PROCEEDINGS OF THE INHOUSE REVIEW

G R O U N D N U T

(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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P R O G R A M

IN-HOUSE REVIEW - GROUNDNUT IMPROVEMENT PROGRAM

3-4 March 1986

VENUE: Auditorium

MONDAY, MARCH 3, 1986

0900	Opening Remarks	L.D. Swindale
0905	Introductory Remarks	J.S. Kanwar
0910	Program Review	R.W. Gibbons

PROJECT PROGRESS REPORTS CHAIRMAN: J.S. Kanwar

Co-chairman : L.K. Mughogho
Rapporteur : S.D. Singh

		Introduced by:
0925	G-101(85) IC: Biology and management of foliar diseases of groundnut Project Scientists: PS,LJR,VMR,AKS Cooperating Scientists: TSW,VRR,NVN, MRR Disciplines: Pat/Brd/Phy/Cyt/ EC/GR	D. McDonald
1000	**Tea Break**	
1015	G-104(85) IC: Biology and management of groundnut diseases caused by viruses, prokaryotes and viroids Project Scientists: DVRR,PWA,AKS,LJR, SLD Cooperating Scientists: KRB,SNN,JPM Disciplines: Pat/Ent/Brd/Cyt	D.V.R. Reddy
1040	G-117(85) IC (Training Project): Epidemiology and screening for resistance to peanut clump disease; serological methods for diagnosis of Witches Broom disease Project Scientist: HAH Supervisors: DVRR, DMcD Cooperating Scientists: MJVR,DS,DDRR Disciplines: Pat/Brd/Nem	D.V.R. Reddy

Co-chairman : Y.L. Nene
Rapporteur : A.M. Ghanekar

		Introduced by:
1055	G-102(85) IC: Biology and management of aflatoxin contamination of groundnut Project Scientists: VKM,MJVR,RCNR,PWA,AKS Cooperating Scientists: VRR,KLS,RJ Disciplines: Pat/Brd/Phy/Ent/Cyt/BN/GR	D. McDonald
1125	G-103(85) IC: Biology and management of groundnut disease caused by soil fungi, bacteria and nematodes. Project Scientists: VKM,MJVR,RCNR,PWA,VMR Cooperating Scientists: AKS,DMcD,JCW Disciplines: Pat/Brd/Phy/Ent/Nem/Cyt	D. McDonald
1145	G-118(85) IC (Training Project): To study genotypic variation in respect of groundnut pod and seed invasion by A. flavus and other fungi and aflatoxin contamination Project Scientist: SN Supervisors: DMcD/VKM Cooperating Scientists: JHW,RCNR,VMR Disciplines: Pat/Brd/Phy	D. McDonald
1200	LUNCH	

Co-chairman : C. Johansen
Rapporteur : Y.S. Chauhan

1400	G-106(85) IC: Water stress effects on groundnut Project Scientists: RCNR,VMR,VKM,PTCN,KRK Cooperating Scientists: VRR,RWG,JAW Disciplines: Phy/Pat/Ent/Brd	J.H. Williams
1425	G-114(85) IC (Training Project): Water stress effects on groundnuts Project Scientist: SNAA Supervisor: JHW Cooperating Scientists: RCNR, JMP Discipline: Phy	J.H. Williams
1440	G-107(85) IC: To investigate nutrient stresses and to exploit rhizobium and mycorrhizae to increase groundnut yields Project Scientists: PTCN,VMR,KRK,MJVR,VKM Cooperating Scientists: KLS,TJR,VRR Disciplines: Phy/Brd/Pat/ SC/GR	J.H. Williams

		Introduced by:
1510	G-116(85) IC (Training Project): Breeding for enhanced nitrogen fixation - some preliminary investigations Project Scientist: MD Supervisors: JHW,PTCN Cooperating Scientists: SLD,MJVR,KLS Disciplines: Phy/Brd/SC	J.H. Williams
1530	**Tea Break**	

