher than Annigeri check.

6. Discussion Highlights :

Look for the collaboration with scientists at A.R.S. Gulbarga.

7. Recommendations :

The Work plan should include suggestion made in discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : C-109(85)IC
2. Project Title : Studies on genetics and breeding methods of chickpea
3. Project Scientists : Onkar Singh
S.C. Sethi
C.L.L. Govda
J. Kumar
4. Period covered by the report : February 1985 - January 1986
5. Discussion

Onkar Singh reported the progress of this project.

R.V. Gibbons : Have you done D_xK introgression to introgress useful characters from each other? There is no mention of seed size.

O.Singh : We have considered seed size as one of the characters for this purpose.

P.K.Anand Rao : Why K-850, which is highly susceptible for dry root rot, is being used in crossing program?

O.Singh : It is an excellent general combiner and has wide adaptation, large seed and high nodulation.

L.Singh : Gulabi (pink) and green seed types should be used to generate more variability.

O.Singh : These types are important only in some specific pockets in Central India, therefore, such type of work should be done locally but as a matter of fact, these types are included in the crossing program.

6. Discussion Highlights Nil

7. tions

Work planned be carried out

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : C-110(85)IC
2. **Project Title** : Climatic adaptation in chickpea
3. **Project Scientists(s)** : N.P. Saxena
4. **Period covered by report** : May 1985 - February 1986
5. **Discussion**

N.P. Saxena presented the project progress report.

R.W. Gibbons :

- (1) I am surprised that the literature review, which receives emphasis in the project write up, has not yet been done. A thorough review of the limitations is necessary before any research is carried out. Yet research results are reported. Are you not putting the cart before the horse?
- (2) Water has been mentioned several times but why does the project only mention adaptation to light and temperature?

C. Johansen :

- (1) This is referring specifically to evaluation of the CE work done at the University of Reading - which, as part of this projects activities, we are trying to evaluate in terms of interpreting G x E interactions for chickpea in field experiments. We are simply admitting that we have not made much progress on this aspect over the previous year, although it remains a priority.
- (2) This particular project concentrates on "light" (photoperiod + photosynthesis) and temperature effects but interactions with other environmental factors, such as water, are being kept in mind. We have other projects specifically dealing with response to water.

J.E. Williams : The main point of this project is to understand and exploit G x E interactions. If so why separate out two components of the environment when you acknowledge that these are not independent. I question the use of only two sites to examine G x E. I believe the approach should be to instrument the breeders trials and utilize the large number of sites for analysis using the techniques developed for investigating G x E interactions.

N.P. Saxena : We do participate in the international adaptation trials along with the breeders at several places. A lot of details are collected in these trials and the data are being processed at ICARDA and ICRISAT. Hyderabad and Bisar represent to different environments where very detailed observations can be made by u , directly.

J.S. Kanvar : Talking about the environments, no data on the soil moisture is presented in the report.

W. Reed : Further to Dr. Williams's question, we have mass of data from adaptation trials etc. over many years. Dr. Simthson tried to use a Post-doc to analyse some of these data but with little apparent output. Should we not make a determined attempt to utilise the masses of data available rather than to continue collect more and more data?

What we need is a really competent specialist to be responsible for the analysis of the old data to determine the major factors involved in adaptation and to quantify and qualify G x E interaction.

C.K. Ong : This is true for most of the ICRISAT projects. I would like to know whether there is any involvement of agroclimatologists in the project.

N.P. Saxena : We have collaboration with A.K.S. Huda, a joint project with Piara Singh, and M.V.K. Sivakumar was involved in some earlier experiments.

H.A.van Rheenen : Dr. Williams is concerned about factors such as light, temperature, daylength etc. Dr.Reed is concerned about mass of data collected already, but not yet analysed. Data collection also has been done by Dr. Williams and his team 3-4 years back, as suggested under. Does it give indications how helpful such data collection is?

J.S. Kanvar : Discussions could be continued on this aspect on a different occasion with all the physiologists getting together.

N. Seetharam : Availability of vast amount of data on G x E interactions is noted. But in view of the fact that in the past, project scientist, Post-docs and consultants have found little use of these data, we must examine the limitations. Mostly soil moisture, nutrient status, etc., is missing in these data sets. We must re-evaluate the usefulness of such data for making physiological analysis of crop adaptations.

J.S. Kanvar One should note this point on minimum data set carefully.

5. Discussion Highlights :

- o A thorough review of literature desirable for improvement of work plan.
- o Apart from light and temperature data, moisture and fertility data should also be collected and interpreted with results..
- o Soil moisture and nutrient status should form a part of the minimum data set for all G x E trials.
- o Study be carried out at more locations, may be breeders multilocation adaption trials data utilised.
- o It is desirable to have a group discussion of all plant physiologists for better interpretation of G x E interaction.

7. Recommendations :

Work plan for next year to include suggestions from above discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : C-111(85)IC
2. Project Title : The alleviation of drought effects on growth, symbiotic nitrogen fixation capacity and yield of chickpea
3. Project scientists(s) : N.P. Saxena
O.P. Rupela
4. Period covered by report : May 1985 - February 1986
5. Discussion :

N.P.Saxena presented the project progress report.

J.H. Williams : I would not agree that soil drought in the surface zone may limit the efficiency of nodules because the water potential of these nodules would approximate to that of the plant and not to that of the soil.

O.P. Rupela : I wish to clarify that with increase in the depth of sowing, there was a reduction in the nodule mass but not the nodule activity in the surface zone.

J.H. Williams : In your work on comparing drought screening methods it is important that the agroclimatologists examine the mandate area to determine the proportion of water available from the rain during the crop's life and that which is in the soil. We have G x screening method interaction depending on the sources of water being deep or shallow in the profile.

N. Seetharama : You have emphasized root studies. Do you have any plans to elucidate the role of mycorrhizae in water uptake by root system? Also, please give us an update on role of 'dev' in chickpea water relations in north India.

C. Johansen : We are studying mycorrhizae in relation to nutrient uptake but not water uptake. We are awaiting leads from other ICRISAT programs on this aspect.

N.P.Saxena : The effect of dev is being studied at Hisar.

Y.L. Nene : We welcome more input from the agroclimatologists and the scientists working on mycorrhizae.

J.S. Kanvar : You have mentioned about alleviating drought effect. How are you going to do that?

M.P. Saxena : Earlier work on this aspect was on the response to the supplemental irrigation. Now we are also concentrating on the genotypic evaluation for efficient use of water.

C. Johansen : Dr. Sethi is using in the breeding program one of the lines identified by Dr. Saxena to be more efficient in water use.

J.S. Kanvar : If N fixation is reduced due to drought, what is its effect on yield directly.

O.P. Rupela : We could not study the direct effect of reduced N fixation on yield because the plant has two sources for meeting its nitrogen needs.

C. Johansen : It is difficult to pinpoint whether the effect of drought is directly on the symbiosis or it is an indirect effect due to reduced plant growth.

M.P. Saxena : Selection of host is more important because the host is primarily effected by drought. Reduced symbiosis is an effect but not the cause.

6. Discussion Highlights :

- o In symbiotic nitrogen fixation studies, available moisture differs at different periods and different parts of the soil profile. There should be accounted to interpret differential behaviour of nodulation with the same genotypes.
- o Nodulation, nitrogen fixation and yield levels should be studied in relation to one another.
- o Input from agroclimatologists and mycorrhizae scientists could improve these studies.

7. Recommendations :

Work plans for next year should be improved keeping in view the discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : C-112(85)IC
2. Project Title : Detection and evaluation of genetic variation in symbiotic nitrogen fixation in chickpea
3. Project scientist(s) : O.P. Rupela
4. Period covered by report : May 1985 - February 1986
5. Discussion

O.P. Rupela presented the project progress report

J.S. Kanvar: Sorghum yielded better after the chickpea variety K850. Could this be due to the differences in soil moisture?

O.P. Rupela: Moisture was not estimated. We intend to make some direct soil measurements before sowing sorghum in the coming years.

J.E. Williams: There is some unexplained phenomena in the experiment that you described, in that, K 850 has more nodules, and fixes more N, but does not have high yields despite responding to fertilizer N.

O.P. Rupela: It can partly be explained if we assume that Annigeri is more efficient in utilising N from soil pool and hence the expected differences in yield between Annigeri and K 850 are not measured.

J.S. Kanvar: Are the yield differences in sorghum significant?

O.P. Rupela: Only at 15% level of probability.

P.T.C. Nambiar: To determine optimum nitrogen requirements for chickpea, pot-culture may not be an ideal system. It may be better to test the response in the field itself.

C. Johansen: Pot studies are mainly to get some leads and to fix the optimum levels of other factors. We plan to do pot and field experiments simultaneously next year.

Singh: The yield of sorghum in fallow-sorghum rotation would have been influenced by differences in moisture status and also nutrient status. Data on soil moisture and nutrient status of fallow soils would help in interpreting differences in sorghum yields in rotation with chickpeas K 850 and Annigeri.

O.P. Rupala: Sorghum was grown in the rainy season with adequate rain fall. However, the unused moisture in the fallow treatment during previous rabi may be available for sorghum in rainy season. It is less likely to make big differences in the rainy season crop when moisture is plentiful. However we would quantify soil moisture in our future studies.

Murari Singh:

- (1) The range of nitrogen doses considered seems to lead to yield responses which are still increasing. This shows the need for experimenting with higher nitrogen levels.
- (2) What levels of nitrogen and range do you wish to explore in your work plan (IV).

O.P. Rupala:

- (1) Yes, we would use higher N levels in future studies.
- (2) All possible levels between absence of N to a level which may be toxic to plant.

Y.S. Chauhan: The question of soil moisture level making a difference for the growth of sorghum in fallow compared to legumes has an important bearing in interpreting your results. Cropping systems experiments have indicated the effect of previous season's cropping pattern on the following year's crop performances. I would suggest you to interpret the results of your experiment in light of Dr. Natarajans's experience in this regard.

6. Discussion Highlights :

- o In long term experiments on residual effect on subsequent crops, it is desirable to estimate initial and final moisture levels as well as fertility status for the crops grown in sequences to interpret results. These studies should be carried for different soil profiles as the feeding zones differ among genotypes and crops.
- o Responses to higher levels of nitrogen should be explored

7. Conclusions

Work plans improved for accounting of moisture effect on yield on long term experiments along with other criteria.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project : CP-113(85)IC
2. Project Title : Identification of situations where chickpea and pigeonpea respond to Rhizobium inoculation.
3. Project scientist(s) : C. Johansen
J.V.D.K. Kumar Rao
O.P. Rupela
4. Period covered by report : May 1985 - February 1986
5. Discussion

O.P. Rupela presented the project progress report.

J.H. Williams: How much are you changing your approach in the light of the Fredrick/Nutman report?

C. Johansen: Very little. Most changes to the projects were independant of their report. However, they did give some useful suggestions on experimental details and possible collaboration with other institutions.

S.P. Vani: The strains of rhizobia for chickpea and pigeonpea have been released by ICAR based on the trials conducted at different locations for three years. Have we tried to look at the data from these trials on the responses to inoculation and studied the factors like rhizobial counts, soil nutrient status and other properties? This should have given the required data which we are trying to collect from "Need to inoculate trials".

C. Johansen: There is limited data available from previous AICPIP trials to enable this to be done. We are currently requesting soil for MPN counts, etc., from sites to which we send inoculants. However, this project does largely involve interpretation of existing data and not much additional field experimentation is required under this project.

P.T.C. Nambiar: The number of rhizobia per gm soil is dynamic depending on time of soil sampling and depth. Considering the manual labour requirement for MPN estimation, I suggest that number of nodules in the uninoculated plot should be used as a criterion.

C. Johansen: We need to do it in the same way that we do soil tests for the nutrient status.

J.V.D.K. Kumar Rao: I do not agree with Dr. Nambiar's contention that MPN counts do not give useful information as they are affected by several soil factors. The seasonal effects balance out over a period of time and MPN counts can give some useful indications.

J.E. Williams: You have indicated that the justification for this work is to predict. If this is so you should not use plant infection because it takes too long to be predictive bearing in mind the dynamic effects of seasons. Surely, use of ELISA is necessary. What about monoclonal antibodies.

C. I completely agree with you on this.

D.G. Paris: In MPN techniques you are measuring ineffectiveness of Rhizobium populations. How will you measure effectiveness of Rhizobium? Is it not an important component of MPN measurement to make it meaningful?

C. Johansen: Yes, in future we have to look for a way to know whether they are effective or not.

O.P. Rupela: While I appreciate the point made by Dr. Paris, I would like to mention that testing the effectiveness of native rhizobia is much more time consuming and a very difficult thing to do.

K.K. Lee: In order to identify situations where and when inoculation is needed, many inoculation trials should be conducted. Do you intend to increase the number of inoculation trials?

C. Johansen: The priority is to evolve methodology. We can have small trials of this type conducted adjacent to the international trials under Asian Grain Legume Program.

W. Reed: The Microbiology efforts were initiated 9 years ago with two objectives, 1. to find a super-Rhizobium, 2. to find a super-symbiosis. Have we not become bogged down with detail? What progress have we made towards the primary objectives? How much longer will we be talking about the need to develop methodology. When will there be a real pay-off from this long term research in the farmers' fields.

C. Johansen: In groundnut super Rhizobium strains have been identified. As far as super symbiosis is concerned, we do not know what it is yet. The Indian situation is unique and the responses to inoculation are difficult to obtain because of the presence of enough native rhizobia in the soils. But with crops like chickpea with specific rhizobial requirements it is mandatory to test inoculation response when the crop is grown for the first time.

J.S. Kanwar: Negative results are not bad results. But the crux of the problem is that when none of the strains is doing better than the native strains, then why not we think of other lines of work like mycorrhizae.

C. Johansen: We can direct our attention to the work on rhizobia that do better than native rhizobia in adverse environments like the acid soils, waterlogged and saline conditions etc.

6. Discussion Highlights :

- o Prior to conducting trials soil nitrogen data to be collected.
- o Future studies to include measurement of effective Rhizobium population.
- o Use of ELISA in prediction studies be looked into.
- o Studies may be extended to acid/saline and waterlogged soils.
- o Increase in number of trials desirable to find out the sites requiring inoculations.

7. tions :

Work plans should include suggestions from discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : CP-114(85)IC
2. **Project Title** : Maintenance, multiplication and distribution of rhizobial germplasm of chickpea and pigeonpea.
3. **Project scientists** : O.P. Rupela
J.V.D.K. Kumar Rao
4. **Period covered by report** : May 1985 - February 1986
5. **Discussion**

O.P.Rupela presented the project progress report.

J.H. Williams: Last year Dr. Nambiar prepared a bulletin on this fermentor system. This was turned down on the grounds that the existing bulletin was adequate. It distresses me that having turned down Dr. Nambiar's bulletin which included the technology now adopted here, there can be no justification for this.

O.P. Rupela: To my knowledge this was turned down due to couple of reasons. The work we presented here has different dimensions than those given in the bulletin you are mentioning.

J.S. Kanvar: I want to know whom you have as the potential user of this fermentor - scientific organisations or universities with responsibilities to supply cultures? In such a case you should carefully consider the cost aspect. I see the need to prepare a catalog but let us not spend too much time for this.

C. Johansen: This type of small system would be ideal for legume improvement projects in such places as Africa, Thailand and Indonesia. Dr. Thompson has prepared a fairly detailed bulletin but what Dr. Rupela has in his mind is a more detailed manual.

O.P. Rupela: The cost is within Rs.3,000/- including the injection device. Each unit can make about 500 packets and many such units may be installed in the same organisation. By this small unit we can reduce the spoilage and have better control.

6. Discussion Highlights :

- o catalog on Rhizobium to be published quickly.
- o Economics of fermentor and accessories, working cost, production levels, target groups and manufacturers to be identified.
- o Suitability of equipment for research workers in national programs to be worked out.
- o Prototypes be made for use at centers of ICRISAT and Asian Grain Legume Program.

7.

Work plans should include suggestions from discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project : CP-115(85)IC
2. Project Title : Detection and alleviation of mineral nutrient deficiencies and soil chemical toxicities in chickpea and pigeonpea.
3. Project scientist(s) : C. Johansen
N.P. Saxena
Y.S. Chauhan
O.P. Rupela
J.V.D.K. Kumar Rao
4. Period covered by report : May 1985 - February 1986.
5. Discussion

C. Johansen presented the project progress report.

J.H. Williams: The salinity screening lends itself very well to the nearest neighbour techniques.

Y.S. Chauhan: We will take your advice on this

J.S. Kanvar: What is your thrust or what are the target elements in this project? In your plans for the next year more emphasis is on the work related to salinity. Considering the title, I suggest that you should confine your work purely to the nutrient aspects?

C. Johansen: The nutrient work in this project is aimed at producing a manual on how to detect whether chickpea or pigeonpea are ever limited by a particular nutrient deficiency. The pot nutrient screening trials, previously referred to, are part of this effort and are continuing on a priority basis. We are firstly trying to develop and document the most suitable procedures for identifying any deficiencies. Having identified a problem we can then initiate field fertilizer trials.

J.M. Peacock: Can you tell us more about the experiment planned to look at the effects of solarization on soil salinity?

C. Johansen: Dr. Katan, a consultant on solarization who visited us last year, reported that solarization did tend to alleviate salinity in Egypt, although these studies are at a preliminary stage. Various theories, related to water movement in the profile under the polythene, may explain this. We intend to apply simple + and - solarization treatments on moderately saline areas at Hisar in the coming season. This is a minor aspect of our overall studies on solarization.

A.K.S. Buda: You mentioned that in your pot experiment, each soil was maintained at or near field capacity. How was FC determined?

C. Johansen: Field capacity was determined by adding water to pots of soil without plants, allowing it to drain for 24 hours, and then measuring water content. The water required to maintain all of the soil in the pot at FC was then calculated. Pots (with plants) were then watered to the calculated total weight daily. Actually, over time the soil would have been below FC on an average since pots were watered to FC and allowed to deplete.

Usaid Singh: This is regarding the mechanism of salinity resistance. Are you planning to conduct some experiments to study mobilization of nutrients or induced metabolic changes regarding this aspect of your project?

C. Johansen: We simply plan some analysis of Na, K, Cl (and possibly other ions) on samples from salt tolerant and susceptible genotypes to see if we can establish any relationship between tolerance and tissue salt content. If we can, then we could perhaps streamline screening for salt tolerance by using plant analysis on a range of genotypes grown in a uniform field (say, in trials for other purposes).

R.A.E. Mueller: What application are presently expected for the solarization? Has this program enlarged the scope of solarization beyond its application on experiment stations?

C. Johansen : Dr.Katan, a consultant on solarization to the Pulses Program, pointed out that this treatment may have application to commercial seed production of chickpea and pigeonpea, in ensuring that distributed seed was free of soil-borne diseases that can be transmitted in the seed, such as Fusarium wilt. For high return crops grown repeatedly on restricted land areas this treatment has been shown to be highly profitable, in places like California and Israel.

6. Discussion Highlights :

- o Priorities of deficient elements be fixed as responses to these elements are varying in different SAT countries.
- o Cost of solarization to be looked into and its various uses and applications worked out.
- o Salinity tolerance studies to also include effect of other nutrients and moisture levels.
- o Study on deficiency symptoms should also form a part of the future plan of work.

7. Recommendations :

The suggestions contained in discussion highlights should be implemented.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : CP-116(85)IC
2. **Project Title** : Adaptation of chickpea and pigeonpea to low levels of available phosphorus and soil moisture.
3. **Project scientists** : J. Arihara
N. Ae
K. Okada
C. Johansen
4. **Period covered by report** : May 1985 - February 1986
5. **Discussion**

Joji Arihara presented the project progress report.

J.S. Kanvar:

- (1) It is a very interesting project. Success of this project depends, however, on soil and plant analysis. Who is doing this, the scientists or the service lab?
- (2) What are your views about the differences in the response to applied P in the Vertisols and Alfisols?
- (3) This project is suitable for use of P-32. Are you planning to use that in your studies?

Joji Arihara:

- (1) Most of the chemical analysis is done by the scientists themselves.
- (2) In the Alfisols the total amount of phosphorus is lower than in Vertisols, but the Olsen available P is higher in the Alfisols. We have observed that the rhizosphere pH is less than 8.5, which is used in Olsen extraction method. This may be causing the discrepancy. We are trying to use alternative methods of P estimation.
- (3) We are planning to use P-32 when we really need to use that in more pointed studies.

J.M. Peacock: The project sets out to establish the mechanisms or principles associated with phosphorus utilization and its interaction with soil moisture status. You plan to work with two crops, two soils and a range of soil moisture conditions. I am concerned that there may be too many interactions and too few resources for successfully carrying out this type of project.

Joji Arihara: We plan to concentrate mainly on the effect of soil physical properties and the interactions with soil microbes on the availability of phosphorus.

C. Johanson: A major part of this project involves putting together a lot of work that has already been done.

K.K. Lee: When I listened to your talk, you repeated several times that P is not limiting factor. It seems to me that somebody said P is limiting factor. Did anybody say so? Or is this a general belief in ICRISAT?

Joji Arihara: I am not very sure, because not much has been published from ICRISAT on this aspect.

C.W. Song: The reason for low response of crops to applied P particularly in Vertisols can be found from both chemistry of P in soils with high free CaCO_3 resulting in high pH and the characteristics of crops, their rooting habit, chemistry of root-soil interface, and biological characteristics. There seems to be no P-enigma. I would like to support your attempt to study on root characteristics particularly.

J.H. Williams: The nutrient response of pigeonpea may be expected to increase as the crop yields are increased in high density/early maturing genotypes. This will change a lot of the factors.