Co-chairman : D.G. Faris
Rapporteur : V. Mahalakshmi

1545	G-105(85) IC: Adaptation of groundnut to specific environments and requirements Project Scientists: SLD,MJVR,VMR Cooperating Scientists: LJR,VRR Disciplines: Brd/Phy	R.W. Gibbons
1615	G-115(85) IC (Training Project): Photoperiod effects in groundnut. Project Scientist: MLF Supervisor: JHW Cooperating Scientist: VMR Discipline : Phy	J.H. Williams

TUESDAY, March 4, 1986 CHAIRMAN: J.S. Kanwar

Co-chairman : W. Reed
Rapporteur : S.L. Taneja

0900	G-109(85) IC: Identification and utilisation of host plant resistance to insect pests and associated organisms. Project Scientists: PWA,SLD,AKS Cooperating Scientists: LJR,MJVR,VKM,VRR Disciplines: Ent/Brd/Pat/GR	J.A. Wightman
0925	G-110(85) IC: Biology and management of pests of stored groundnuts Project Scientist: KMD Supervisor: JAW Cooperating Scientists: PWA,VKM Disciplines: Ent/Pat	J.A. Wightman

		Introduced by
0945	G-111 (85) IC: Integrated pest management with emphasis on Spodoptera litura and groundnut leafminer Project Scientists: JAW, GVRR Cooperating Scientists: PWA,RWG,JHW, RAEM/ABSK Disciplines: Ent/Brd/Phy/EC	J.A. Wightman
1010	**Tea Break**	
	Co-chairman: J.R. Witcombe Rapporteur : V.R. Rao	
1025	G-108(85) IC: Exploitation of Arachis species for improvement of the cultivated groundnut Project Scientists: AKS,DCS,JPM Cooperating Scientists: PS,PWA,LJR,VKM,DVRR Disciplines: Cyt/Pat/Ent/GR	J.P. Moss
	JOINT PROJECT - Groundnut & Biochemistry	
	Co-chairman: J.R. Burford Rapporteur : C.K. Ong	
1055	G-113(85) IC: Evaluation of nutritional and food quality of groundnut Project Scientists: RJ,SLD Cooperating Scientist: VRR Disciplines: BN/Brd/GR	R.W. Gibbons/ R. Jambunathan
	GENETIC RESOURCES - GROUNDNUT	
	Co-chairman: R.W. Gibbons Rapporteur : K.E. Prasada Rao	
1125	Introductory Remarks	M.H. Mengesha
1130	GR-114(85) IC: Collection and assembly of Arachis genetic resources from national and international sources; classification and documentation Project Scientist: VRR Cooperating Scientists: All GRU and GIP scientists	V. Ramanatha Rao
1145	GR-115(85) IC: Maintenance and evaluation of groundnut germplasm Project Scientist: VRR Cooperating Scientists: All GRU and GIP scientists.	V. Ramanatha Rao

OPENING AND INTRODUCTORY REMARKS

Dr.L.D. Swindale in his opening remarks mentioned that India is very much concerned on groundnut diseases and production and is waiting anxiously for any breakthrough by ICRISAT groundnut research. For the improvement of oil-seeds ICAR is also contemplating appointing a Senior Officer as Additional Director General (Oilseeds).

ICGS11 needs to be multiplied and its agronomy worked out for higher yields.

We need to make sure the requirements of African countries and our client group in the national program kept informed about the latest developments in technology and genotypes.

Dr.J.S. Kanwar in his introductory words said that better progress is possible through interdisciplinary approach. Our work plans need to be tied up with the requirements of our mandate area and seed constraints to be removed for spreading the promising varieties. Dr.M.V. Rao, who would take over the Directorship of the Technology Mission on oilseeds has assured for multiplication of ICRISAT's seeds for India. Dr.D.G.Faris to look into the seed requirements and multiplication for South East Asia.

Training of larger groups in research methodology in various disciplines for different crops is important. Scientists should spare time for this purpose.