Joji Arihara: I agree with you.

6. Discussion Highlights :

- o Analysis to include both soil and plant samples.
- o The responses be tried also for high density/early maturity types.
- o Project might include studies with P32.
- o Agronomic aspects also to be studied along with P response for dry matter production and grain yield.

7. Recommendations :

Future work plan to take account of above discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : CP-117 (85) IC
2. Project Title : Studies on the pathogens causing wilts and root rots of chickpea and pigeonpea.
3. Project scientists : M.P. Havare
4. Period covered by report : January 1985 - December 1985
5. Discussion

M.P.Havare presented the project progress report.

K.C.Jain : Solarization reduced the propagules of Fusarium oxysporum f. sp. ciceri by 9-fold, whereas it could reduce propagules of F. udum only by 2-3 fold. What is the possible explanation for this ?

M.P.Havare : We are dealing with two different pathogens.

P.W.Amin : How long the residual effect of solarization will last?

M.P.Havare : We do not know yet. Studies in Israel have shown effects for 4-5 years.

Y.L.Nane : These effects depend upon pathogens. We have to test under our conditions.

S.B.King : What is the practical significance of seed-borne nature of F. udum ?

M.P.Havare : It is important for quarantine purposes and also to avoid the spread of the disease in new areas within the country.

S.B.king : Do we have evidence for transmission of disease from infected seed ?

M.P.Havare : Yes.

R. Bandopadhyay

- (i) Does infected seed show any external symptoms ?
- (ii) What is the incidence of infected seed from F. udum infected-plants ?

M.P. Havare

- (i) There are no external symptoms for infected seeds.
- (ii) Five to ten percent seeds were found infected in the cultivars tested.

B.K. Varma

- (i) Is seed treatment with Benlate T helpful in eradicating the fungus in infected seeds ?
- (ii) What is the period of effectiveness of this seed treatment in chickpea ?

M.P. Bhave

- (i) Yes. The seed treatment with Benlate T has been recommended for chickpea.
- (ii) It is effective for two years.

L.K. Mughogho

Why investigations on the perfect state of F. udum are important, and how do you propose to do it ?

M.P. Bhave

It is important to know more about races and survival of the fungus. We look for the perfect stage while on survey trips, by making isolations/ inoculations on culture media, stem, and by studying effects of temperatures, moisture, light etc.

6. Discussion Highlights :

- o As internal seed-borne nature of Fusarium udum is established plant quarantine measures be adhered to 'take care of' the pathogen.
- o Cost of solarization, its residual effect on pathogens in Indian conditions be established.

7. Recommendations :

work plan may be oriented to study above aspects.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : CP-118(85) IC
2. Project Title : Studies on the pathogens causing blights of pigeonpea and chickpea
3. Project scientists : Y.L. Nene
Ph.D. Scholar and
Post-doctorial Fellow
4. Period covered by report : January 1985 - December 1985
5. Discussion

Y.L.Nene presented the project progress report and explained that several research scholars and Post-doctoral fellows have worked on a number of basic aspects of the pathogens causing blights of pigeonpea and chickpea.

J.B. Williams :

- (i) In view of the extensive variability in A. rabiei, would it be possible to carry out effective breeding for resistance to Ascochyta blight of chickpea ?
- (ii) What rating does the Ascochyta blight-resistant material have on 1-9 scale ?

Y.L. Nene :

- (i) If the fungus has in-built capacity to produce large number of races then breeding for resistance to the disease would be difficult.
- (ii) The resistant lines have been rated 3 on 1-9 scale.

M.V. Reddy : A number of races may be present but it is significant to know how important are they ? For instance, there exist 6 races of A. rabiei in Syria but only one race is serious in farmers' fields. The prevalence of races should not deter us from breeding for blight resistance. There are cases such as wheat rusts where many races are present but resistance breeding is effectively used.

S.B. King : But there is danger in instability of resistance.

J.B. Williams : In the face of claims and growing evidence for a number of races of the blight fungus, do you feel that a heavy investment in moving genes from the wild species to the cultivated is justified ?

Y.L. : We will look into this aspect carefully.

R. Bandopadhyay : Is there any information on how P. drechsleri f. sp. cajani spreads ?

Y.L. Nene : Phytophthora spp. spread in the soil through zoospores. Zoospores float on water.

6. Discussion Highlights :

- o In view of the possible existence of races, the breeding programs be properly chalked out. More information on pathogen variation, virulences and prevalences might help plan better breeding programs. Host pathogen-environment relationships be established.

7. Recommendations :

The work plan be reoriented to cover the points in discuss on highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** CP-119 (85) IC
2. **Project Title** Studies on the viruses affecting pigeonpea and chickpea.
3. **Project scientist** A.M. Ghanekar
4. **Project covered by report** May 1985 - January 1986
5. **Discussion**

A.M.Ghanekar presented the project progress report.

D.V.R. Reddy

- (i) Harsh treatments have been applied in purification procedures for sterility mosaic virus. Immunogold labelling technique is dangerous and difficult for such a virus. It should be used in cases where otherwise virus particles are not visible. Extracts of the virus infected leaf tissue should be used to detect the virus in the infected tissue.
- (ii) The chickpea stunt virus is easy to purify. Produce antibody against it and use it for detection of the virus.

A.M. Ghanekar

- (i) I am not much aware of the immunogold labelling technique. Mr. Manohar's expertise will be utilised in case we are to use this technique.
- (ii) PLRV is a very good antigen. Yes. I agree that serology is the best way to detect the virus.

D.V.R. Reddy : For sterility mosaic virus, I suggest to use other modern methods apart from electron microscopy.

D.G. Paris : What about long term plans about virus disease problems in other countries ?

Y.L. Nene : If the disease exists, we realize to identify it in other countries. Once we have antiserum against the sterility mosaic virus, we can do surveys with microscope to look at mites. Phyllody has been reported in pigeonpea. Leafhoppers can transmit MLOs.

P.W. Amin : Can you transfer SM mechanically to other hosts ? Pathogenicity tests are essential to prove that VLP are implicated in SM.

A.M. Ghanekar : We are trying mechanical transmission.

J.B. Williams : Have you analysed the VLP for DNA or RNA ?

A.M. Ghanekar : No.

6. Discussion Highlights :

- o simplified procedures be used for purification and detection of sterility mosaic virus.
- o Modern methods be used apart from electron microscope
- o Pathogeneity tests are essential to prove that VPL are implicated in sterility mosaic

7. Recommendations :

Note should be taken of the discussion highlights in implementing the work plans.

ICLISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : CP-120(85)IC
2. Project title : Screening for disease resistance in chickpea and pigeonpea
3. Project scientists : M.V. Reddy
D.G. Paris
E.A. van Rheenen
4. Period covered by report : March - December 1985

5. Discussion

M.V.Reddy presented project progress report.

P.Subrahmanyam : What is the variation in infection rates in Ascochyta blight-resistant lines ?

M.V. Reddy : No studies have been made on this aspect. We do not have lines resistant to blight.

K.B. Saxena :

- (i) Can you mention the reasons for low incidence of sterility mosaic (SM) in SM sick nursery last year ?
- (ii) In 1986-plan you have proposed to have only combined wilt and SM nursery and no nursery exclusively for SM. Will it not affect the breeding work where we incorporate resistance to SM only ?

M.V. Reddy

- (i) Last year the incidence of SM was low as the mite population was low.
- (ii) I have projected the breeders' view point to combine resistance to both wilt and SM.

I.L. Mene

- (i) I am afraid if we can release cultivars that easily that have resistance only either to wilt or to SM. We can't predict when SM becomes serious. When we can combine resistance to both these diseases, why should not we attempt it ?

- (ii) Is there any evidence that yield goes down when we attempt to breed for combined resistance to wilt and SM ?

K.C. Jain : Yield is not reduced significantly while combining resistance to both wilt and SM.

D.G. Paris : It is difficult to have combined resistance vis-a-vis maintaining yield. Breeders' view point is that it should happen in phases. There should be single disease nursery for breeding material in the first place. Eventually our materials ought to have resistance to both diseases.

Y.L. Nene : This requires in-program discussion as there is a difference of opinion.

P.V. Amin : It was mentioned at the recent seminar at CPPTI that we know very little of the epidemiology of SM. Is ICRISAT contemplating any studies on this aspect ?

Y.L. Nene : I do not agree that we know very little about epidemiology of the disease. Perennial pigeonpeas are excellent reservoirs of mites. In areas where perennial pigeonpeas are grown there are good incidences of SM. But, why mite population goes down is not known.

B.K. Varma : What are the chances of the entry of Syrian races of Ascochyta rabiei into India through seed imported from Syria in spite of seed treatment with TBZ ?

M.V. Reddy : There is no chance of the introduction of races because the seeds are exported from the Spring chickpea crop that does not suffer from Ascochyta blight.

6. Discussion Highlights :

- o Regarding transfer of resistance to wilt and SM, simultaneously or in phases, without loss to yield be discussed within the program with the available data.
- o The fluctuations in mite populations be studied in relation to severity of SM.

7. Recommendations :

The above points should be looked into for improving work plan.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : CP-121 (85) IC
2. **Project Title** : Studies on the nematode diseases of pigeonpea and chickpea.
3. **Scientist(s)** : Y.L. Nene
Post doctoral Fellow
4. **Period covered by report** : January 1985 - December 1985
5. **Discussion** : .

Y.L.Nene presented the project progress report.

D.G. Paris : What are the plans to continue examination of lines resistant to nematodes vis-a-vis the possible association of resistance to Fusarium wilt with resistance to nematodes ?

Y.L. Nene : We could not send nematode-resistant lines for testing to the North Carolina State University (NCSU), USA. Lines resistant to Fusarium wilt were sent to NCSU and some of them were found resistant to root-knot nematodes. We have facilities and free help from Scientists of GAU to test our wilt-resistant lines for resistance to root-knot nematodes at GAU farm. However, funds are needed for collaborative work with NCSU (The International Heloidogyne Project).

P. Subrahmanyam

- (i) Do we have any information on the occurrence of nematode diseases in farmers' fields ?
- (ii) How the wilt-resistant lines were evaluated for resistance to root-knot nematodes at the Gujarat Agricultural University ?

Y.L. Nene

- (i) No. We do not have data for nematode diseases in farmers' fields.
- (ii) The wilt-resistant lines were tested for resistance to root-knot nematodes in glass house.

M.V. Reddy : Nematode diseases of chickpea have been found serious in farmers' fields in Syria. Cultivar ILC 482, released as Ascochyta blight-resistant line in Syria, was withdrawn later due to its susceptibility to cyst nematodes.

S.B. King : How do you evaluate material for resistance or susceptibility to nematodes ?

Y.L. Nene : Resistant and susceptible check genotypes are identified based on overall growth of plant.

6. Discussion Highlights :

- o This project was carried out by a Post-doctoral Fellow. Further continuation of work on nematode of chickpea and pigeonpea will depend on how soon ICRISAT's management decides to appoint Nematologists.

7. Recommendations :

The nematologist should plan program to support the breeding program for breeding for resistance to nematodes.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project : CP-122(85)IC
2. Project Title : Studies of Heliothis population to support the pest management programs, and to rear Heliothis for experiments.
3. Project scientist(s) : V. Reed
D.R. Dent (to Dec 1985)
4. Period covered by report : March 1985 - January 1986
5. Discussion :

V. Reed presented the project progress review and summarized various aspects of Heliothis population studies with a main aim to increase the yields in the farmers fields and long term environmental protection. According to Dr. David Dent's report, though the pheromone traps are inefficient in trapping Heliothis (<20%), the proximity of the crop and the location of the trap were also important. Dr. Dent has also suggested the expansion of the pheromone trap national net work by increasing the replication at key locations as well as covering some gaps in the subcontinent. Drs. Dent and A.B.S. King have also made some improvements in mass rearing Heliothis under laboratory conditions to utilise them in screening germplasm for resistance under field cages. Dr. Reed emphasised the importance of their Heliothis data bank, which will be available to research workers in an easy format. Dr. Reed pointed out the future need for increased emphasis on host plant resistance particularly in north India and to limit their efforts on biocontrol. He mentioned that Dr. Dent's departure requires review of Heliothis project and the need for additional scientific staff.

P.V. Amin : Much of the information on trap catches clearly show the lacunae in the technique. Under these circumstances, is it justified to continue this work or to intensify it? If so, what is the time limit on this work? It will also pinpoint what is expected of this project?

V. Reed : Most of the lacunae are in our ability to interpret the data. We should continue but for a required period to ensure an adequate data set, but we have to consider the future of this project in relation to the TDRI project in RMP. The results of this are providing us with interesting information and we have taken steps to increase replication at key sites to improve the utility of the data.

C.S.Pavar : What could be the outcome of this project? Shall we go for mass trapping as indicated by Dr. Dent? What are the possibilities of finding attractants for females?

V.Reed : The outcome from this project will be a better understanding of *Heliothis* populations. I can see no scope for mass trapping as a means for control of *Heliothis armigera*. We have tried to find female attractants and will continue to do so but the chances do not look good.

Y.S.Chauhan : Some time back I happened to read in the Indian Express about the development of mass trapping technique for *Heliothis* moth in controlling its infestation by the Pulse Directorate, Kanpur. Are you aware of it? Do you believe that is going to be successful?

V.Reed : Yes, I am aware. I do not think there is any possibility of using the *Heliothis* pheromone directly for the control of *Heliothis* damage.

H.C.Sharma : Some birds are always sitting on the pheromone traps, and catch the *Heliothis* moths that visit the traps during day time. Do you take into account such a phenomena?

V.Reed : Most birds sitting on pheromone traps are the king crows (drongo). These do not hunt at night when *Heliothis* fly. Only exceptional moths will visit the traps during the day time.

M.Singh : How do you measure the efficiency of pheromone traps for catching the moths? There is variation in the moth catches over replicates. Can this variation be accounted for by the reduction in population already caught in other traps?

V.Reed: Dr. Dent observed single traps through the night and found 15% or less of those approaching the traps were caught. As about 14 million are flying on ICRISAT at a peak and we do not catch more than 5,000 of these in a night, I doubt if the catches greatly affect the numbers available for capture.

R.A.B.Mueller : What type of statistical methods have been used to analyse the pheromone trap data?

V.Reed : A variety of methods were used and many others tried. These are all described in Dr. Dent's report.

Y.L.Nene : Do you see a time limit on your *Heliothis* project work?

V.Reed : Yes, we intend to review light trap continuation at the end of this season and will either stop or reduce the work. For pheromone trapping we intend to continue for one more year and then assess the value of the work. We regard this work as long term but it has to justify itself.

6. Discussion Highlights :

- o The project be reviewed by the Entomologists at the end of the season for the future line of work.
- o Data available be interpreted to give concrete suggestions.

7. Recommendations :

The project should be concluded and results published. If necessary a new project may be proposed for future consideration.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : CP-123(85)IC
2. Project Title : Studies leading to integrated pest management on pigeonpea and chickpea including the augmentation of natural control elements.
3. Project scientist(s) : S. Sithanathan
4. Period covered by report : March 1985 - January 1986
5. Discussion

S.Sithanathan presented the project progress report for review.

P.V.Amin : Dr.M.V.Pavar of MAU, Parbhani has done excellent work on NPV and has standardised the method for preparation of NPV suspension. The results of trials conducted on farmers fields clearly show high efficacy in controlling Heliothis and obtaining higher yields. I suggest ICRISAT collaborates with him and utilise his expertise to speed up the work on NPV.

S.Sithanathan : It is a good suggestion. We should consider this if we undertake further research on biocontrol at ICRISAT.

C.S.Pavar : What was the difference of methodology of pesticide application followed at ICRISAT and at Coimbatore for NPV application?

S.Sithanathan : I hope that we achieved a more uniform coverage.

C.S.Pavar : Do we need to test different techniques of pesticide application?

S.Sithanathan : Yes, this is being considered.

R.A.E.Mueller : What exactly is the objective of research on economic thresholds? Is it to provide a basis for research by NARS or is it to provide thresholds by use of farmers?

S.Sithanathan: It is now directed for scientists.

H.C.Sharma : What is the degree of Heliothis parasitisation by Trichogramma on different pigeonpea cultivars?

S.Sithanathan : It is as high as 30 - 70% in laboratory, but we should ascertain in field tests.

H.A. Van Rheenen : Were differences in percent parasitism of larvae on resistant vs susceptible varieties significantly different and could you explain reasons for the differences?

S.Sithananthan: Yes, these differences were significant between a pair when pooled over seasons. Comparison of more pairs of resistant and susceptible is in progress. Differences may be caused by H. armigera population density differences.

J.H.Williams : How are you changing your thrust towards pest resistance considering the decision to concentrate on pest resistance. You say that you will be intensifying efforts on host plant resistance.

S.Sit : We balance it while revising the projects.

C.Johansen : In view of increased emphasis in pigeonpea improvement on early determinate large seeded, densely planted crops, which would be increasingly attractive to insects, what is your strategy vis-a-vis host plant resistance and use of insecticides.

W.Reed : Insecticide research will have to continue as a short term solution but host plant resistance must be the long term goal.

6. Discussion Highlights :

- o It is desirable to have collaboration with MAU on NPV.
- o Studies on Heliothis parasitism under field conditions are required.

7. Recommendations :

The work plan should be improved taking suggestions from discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : CP-124(85)IC
2. Project Title : Host plant resistance to insect pests in chickpea, pigeonpea and its relatives, screening and identification of mechanisms.
3. Project scientist(s) : S.S. Lateef
4. Period covered by report : June 1985 - January 1986
5. :

S.S.Lateef presented the project progress report.

P.V.Amin : I feel the reorganisation of this project is necessary. At present the work is not divided properly between the two scientists (SS, SSL). The logical choice would be either (1) crop-wise division (pigeonpea/chickpea) or (2) pest-wise division (Heliothis/podfly). I prefer the latter. Since host plant resistance was recognised as a major area of research, sooner this is done the better.

W.Reed: We work as a team and the present division of SSL dealing with all host plant resistance (HPR) screening and SS contributing his podfly expertise in the research on mechanisms of resistance to podfly has proved productive. However, as we are moving more resources to HPR it might be productive to allocate HPR screening of late maturing pigeonpea, which is mainly podfly screening in northern India to SS, we will consider this.

P.V.Amin: It is stated that when resistant and susceptible were in close proximity the differences in pod damage diminish. Obviously, the resistance is associated with lower preference for egg laying in resistant cultivars under field conditions. Has this been tested in the laboratory? What will happen if resistant pigeonpea is grown on large scale? Any plan to conduct such experiments? Does the resistance stand all over India? There were some doubts expressed at the Kanpur meeting on this topic.

S.S.Lateef: Several laboratory tests were also conducted, but in field conditions larval migration from the neighbouring plants/plots was recorded. This was evident from the transparency on larval counts from the brushed/unbrushed rows. In both the situations the larval number was almost equal. For the adaptability and performance of our resistant sources, we conducted multilocation tests.

J.H.Williams: I find that the organisation/division of responsibility between these scientists is confusing. Can you explain?

V.Bood: Dr. Lateef deals with HPR, including screening of field material. Seed screening involves pod damage estimates for all pests. Dr. Sithanathan is our podfly expert. He deals with the behaviour etc. of this insect and differences between resistant and susceptible material. We work as a team!

E.A. Van Rheenan: Spacing widely may give better conditions for Heliothis screening but results do not clearly show this. No significant differences in Heliothis damage between ICC 306 and Annigeri at 60x30 (wide) cm spacing also no significant differences were observed between plots-alternate rows-alternate plants in 3 - 4 cases (82/83, 83/84).

S.S.Lateef : We tested 60x30 cm as "close" spacing and 60x60 cm as "wide" spacing and we have found significant differences in borer damage (X) of the resistant/susceptible selections in all combinations. The wide spacing between plants limits the larval movement from plant to plant and that enhances the precision of our selection.

Unaid Singh : This refers to MPI-Munich work. Would you like to be more specific with respect to the results on chemical constituents regarding the resistance mechanism?

S.S. Lateef : A biochemist Mr. P. Walner, working on chickpea at MPI-Munich has isolated certain volatile chemicals from the resistant and susceptible cultivars and is testing these for Heliothis attractancy in the laboratory. Detailed results are still awaited. Mr. Tober is now completing his Ph.D. and we await his thesis.

B.C.Sharma : Your demonstration of antibiosis to Heliothis is impressive. However, I would like to know whether you used green (immature grain) or mature grain. The two types of grain would produce different results.

S.S.Lateef : In this test I have used matured dry seeds of pigeonpeas collected from resistant and susceptible cultivars.

6. Discussion Highlights :

- o The observations on spacing and migration effects be critically made.
- o It is preferable to have test on antibiosis on immature and mature seeds, coordination from Biochemists required on antibiosis studies.

7. ti

The work plan should be extended to cover the above points.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : C-125 (85) IC
2. Project Title : Grain quality improvement in chickpea
3. Project Scientist(s) : Unaid Singh
J.Kumar
S.C.Sethi
4. Period covered by report : January 1985 - December 1985
5. Discussion

Unaid Singh presented the project progress report

C.Johansen : What is the proportion of samples being analysed in the Biochemistry laboratory which are part of research projects in which you are directly involved as project scientists, as with those analysis done as a service facility?

Unaid Singh : Routine analysis is done by research We analyse all the samples received from the Genetic Resources Unit and Pulses Improvement Program, whether we are directly involved as project scientists or as a service.

C.Johansen : Do you think that you should restrict your efforts to samples where you are directly involved in a research project?

Unaid Singh : Wherever critical analysis is required, I attend to that. Service analyses are being done whenever necessary. We are not encountering any problems at this stage. The system is working satisfactorily.