PROGRAM OVERVIEW

Mr.R.W. Gibbons gave an overview of work carried out last year in the groundnut program. He mentioned that progress is reported as the projects were initiated only last year after thorough review, alongwith lines suggested by the EPR report and the discussions held at the previous inhouse review. The program has regular meetings of scientists to review the progress on each project. Close relationships are existing with the Germplasm Resources Unit and Biochemistry. In large seeded confectionary types, results from Sudan are encouraging. Short duration types have been produced and their suitability for rice fallows is underway. A number of entries are performing well in AICORPO trials. The southern African program is making excellent progress. The SADCC scientists desired that work on insect pests should be carried out at ICRISAT Center and in the southern African region. Cytogeneticists must contribute to early leaf spot disease research in southern Africa also. He said that Plant Quarantine is posing a problem in some of the SADCC countries and a meeting with concerned officials might help solve this problem. On his tours he noticed that ICRISAT's publications are much valued particularly in remote Research Stations.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-101(85) IC

2. **Project Title** : Biology and management of foliar diseases of groundnut.

3. **Project Scientists** : P. Subrahmanyam
   L.J. Reddy
   V.M. Ramraj
   A.K. Singh

4. **Period covered by report** : January 1985 - January 1986

5. **Discussion**

D.McDonald introduced the project progress report.

L.D. Swindale : You have mentioned the testing of 13 foliar disease resistant and high yielding lines in various AICORPO trials. What are the diseases involved?

D.McDonald : The diseases we referred to are rust and late leaf spot (LLS).

L.D. Swindale : The section of the report on economics does not contain any economics data?

T.S. Walker : Input from economics will be incorporated in next year's report. We are currently working on three areas: i) Partial budgeting of all trials conducted since 1977 on host-plant resistance, ii) modelling, possibly using dynamic programming, to determine optimum levels of host-plant resistance, and iii) economic analysis of farmer's yield trials under spray and no-spray treatment with susceptible and resistant material.

L.D. Swindale : Is the level of LLS resistance obtained by the use of wild relatives significantly greater than that obtained from the cultivated groundnut?

A.K. Singh : The resistance transferred from wild species into A. hypogaea is of a similar degree as is available in cultivated groundnuts. But the interspecific derivatives with resistance to rust and late leaf spot are agronomically superior to the sources from cultivated groundnuts. Many interspecific derivatives can be introduced directly in a system while others can be utilized as better sources of resistance in a conventional breeding program.

J.S. Kanwar : You have been looking for testing site for early leafspots (ELS). Which are these sites?

P. Subrahmanyam : At the present time LLS and rust are predominant in almost all major groundnut growing areas in India. I understand that ELS is predominant at Pantnagar. We would like to visit Pantnagar in the coming season and initiate some collaborative trials.

J.H. Williams : With the progress of resistance to LLS it is likely that we will encourage ELS to develop as a major problem.

P. Subrahmanyam : No, I think that enviromental factors are more important in determining the relative prevalance of the disease.

J.S. Kanwar : Can we create ELS epidemics artificially utilising controlled environment?

P. Subrahmanyam : We can evaluate germplasm for resistance to ELS in the glasshouse. However, it is difficult to promote the disease in epiphytotic proportion in field trials at ICRISAT Center.

A.K.S. Huda: You mentioned in the report that there was no disease development below 10 or above 35 C. What was the effect of maximum and minimum temperatures? In future work, you may consider this aspect in relation to the studies on effect of environmental factors on disease development? How would you do this in field ?

P. Subrahmanyam : We have presented results from a preliminary trial. More research needs to be done in this area. We plan to simulate environmental conditions in growth chamber and study their effects on ELS development.

J.P. Moss : Will the competition between ELS and LLS be affected by the widespread release of LLS resistant material?

P. Subrahmanyam : I do not think that there is a competition between ELS and LLS. I consider that environmental and host factors are more important in determining the degree of severity of these diseases.

L.K. Mughogho : Do you know the optimum temperature for ELS infection and disease development in the glasshouse ?