J.P.Noss :

- (1) Routine analysis of samples is not the job of a research scientist and it should be carried out by research associates or laboratory assistants.
- (2) What type of field trials are required to obtain seed samples for protein analysis?

Unaid Singh :

- (1) I agree that the routine analysis should be done by research associates, and it is being done.
- (2) Several environmental factors play an important role in protein content of seeds. However, ranking of genotypes for protein content remains the same in samples collected from different locations.

Y.L.Nane : Breeding lines with protein content lower than the standard check cultivars are not considered for advancing.

W.Reed :

- (1) Did you include standard check cultivars in your experiment?
- (2) No mention has been made on milling quality and acceptance.

- (1) We do include check cultivar Annigeri.
- (2) We do not have much information on milling quality as we have not yet standardized a procedure to study these aspects. We hope to do some work in the near future.

H.P.Saxena : There is a danger when you collect seed samples from different environments unless you have information on soil factors including moisture regimes. Large variability in salinity within a subplot is well known at Hisar, and I have observed similar variability with respect to soil moisture at Gwalior. These influence protein content of the seed.

Umaid Singh Yes, I agree

Narari Singh : How many plants are used for collecting a sample? What is the range of coefficient of variation in your experiments? How many replications are used?

Umaid Singh : We do not collect samples from individual plants. Samples are collected after harvest and analysed for each replicated plot separately. Number of replications are approximately three and variation within field replications for protein content is around 20%.

R.Jambunathan : (comment) Studies are being carried out to obtain information on consumer preference and acceptance. Information on proportion of chickpea utilized as flour, whole seed or dhal is not available. There are no uniform milling procedures and the effect of milling on protein quality was not investigated in detail. Some of these aspects need to be investigated in 1986.

6. Discussion Highlights :

- o Relationship between the environmental factor: (soil fertility, moisture, salinity) and variation in protein levels in genotypes be worked out seeking help from Pulse Agronomists.
- o Seed samples also can be obtained from All India Coordinated Pulse Improvement Project along with the environmental data for analysis of protein to get a better picture of protein in different ICRISAT lines in the coordinated trials and other coordinating countries.

Procedures for standardization to study milling quality (percentage of recovery, protein losses) be evolved.

7. tions :

The work plan should be improved from the point of view of discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project** : C-126 (85) IC
2. **Project Title** : Investigate host plant resistance in chickpea using chemical/ biochemical methods.
3. **Project Scientists** : Research Fellow/
R. Jambunathan
4. **Period covered by report** : July 1985 - December 1985

5. **Discussion**

R.Jambunathan presented the project progress report

B.C. Sharma : The project title is vague. Is the resistance related to disease, insect or both. If it refers to disease, what are the diseases being dealt with?

R.J than : The resistance is related to chickpea wilt.

6. **Discussion Highlights** :

- o Title to indicate wilt disease.

7. **Recommendations** :

The disease 'wilt' be specified in title.

ICRISAT RESEARCH PROJECT PROCESS REPORT

1. **Project** : **New Project**
2. **Project Title (proposed)** : **Germplasm collection, evaluation and cataloging and genetical investigation.**
3. **Project Scientists** : **K.B. Singh
Post-doctoral Fellow**
4. **Period covered by the report** : **February 1985 - January 1986**
5. **Discussion** : **Nil**
6. **Discussion Highlights** : **Nil**
7. **Recommendations.** : **Work planned be carried out**

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : P-101(75)IC
2. Project Title : International trials
3. Project Scientist(s) : Lakman Singh
M.V. Reddy
S.S. Lateef
4. Period covered by report : 1984 - 1985
5. Discussion :

D.G. Paris presented the project progress report.

J.P. Moss : How much weight do you put on results of trials where CV's are 29.2, 27.3, or 84.7%, when you get CV's of 12 or 13% at ICRISAT.

D.G. Paris : Some times we are forced to use trials with CV's around 30% - obviously with some care-but if several trials give similar results eventhough they have around 30% we can give them some confidence. Obviously with 85% CV we would give the results no weight.

U. Singh : (1) Is the trial on G x E on protein content a separate one or it is a part of other trials? (2) what specific areas under utilization are you planning that need be studied? (3) with these activities in mind, I think, biochemistry unit should be involved. But it has not been listed. Would you like to comment on this.

D.G. Paris : (1) This is a special trial but connected with the project breeding for protein, P-106(85)IC. (2) Suggest pursuit studies but add fermentation products and feed and perhaps more work on high protein and vegetables. (3) Definitely, biochemistry should be involved but this has been done through the specific breeding projects.

M.J.V. Rao : I feel that an international food quality trial involving an array of food products prepared out of pigeonpeas would be useful to popularize it. This could be done parallel to adaptation trial in countries where pigeonpea is being introduced for the first time.

D.G. Paris : We will follow good suggestion up.

H.A. van Rheenen:

- (1) Reports "having compiled" should read "have been"
- (2) Pure seed of lines means seed of pure lines?
- (3) Identified for pre-release multiplication
"identified for release"?
- (4) Seed supplied to whom?

D.G. Paris

- (1) Yes.
- (2) Yes.
- (3) Identified as promising.
- (4) Various agencies.

J.S. Kanwar : I wonder whether DGF has any plans to identify and bring trainees from South-East-Asian countries to ICRISAT so that they get exposed to this crop.

D.G. Paris : Yes, we have plans to identify such trainees.

J.S. Kanwar : Is our biochemistry unit is looking into the preparation of fermentation products of pigeonpeas?

U. Singh : Not yet, but we plan to include these aspects in our project.

Y.L. : This is the time we should capitalize on such products.

S. Sithanathan : The Advanced Center for Agricultural Microbiology of T.N.A.U., Coimbatore, may be a useful collaborator for studies on utilization of pigeonpeas for fermentation products.

D.G. Paris : Good idea. We will follow it up.

6. Discussion Highlights ;

- o Testing materials in never and unconventional areas be tried along with the array of food products prepared out of pigeonpea for popularisation of the crop.
- o Biochemistry unit may try fermentation products of pigeonpea and this work may have coordination with microbiology unit of T.N.A.U., Coimbatore.
- o It is desirable to train agricultural scientists from South-East Asian countries to get exposure of this crop.

7. Recommendations

The work plans be improved based on discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project** : P-102(85)IC
2. **Project Title** : Development of short duration cultivars and superior breeding lines for stability and grain production
3. **Project Scientist(s)** : S.C. Gupta
M.V. Reddy
S.S. Lateef
Y.S. Chauhan
4. **Period covered by report** : 1984 - 1985

5. Discussion

S.C.Gupta presented the project progress report.

Y.S. Chauhan : You may consider including the ratoonability as one of the objective which at present is not much apparent.

S.C. Gupta : Because of the occurrence of frost almost every year at Hisar, it is difficult to screen the lines for ratoonability. We have tried this during 1983 and 1984 but most entries killed of frost. All multilocation trials of early types are conducted at Patancheru for studying their performance in multiple harvest by ratooning and this should help us in identifying lines with high ratoonability. We will pay more attention on this at Patancheru.

C. Johansen : What is the reason for 203 times higher yields of pigeonpeas at Hisar than at Patancheru.

S.C. Gupta : Mainly temperature and photoperiod effects.

W. Reed : For historic reasons the short duration project has one breeder who is situated at Hisar. Now we know that short duration pigeonpea has big potential in southern India and elsewhere particularly for multi-harvests. I suggest that the project should have two distinct objectives (1) to produce cultivars for north India to fit in with wheat, and (2) a different type for southern India and elsewhere for ratoonability. It might be useful for another breeder based at Patancheru to take responsibility for the project and to select for multiharvest.

S.C. Gupta : Yes, I agree. Dr. K.C. Jain shall be spending about 20% of his time on this project at Patancheru. Initially, the lines in multilocation trials can be screened for ratoonability. This is already in progress and will receive increased attention.

D. Sharma : How appropriate is the objective of studying the genetic parameters separately in early maturity backgrounds?, it

will bring out only the environmental effects what are the characters whose genetic parameters are likely to be influenced by the environment?

S.C. Gupta : Most phenological characters are influenced by the environment and so will be their genetic parameters.

R.J. Witcombe : A well designed breeding program will always generate information on various genetic parameters and, I think, there is no need of planning specific experiments for this purpose.

J.S. Kanvar : What is about the genetic resistance of these early high yielding lines to insect pests? Have there been any studies conducted on the insecticide use on these lines?

S.C. Gupta : There are genotypic differences among these lines for resistance to insect pests and several lines are promising.

S.C. Gupta : Field trials on insecticide use have been conducted at Patancheru and Hisar; 3 to 4 sprays of insecticides were found very effective in controlling the pests.

B. Singh : You have mentioned that breeding lines will be monitored for grain quality characteristics. How many lines will be evaluated for these characteristics in 1986?

S.C. Gupta : It may be around 60 lines, going to AICPIP and ICRISAT multilocation tests.

T.L. Nene : We will pay more attention to our work on short duration pigeonpeas at ICRISAT Center and will look into the agronomical aspects such as ratoonability and response to phosphorus.

J.S. Kanvar : Work on early pigeonpeas is done at Hisar. What are your observations regarding their response to phosphorus and other nutrients.

T.S. Chhabra : No studies have been conducted on response to phosphorus at Hisar. Only pot experiments have been done at ICRISAT Center where we have observed some response.

B. Singh : Experiments at Hisar did show a considerable residual effect of pigeonpeas to the subsequent crop in terms of Nitrogen.

N.P. Saxena : At the regional station of JNKVV at Morena, a study on the response of early pigeonpeas to irrigation and phosphorus is currently under progress, and district interactions between irrigation and levels of phosphorus could be observed visually.

J.S. Kanvar : Does Dr. N.P. Saxena have any plans to conduct agronomical experiments on pigeonpeas at Hisar.

N.P. Saxena : Dr. Arihara has such plans.

Y.L. Yes, we must have plans for such studies at Hisar.

H.A. van Rheenen: In the previous In-House Review, it was suggested to put the word 'stability' before 'high yield' in the objectives of the project, what is your reaction to it? What are you doing to produce white seeded ICPL 87? Are all the characters listed in 5.a.(iv) qualitative?

S.C. Gupta : I agree with the priority in wording. we have back-crossing program for ICPL 87 and will look into the qualitative characters more critically.

Y.S. Chauhan : We recognize that there is a need to study the response of pigeonpea to phosphorus but fields at our farms have been dumped with lot of phosphorus and we don't get the response. Farmers' fields, on the other hand, appear to be deficient in phosphorus.

Y.L. Nene : That is no excuse for not doing any work on response to phosphorus. We should find out means and ways to accomplish such work. So I ask for suggestions.

J.S. Kanwar : (1) If there is no response to P, why do we apply P fertilizers in the fields? (2) Do we analyse the soil for P before starting an experiment? (3) As agronomists, you should work in various environments, including Hisar. (4) Work on P is mostly confined to medium-maturity group and should be extended to early types.

C. Johansen : We have project to identify and alleviate mineral nutrient deficiencies, especially in relation to early pigeonpeas.

6. Discussion Highlights :

- o Attention be paid to short duration cultivars (a) to produce types for single harvest for North India to fit with wheat rotation and (b) multiharvest and ratoonability types to fit in South India and elsewhere.
- o Work on response to phosphorus, other nutrients and agronomical aspects need to be intensified at Patancheru and Hisar. Such studies should have P analysis data before and after the crop. P studies for early types need intensified.

7. Recommendation

The project should have emphasis on points of discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : P-103(85)IC
2. Project Title : Development of medium duration cultivars and superior lines for stability and grain production.
3. Project Scientist(s) : K.C. Jain
M.V. Reddy
S.S. Lateef
4. Period covered by report : June 1984 - May 1985
5. Discussion

K.C.Jain presented the project progress report.

D. Sharma : Data in table is very interesting and requires further thinking. C 11, though susceptible to SM and wilt, gave highest yield. What happened to ranks 2,3, and 4? Where do we go from here as far as medium-maturing lines are concerned? Is there something happening with regard to the relationship between yield and disease resistance?

K.C. Jain : The disease ratings are from disease nurseries, whereas the yields are from normal fields where the spread of diseases was not enough. Combining disease resistance with yields at par with checks is a significant achievement.

R.J. Witcombe : Is there any example of a variety being identified for release with disease resistance but low yield?

K.C. Jain : There is one example.

J.S. Kanvar : Is it fair to compare the yield data and disease ratings from two different fields?

K.C. Jain : Yes, it is fair. There is nothing wrong in this.

M.V. Reddy : It is not fair to compare the yields of susceptible checks in the sick plots as the checks are 100% killed.

Murari Singh : The presentation of yield and disease percentages seem to be reasonable (or least bad alternative), since one would not like to conduct trial for yield in sick plots nor for disease resistance under full protection.

D.G. Paris : AICPIP has set up these trials to identify the best materials with disease resistance.

Y.L. Nene : Should we not initiate a back-cross program in order to incorporate wilt resistance in C 11, the highest yielder.

K.C. Jain : Yes, we will do.

J.P. Moss : The yield figures for C 11 are given as 2978 kg/ha and 2744 kg/ha under disease free conditions, but when grown in pesticide free area, only gave 920 kg/ha. Yield figures should be realistic and more related to expected disease conditions. What is the figure the farmer can expect in his field?

K.C. Jain : At present, the average yields in India are around 700 kg/ha. The yield reported in pesticide-free area is similar to farmers' fields situation. Therefore, we are trying to combine disease, insect resistance into high yielding backgrounds, such as C 11.

C. Johansen : What will be relative emphasis on medium duration breeding in view of Frey's recommendation of 80% efforts on early duration and in view of intention to screen under intercropping with sorghum?

K.C. Jain : Dr. M.R. Rao is doing screening of elite lines under intercropping situation.

Singh : This project will continue to receive emphasis on developing determinate and disease resistant cultivars with acceptable yields. Two-thirds of our total efforts will go to early types.

D.G. Paris : Dr. Jain has 0.2 mandays on early types.

6. Discussion Highlights :

- o It would be better to initiate a wilt resistance program for C 11, the highest yielder.
- o Developing determinate and disease resistance cultivars need emphasis for medium maturity group.

7. Recommendations :

The work plan should consider the discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : P-104(85)IC
2. **Project Title** : Development of long duration cultivars and breeding populations for stability and grain production.
3. **Project Scientist(s)** : Breeder
M.V. Reddy
S.S. Lateef
4. **Period covered by report** : 1984 - 1985
5. **Discussion** :
No specific discussion held.
6. **Discussion Highlights** :
o Selection process be followed for June-July and September plantings.
7. **Recommendations** :
The selection process be followed for two planting dates.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project : P-105(85)IC
2. Project Title : Development of Hybrids and their seed production technology.
3. Project Scientist(s) : K.B. Saxena
M.V. Reddy
4. Period covered by report : 1984 - 1985
5. Discussion

K.B. Saxena presented the project progress report.

M.V. Reddy : Should we not first test the hybrids before conversion.

K.B. : No, it will take much more longer to proceed that way.

D.G. Paris : Should seed agencies not take the conversion work?

K.B. Saxena : Seed agencies are also doing the conversion work.

R.J. Vitcombe : Our relationship with private seed agencies may be quite sensitive to our relationship with ICAR!

Y.L. Nene : The Director General has made it clear in the ICAR-ICRISAT Committee meeting that ICRISAT materials can be freely shared with anyone interested in it.

J.P. Moss : Are you looking at the potential of second crop/ratoon in hybrid pigeonpeas to get more return from initial high costing of hybrid seed?

K.B. Saxena : I appreciate the suggestion. At present we don't have any hybrid which does well in peninsular India. Once we get such hybrids we will look into such possibilities.

P. Ramnandan : Do you think that the present low yield levels of hybrids can be detrimental to the acceptability of better hybrids produced later on?

D.G. Paris : Hybrid pigeonpea will probably make their mark under high production systems where farmers are willing to put inputs such as sole crop and for vegetable production.

R.J. Vitcombe : Do you have a set of male lines which are more heterotic in hybrid combinations?

K.B. Saxena : No, we don't have such set.

H.A. van Rheenen: How much extra yield is required from hybrids to compensate the extra cost involved in seed production?

K.B. Saxena : No, we don't have any such estimates as yet.

6. Discussion Highlights :

- o Yield potential for hybrids be tried at higher levels of management as sole crop and for vegetable production.
- o Estimates of hybrid seed costs and economic returns of cultivation be worked out.

7. Recommendations :

The work plan should take care of discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : P-106(85)IC
2. Project Title : Breeding for special traits (new variability, high protein, vegetable types).
3. Project Scientist(s) : K.B. Saxena
Laxman Singh
U. Singh
C. Johansen
4. Period covered by report : 1984 - 1985
5. Discussion

K.B. Saxena presented the project progress report.

J.P. Moss : What is the distribution of protein within the seed (cotyledon, versus epicotyl), does it change with seed size, and how does it effect breeding for large seeded high protein types?

U. Singh : This aspect has not been studied but what we have studied the protein fractionation of cotyledons and embryos and observed considerable differences in the protein make-up of these components.

N. Singh : What are the environmental factors that affect the protein content of the seeds?

K.B. Saxena : Both, below-and above-ground environmental factors.

D.G. Paris : I would like to emphasize that high protein short duration pigeonpea could be the material for a break-through for pigeonpea in S.E. Asia for it could be used as a direct replacement for soybeans. I would therefore encourage that emphasis be given to breeding a high protein early duration pigeonpea.

R. Jambunathan :

- (1) I believe that you included hidden check samples when you had your samples analysed in biochemistry lab. How was the precision of analysis in these check samples?
- (2) Your comments/views regarding the cooperation extended by biochemistry in analysing your samples?

K.B. Saxena :

- (1) Yes, we do include blind checks in the samples sent for protein analysis. Overall we are satisfied with the precision of the protein estimates.
- (2) We have an excellent cooperation and help from biochemistry.

J.S. Kanvar : Have you studied the amino acid profile of high protein lines?

U. Singh : Yes, we are not losing the quality of amino acids on account of high protein in such lines.

J.S. Kanvar : How the distribution of protein varies with the removal of husk during milling? Any study on this?

U. Singh : We do use protein in cotyledon-powder in milling. Large samples are needed for more precise assessment.

J.S. Kanvar : P. Remanandan has been listed as a project scientist in this project. How is that cooperation? Are we exploiting good germplasm lines in the breeding program?

P. Remanandan : We are cooperating by way of supplying potential germplasm lines and wild species?

K.B. Saxena : We have picked-up most promising germplasm for our breeding program.

J.S. Kanvar : Is GRU aware about the work on mid-maturity group being done at Gwalior?

P. Remanandan : Yes, we are conducting trials on mid-and mid late materials at Gwalior.

J.S. Kanvar : I would like to state here that emphasis on vegetable types is justified and high protein must be incorporated in vegetable types.

Y.L. Nene : Sugar content in vegetable types is very important and we should not lose it while improving on other aspects in the vegetable types.

J.S. Kanvar : What maturity group in vegetable types you are interested in.

K.B. Saxena : We want more of vegetable types in early maturity group. The pod harvest in September may be ideal proposition for the farmers.

N.H. Mengesha : I suggested pigeonpea breeding to give increased priority to Africa. I hope breeders will do. Drought resistance, high protein, vegetable types etc. may be extremely useful in African continent. Posting ICRISAT staff at some of the important locations may help a great deal in this regard.

Y.L. Nene : We have done our best in this regard. We have been sending various nurseries to many countries in Africa. Two staff members will be sent to participate in the workshop in Kenya. The important point is that the response will have to come from that side and we will not be lacking in cooperation.

J.S. Kanwar :

(1) A small group of scientist including Dr. Mengesha should examine this issue.

(2) P. Remanandan is going to West Indies for collection. The breeder should ask him to collect and bring back any specific material in which they are interested.

6. Discussion Highlights :

- o If short duration high protein cultivars are evolved they could replace soyabean in South-East Asia.
- o High protein, sugary and early types be identified in vegetable types.
- o For pigeonpea requirements (drought resistance, high protein, vegetable types, nonvegetable medium/long duration types etc.) in Africa, Dr.Y.L.Nene is requested to examine in a small group consisting Dr.M.B.Mengesha.
- o Dr.P.Remanandan's exploration trip to West Indies be utilised by the pigeonpea breeders for getting specific material of their interest.

7. Recommendations :

The work plan should be looked in the light of discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : P-107(85)IC
2. Project Title : Climatic adaptation in pigeonpea
3. Project scientist(s) : Y.S. Chauhan
4. Period covered by report : May 1985 - February 1986

5. Discussion

Y.S. Chauhan presented the project progress report.

C.K. Ong: How do you propose screen for lower base temperature.

Y.S. Chauhan: By germination response at different temperatures.

C.K. Ong: Experience elsewhere has indicated that studies on base temperatures have provided very useful information in some crops such as Millet, Peanut etc., whereas in other crops it has not been so useful. A thermal gradient plate was used for this purpose in Nottingham.

J.M. Peacock: The objectives of the project are entirely related to temperature and light. This information is not indicated in the project title. The title "Climatic adaptation in pigeonpea" is misleading and should perhaps be changed to include the key words light and temperature. I am also not clear why work on solarization comes into this project?

Y.S. Chauhan: The project is essentially on climatic factors other than those of salinity, waterlogging and drought which have been covered under separate projects. Inclusion of solarisation has been essentially done to study the improved growth of pigeonpea as a result of solarization.

J.S. Kanvar: Are you moving in the right direction, considering the future of pigeonpeas and its extension to new areas?

Y.S. Chauhan: A considerable emphasis in our projects has been given to the work on understanding climatic limitations which are likely to affect pigeonpeas in the newer areas. If there are some areas which require particular attention, but have not been considered in our projects, we will welcome suggestions on these.

C. Johansen: Cold tolerance in pigeonpea will be useful trait in extending it to the rice based cropping systems since pigeonpea does not grow well at mean temperatures less than 20 C. In Gwalior we plan to screen for cold tolerance by artificially extending the day length in the winter season.

D.G. Paris: I have a few c ts to make:

Firstly, there is a need to fit our material into trials being developed in Asia for rice based cropping systems and other cropping systems.

Secondly, to extend pigeonpea into new areas we need to have types which grow under cool temperatures and also which will flower and set pods at low temperatures as Dr. Chauhan stated earlier.

Thirdly, among the early maturity types there are types which are more nearly annual than others which should be examined as they may partition more of their dry matter into yield where only one crop and not multiple harvest is required.

Singh: We have initiated discussions and planning for testing wide range of pigeonpea genotypes under :

- (1) Rice fallows in October-January plantings
- (2) Semi-arid to arid conditions in Rajasthan & Africa under rainfed conditions.

A meeting was held with physiology group and Dr. Morfo of Ghana on January 27 on this subject.

H.A.van Rheenen: You need to study the root competition between the component crops in an intercropped situation along with the competition for light.

A.K.S. Buda: You mentioned that very little growth and dry matter production has occurred below 20 C mean temperature based on pooled data from different sowing dates. Did you relate temperature to physiology , and then to dry matter?

While pooling data, did you consider the effect of photoperiod, and other variations in management factors such as plant density? This is important particularly for dry matter production.

Y.S. Chauhan: Since we included only values from early genotype ICPL 87 and most of the experiments were conducted at ICRISAT, the correlation between mean temperature and days to maturity was not significant. Hence temperature, through days to maturity, may not have contributed so much to total dry matter production as much through its direct influence. Correlation with solar radiation and TDM produced was also poor. Other experimental conditions did not vary much except in spacing but considering the plasticity it has shown over the populations its contribution was limited. We recognise the need to systematically investigate this since it is an important attribute in pigeonpea adaptation. The relationship between temperature and growth of pigeonpea is in conformity with observations made in controlled conditions at DSIR New Zealand.

C.W. Hoag: I am referring to (v) of the work plan for next year. How optimum is optimum in agronomic practice. Optimum level of agronomic input can be determined on the basis of target output and I wonder whether this aspect has been considered?

Y.S. Chauhan: In our experiments we are trying to approach the yield plateau by applying various monetary and non-monetary inputs. Non-monetary inputs should not pose a major difficulty to the farmers'. For other inputs, cost benefit ratio will be an important consideration before their adoption. Economists may look into these aspects.

R.A.E. Mueller: Why is the objective to determine yield levels of pigeonpea included ?

C. Johansen: The role of the biological scientist is to produce entire response curves for the various growth factors. Then, these can be evaluated by economists to determine optimum economic inputs, which are usually at a level that would give less than maximum yield (due to the Law of Diminishing Returns). It is also instructive to know the yield potential of any crop to work out the scope for improving it, in relation to current on-farm yields.

6. Discussion Highlights :

- o Pigeonpea adaptation studies required for South Asia and South East Asia to fit in wheat and rice based cropping systems
- o Among the early maturity types there are types which are more nearly annual than others which should be examined as they may partition more of their dry matter into yield where only one crop and not multiple harvest is required.
- o In case of pigeonpea/sorghum intercrops root competition to be taken into account.

7. Recommendations :

Work plans to be improved in the light of discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project : P-108(85)IC
2. Project Title : The alleviation of drought and waterlogging effects on growth, symbiotic nitrogen fixation capacity and yield of pigeonpea
3. Project scientist(s) : Y.S. Chauhan
J.V.D.K. Kumar Rao
4. Period covered by report : May 1985 - February 1986
5. Discussion

Y.S. Chauhan presented the project progress report.

Laxman Singh: Waterlogging problems in pigeonpea can be managed by proper agronomic practices like planting on ridges, broad beds, in addition to looking for waterlogging resistant varieties, which is a long term program.

Y.S. Chauhan: I agree with you that management can greatly reduce waterlogging but sometimes continuous rains create near anaerobic situations in the soil. Under such conditions, tolerance for waterlogging in a genotype could further ensure a good crop.

Y.L. Nene: I appreciate Dr. Laxman Singh's comment. We can reduce waterlogging and the severity of certain phytopathogens by developing appropriate management practices.

N. Seetharama: I suggest that you give more attention to mechanisms related to waterlogging than to those related to drought resistance, at least initially. The reason is, there are fewer mechanisms controlling resistance to waterlogging, and with the available literature it is clear that more progress can be achieved in this area. Also I would like to know what kind of correspondence do you get between waterlogging resistance and drought resistance in the lines you observed.

D.G. Paris: The line ICPL 304 is drought tolerant and apparently flooding tolerant.

Y.S. Chauhan: I am not sure if we can generalize the relationship on the basis of one example. We ought to base this on a range of genotypes.

We are indeed initiating some studies to understand the basis for waterlogging tolerance in few genotypes that we have identified.

N. Seetharama: In most cases, we are interested in WUE of the cropping system as a whole, in which pigeonpea is a component, rather than in sole crops. You will invariably find WUE is highest in case of early pigeonpeas, but this information is of less importance than that on the system as a whole.

Y.S. Chauhan: Early pigeonpeas are generally grown as a sole crop only. Thus it is reasonable to take their water use efficiency as such. I agree with you when it comes to medium and late maturing pigeonpeas which are grown as mixed crops.

6. Discussion Highlights :

- o Mechanisms related to waterlogging be studied. Lines suitable for both waterlogging and drought tolerance may be identified.
- o Pigeonpea types suited for rice fallows may have tolerance to waterlogging. Collection of germplasm of these types is desirable.

7. Recommendations :

The work plans should be improved from the point of view of discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : P-109(85)IC
2. Project Title : Detection and evaluation of genetic variation in symbiotic nitrogen fixation in pigeonpea
3. Project scientist(s) : J.V.D.K. Kumar Rao
4. Period covered by report : May 1985, - February 1986
5. Discussion

J.V.D.K.Kumar Rao presented the project progress report.

D.C.Paris : I wish to get on the record the experiment Dr.Kumar Rao has conducted where two generations of selecting from high and low nodulating types indicating that the differences between the nodulation of plants within the a genotype are due to the environment. The information from the experiment should be able to tell us how many plants are required to remove plant to plant variation due to environment so that genotypic differences can be confidently identified.

Singh: Projects like screening genotypes for symbiotic efficiency and resistance to damage by nodule eating insects are of long term nature and genetic differences may be confounded with environmental effects considerably.

Rather, we should consider giving priority to the studies on increasing symbiotic efficiency under rice-fallows and arid areas.

J.V.D.K. Kumar Rao: Our preliminary studies on pigeonpea under rice-fallows indicated good scope for improving nodulation and growth of pigeonpea through Rhizobium inoculation. Detailed studies, however, are required on the occurrence of pigeonpea rhizobia, responses to Rhizobium inoculation, Rhizobium strain differences, if any, in rice fallows in a range of environments. Studies on symbiotic nitrogen fixation under drought will be dealt with under project number P-108(85)IC.

V. Reed: I would suggest we should first determine whether nodule damage affects plant growth and yield. If it does, then we should screen germplasm for resistance.

The pot method of inoculating this insect and so studying plants with or without damage that was initiated by Dr. Sithanatham should be used before embarking upon field screening which will be difficult and expensive.

J.V.D.K. Kumar Rao: I agree with you. As you are aware we have a field experiment in progress, to estimate the loss in nitrogen fixation, plant growth and yield due to nodule damage.

I am collaborating with Dr. Sithanathan in the pot study and we will explore the possibility of using the pot technique for screening of pigeonpea germplasm for differences in nodule damage.

N. Satharama: The fertilizer use efficiency we saw from your slides was 1.2 to 2.0 kg grain per kg. N. This is too low, and certainly not acceptable. You need to look at ways of increasing FUE if you plan more research in this area.

J.V.D.K. Kumar Rao: The fertilizer use efficiency is low because the pigeonpea in this experiment was grown rainfed. This could be higher under irrigated conditions. Further, I wish to clarify that the main objective of this study is only to know whether nitrogen supply by nodules is enough to meet the nitrogen requirements of the crop to provide optimum yields under field conditions. This is not to recommend as a practice to farmers.

C.V. Hong: Pot experiment may not be adequate for determining the optimum requirement of nitrogen fertilizer by pigeonpea?

J.V.D.K. Kumar Rao: This point was already discussed earlier in the session. The pot studies can give us an idea of the nitrogen needs of pigeonpea and how much this is met by the symbiotic N fixation.

Y.L. Hane: We need to review this at program level because several points were raised during discussions.

6. Discussion Highlights :

- o While selecting genotypes, effect of environment on nodulation to be taken care.
- o Priority be given to study symbiotic efficiency under rice fallows in a range of environments.
- o Nodulation is confounded to plant, number of nodules over root length or root mass might give better
- o It is desirable to screen germplasm for nodule damage by Rivellia angulata and also relate the damage to yield loss.
- o The project needs to be reviewed at program level.

7. Recommendation:

Work plan to take care of suggestions in discussion highlights.

ICRISAT RESEARCH PROJECT

1. Project Number : P-110(85)IC
2. Project Title : Studies on the pigeonpea podfly, Melanagromyza obtusa including investigations of the mechanisms of host plant resistance.
3. Project scientist(s) : S. Sithanathan
4. Period covered by report : March 1985 - January 1986
- 5.

S.Sithanathan presented project progress report.

C.S.Pavar : What should be our strategy for insecticide application against podfly? Is this an equally important pest, next to H. armigera?

S.Sithanathan : Now it is based on periodical sprays. But ... should explore the possibility of restricting sprays by monitoring and/or varieties which resist/avoid podfly attack.

C.K.Ong : There is a real possibility of pupal survival during the dry season because shaded areas have temperature 10-15% below the lethal temperature quoted (40(o)C).

S.Sithanathan : This possibly exists and we will investigate but pupae are rarely formed outside pods and chances of burial in shaded areas are remote.

S.L.Taneja : In your resistance mechanism studies, have you looked into morphological characters as a factor associated with podfly resistance?

S.Sithanathan : Yes, we looked at ... of these both morphological and structural, but no character is associated across sets of genotypes.

G.V.Ranga Rao : You have shown that upper lethal threshold is 40(o)C. When you exposed pupae at 40(o)C, did you consider the possibility of diapause induction?

S.Sithanathan : We dissected the pupae after 6 weeks and determined the mortality from non-emerging pupae.

Omair Singh : Apart from soluble sugar, several other components such as total nitrogen, soluble nitrogen, crude and phenolic compounds were determined in susceptible and resistant lines. But differences were apparent in the total soluble sugars.

S.Sithanathan : Yes, this needs mention.

R.Jambunathan : Are there any published literature/reprints implicating chemical/biochemical compounds in insect resistance/susceptibility in other crops.

S.Si : Yes, very recently there are a couple of publications.

Onkar Singh : After confirming that, for ovipositional nonpreference, soluble sugars are involved in the mechanism of resistance to podfly, how confident are you about the stability of resistance compound to resistance to Heliothis.

The biochemical aspects of work on mechanism of resistance may well be placed in project C-126 presented by Dr. Jambunathan.

S.Sithanathan : The probability of stability of resistance to podfly seems equal, if not more to that of Heliothis.

The biochemical aspects are being looked at by biochemists; we hope to intensify further.

6. Discussion Highlights :

- o Pupation outside pod and in shaded areas be investigated.
- o Close coordination of Biochemists in antibiosis studies be made. This may be studied in project C-126(85)IC.

7. Recommendations :

The points in discussion highlights be considered to improve the work plan.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : P-111 (85) IC
2. Project Title : Study some of the factors affecting the grain quality of pigeonpea.
3. Project Scientists : Umaid Singh
K.B. Saxena
4. Period covered by report : January 1985 - December 1985

5. Discussion

Umaid Singh presented the project progress report.

D.V.R.Reddy : The quality must be determined completely by analysing the amino acid content etc. and some of the work on nutritional quality is better entrusted to other institutions.

Umaid Singh : Such a work is not difficult and we are capable of doing with precision.

J.H.Williams : Were difference in protein lines significant?

Umaid Singh : The difference between high and low protein lines are large and significant.

6. Discussion Highlights :

- o Studies on quality to include amino acid profile.

7. Recommendations :

Work plans be carried taking account of suggestions in discussion highlight.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project number** : BN-101 (85) IC
2. **Project title** : Biological evaluation of advanced/
pre-release cultivars developed by
crop improvement programs.
3. **Project scientist** : R. Jambunathan
4. **Period covered by report** : January 1985 - December 1985
5. **Discussion** : No specific discussions were held.
6. **Discussion Highlights** : Nil
7. **Recommendations**

Work planned be carried out.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : GR-109(85) IC
2. Project Title : Maintenance and evaluation of pigeonpea germplasm
3. Project scientist(s) : P. Remanandan
4. Period covered by report : January 1985 to December 1985

5. Discussion

P. Remanandan presented the project progress report.

K.B.Saxena : What about the 68 promising lines identified for photoperiod insensitivity?

P. Remanandan : The methodology of screening germplasm for photoperiod reaction and promising lines identified by date of planting trials are further tested under extended photoperiod.

Singh : There is need of testing the lines under controlled environment and possible cooperation of physiologist in this screening.

M.H. Mengesha : I Welcome the suggestion.

H.A. van Rheenen: Whether low viability of some accessions would cause a shift in the population?

P. Remanandan: Now better storage facilities are existing and danger of genetic drift is not there.

Onkar Singh : How about the stability of performance of high yielding germplasm lines? Have some lines from germplasm been promoted to yield trials?

K.C. Jain : Many so-called high yielding germplasm lines have been tested by me in replicated trials and none was found outstanding.

J.S. Kanwar : Are the breeders making good use of pigeonpea germplasm in breeding?

P. Remanandan : Particularly in long duration pigeonpea breeding project some germplasm lines/selections have given exceptionally high yield.

J.S. Kanwar : There is need of conducting joint yield trials by and GRU groups.

Future work plan should include screening and testing of germplasm material for above aspects.

7. Recommendations :

- o Joint yield trials be conducted by breeding and GRU Groups.
- o Promising (resistant and stable) lines be tested with suitable statistical designs and entered into yield trials directly.
- o For screening germplasm for photoperiod insensitivity, help from plant physiology group and other related disciplines are desirable.

6. Discussion Highlights :

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : GR-110(85) IC
2. Project Title : Collection of germplasm of pigeonpea and related Cajaninae
3. Project scientist(s) : P. Remanandan
4. Period covered by report : January 1985 to December 1985

5. Discussion

P. Remanandan presented the project progress report and also mentioned about his recent collection trip to West Africa.

R. Jambunathan : How about pigeonpea canning industries in West Indies?

P. Remanandan : Canning industries are excellent and most of the super markets sell canned pigeonpeas.

J.S. Kanvar : What about the collection plan in South and South-East Asia?

P. Remanandan : This area is low in the priority list.

J.S. Kanvar : Why a collection trip to Central America has been planned when similar trip has been made to the Caribbean recently?

6. Discussion Highlights :

- o It is desirable to discuss the collection priorities, material interests with the pulses (pigeonpea) program.
- o Thailand in South East Asia can be a priority area.
- o For collection in India plans be chalked out in collaboration with NBGR.

7. Recommendations :

Discussion highlights should be brought into future work plan.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : GR-111(85) 1C
2. Project Title : Maintenance and evaluation of Cicer germplasm
3. Project Scientist(s) : R.P.S. Pundir
4. Period covered by report : January to December 1985
5. Discussion

R.P.S.Pundir presented the project progress report

J.P.Moss:

- (1) Is the 'Chickpea Descriptors' ICRISAT Publication (it is not listed in the Progress Report)?
- (2) Is the published descriptor list being used at ICRISAT?
- (3) Are other data than passport information for 14 058 entries in the computer?
- (4) If they are, in what form?

R.P.S.Pundir : The chickpea descriptors are published by IBPGR in collaboration with ICRISAT and ICARDA. All the descriptors recorded are listed in the descriptors just published. We received this publication only a few days ago and thus it was not listed in the progress report. The evaluation data on 14 018 accessions is computerized in retrievable form.

J.P.Moss : When will the chickpea germplasm catalog be published?

R.P.S.Pundir : Most of the analysis and summarisation work has been completed. Draft will be ready shortly.

M.H.Mengesha : The base for the 'Chickpea Descriptors' were developed at ICRISAT and mostly by RPS and LJGM. However, it was further reviewed by ICARDA and published in collaboration with IBPGR. The documentation work is in line with descriptor list.

With regard to catalogs, the pigeonpea catalog is in 1st draft stage. Draft of chickpea catalog will be ready soon which will be first circulated to a few scientists for their comments and suggestions before it goes for publication.

W. Reed : The ICARDA chickpea Unit produced a chickpea catalog using ILC numbers. We must ensure that ICRISAT catalog cross refer to ILC numbers.

6. Discussion Highlights :

- o Germplasm evaluated be utilised in other projects.
- o The catalog of germplasm is an important source of information. This be published early.
- o ICRISAT catalog to have cross reference to ILC numbers from ICARDA catalog.

7. Recommendations :

The publication of germplasm catalog should be given highest priority.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : GR-112(85) IC
2. **Project Title** : Collection of Cicer germplasm
3. **Project Scientist(s)** : R.P.S. Pundir
4. **Period covered by report** : January to December 1985

5. Discussion

R.P.S.Pundir presented the project progress report.

R.Jambunathan : When GRU scientists travel for collection of germplasm it would be useful if they could enquire with the farmers on preference of particular types of cultivars. Such data will supplement lab analysis for quality.

It was decided in chickpea planting discussions that GRU will conduct a trial of various seed sizes and color in a replicated trial and supply the seed for protein analysis to know the association between protein content and seed type. What is the position on this?

R.P.S.Pundir : On collection trips we found that most of the farmers grow what they prefer. So they would not be able to give any information on preferences. They do not grow what they do not like.

We have grown, in a replicated trial, 25 accessions comprising of various seed sizes (small-largest), various seed colors and types. The seeds will be supplied to Biochemistry Unit for protein analysis after harvest and processing.

6. Discussion Highlights :

- o It is desirable that collection plans be discussed with pulses (chickpea) program for deciding priorities of exploration and nature of material needed.
- o Collection plans for India be finalised in collaboration with NBPGR.

7. Recommendations :

Work plans for this year should be discussed with the Pulses program.

ICRISAT RESEARCH PROJECT PROGRESS REPORT (1985)

1. Project Number : GR-113(85) IC
2. Project Title : Maintenance of wild Cicer species and interspecific hybridization.
3. Project Scientist(s) : R.P.S. Pundir
4. Period covered by report : January to December 1985
5. Discussion

R.P.S. Pundir presented the project progress report informed that wild species like Cicer judaicum, Cicer reticulatum and Cicer microphyllum have useful characters. Efforts to screen more wild species accessions in collaboration with the other chickpea scientists are in progress.

No specific discussions were held.

6. Discussion Highlights : Nil
7. Recommendations :

Work plan listed be carried out.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : CR-116(85) IC
2. Project Title : Multilocation evaluation of pigeonpea germplasm
- *3. Project scientist(s) : P. Remanandan
4. Period covered by report : January 1985 to December 1985

5. Discussion

P. Remanandan presented the project progress report.

M.H. Mengesha : During multilocation testing and documentation of its data some other important disciplines should also be included with GRU.

J.S. Kanvar : I agree to this view and suggest that we should have a small group for this job.

6. Discussion Highlights :

- o In multilocation testing the data on environmental variables also to be collected for interpretation of results and for this purpose there is need for involvement of other disciplines.

7. Recommendations :

A small group should be identified to take account of various aspects including environmental variables in multilocation testing.

***Cooperating scientist (7(c) in Project outline)**

Harjit Singh is replaced by N.P. Saxena
NBPCR scientists (to be communicated by R.K. Arora)

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : GR-117(86) IC
2. Project Title : Multilocation evaluation of chickpea germplasm
3. Project Scientist(s) : R.P.S. Pundir
4. Period covered by report : January to December 1985
5. Discussion

R.P.S. Pundir presented the project progress report.

W. Reed : I am concerned that quantitative characters which represent environmental differences rather than genotype differences are to form part of the catalog. We have just heard that protein content for 'Annigeri' varies from 10-20% according to environment. Surely we should quote relative to checks, that is the yield, height etc., greater or lesser than appropriate checks grown in the same trial. Also, in the IBPGR Descriptor list it was suggested that pest resistance should be categorized as percent damage. I commented at the draft stage that percent damage in any genotype is, partly a function of reduced susceptibility, but mainly a function of the insect population in the field. Thus a susceptible genotype may be 100% or 0% damaged. We must quote relative resistance, i.e. damage in relation to a control cultivar.

R.P.S.Pundir : For quantitative characters data are recorded on checks also which are planted at random intervals, so the data on other accessions can be related to data on check cultivars if needed.

Disease or pest resistance screening is done by the respective disciplines. GRU is computerizing the data in germplasm data base in whatever form (score/grades/percent damage) the data is provided by the concerned discipline.

6. Discussion Highlights :

- o While evaluating germplasm accession in multilocations/over years, role of environment, diseases, pests as reflected on standard check be used for interpretation of data on quantitative characters.
- o Uniformity in reporting data (scoring) and statistical designs be followed for meaningful evaluation of germplasm lines.

7. Recommendations :

The suggestions contained in discussion highlights should be taken note of while implementing work plans.