P. Subrahmanyam : 25 C is optimum for infection and subsequent disease development in the glasshouse.

D.G. Faris : Do you have evidence to show that genotypes resistant to rust and LLS at ICRISAT Center were also resistant in the Philippines and Thailand?

D.McDonald : In general, resistance to rust and late leaf spot diseases has been found stable in our multilocational testing. However, some differences in reaction to rust have been noted for a few genotypes between ICRISAT Center in India and Guangdong Province in the People's Republic of China.

P. Subrahmanyam : Before 1984 several entries that were resistant to rust at the ICRISAT Center, showed resistance in the People's Republic of China. However, in 1984 and 1985 two highly resistant lines at ICRISAT were only moderately resistant in the People's Republic of China. This may be due to variation in pathogen populations. Further studies are necessary to characterise the race situation using differential series.

J.P. Moss : Do you think that low severity of ELS at ICRISAT Center is due to low inoculum availability ?

P. Subrahmanyam : Inoculum is available in abundance. Low disease severity may be due to uncongenial climatic conditions. In our field screening trials, we inoculate infector rows with ELS pathogen and provide potted spreader plants as an additional source of inoculum.

J.S. Kanwar :
(1) Is ELS a serious problem in the SAT? Can we screen effectively for resistance under natural conditions?
(2) You are screening simultaneously for resistance to 5-6 diseases. How can you do this?

D.McDonald : Early leaf spot is a serious problem in West Africa, Southern Africa, the USA and in parts of Asia. Field screening presents no problems in Southern Africa but it does at ICRISAT Center where disease levels are usually very low.

P. Subrahmanyam : Effective screening for resistance to ELS can be done in Malawi where the disease pressure is very high. At the present time we are giving priority to LLS and rust only. Research on other diseases will be taken up when need arises.

6. Discussion Highlights :

- o Input from economics need to be incorporated.
- o Biology and epidemiology of early leaf spot needs to be well understood.
- o There is need to understand influence of temperature, humidity on the foliar diseases.
- o Suitable site in India be identified to screen for early leaf spot.
- o Screening for early leaf spot in Malawi is desirable.

7. [illegible]mation :

Work plans should include suggestion made in discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-102(85) IC

2. **Project Title** : Biology and management of aflatoxin contamination of groundnut.

3. **Project Scientists** : M.J.V. Rao
R.C.N. Rao
V.K. Mehan
P.N. Amin
A.K. Singh

4. **Period covered by report** : January 1985 - January 1986

5. **Discussion** :

D.McDonald introduced the project progress report.

V.K. Mehan : Aflatoxin contamination can occur before harvest, during post-harvest drying, or in storage. In the SAT aflatoxin contamination appears to be mainly preharvest in origin. We are now laying more emphasis on resistance to preharvest seed infection by A.flavus. Some groundnut genotypes with resistance to in vitro seed colonization have also shown field resistance to seed infection by the toxigenic fungus. We are now testing these genotypes for stability of resistance in multilocational trials in drought-prone areas of South India.

J.S. Kanwar : ICAR is giving high priority to aflatoxin research and is planning to hold an international workshop on aflatoxin research.

R.W. Gibbons : Resistance to aflatoxin production may be viewed as a package which should include detoxification, cultural and chemical control practices besides genetic resistance.

Y.L. Nene : What is the position on biological control of the fungus Aspergillus flavus?

S. Mahdi : Species of Penicillium have been preliminarily observed as to antagonistic Aspergillus flavus and this aspect is further under investigation in our research.

M.H. [illegible]: Is there any method by which we can make our germplasm free of aflatoxin contamination?

D. McDonald: Seed will be free from aflatoxin if they are free from the toxin producing fungus Aspergillus flavus. This fungus can cause seed rot and seedling disease. If an aflatoxin - producing strain, it can cause aflaroot disease. It is desirable that seed in your germplasm collection should be free from infection with Aspergillus flavus.

Y.L. Nene : Can the variation between genotypes resistant and susceptible to Aspergillus flavus infection be explained by biological interaction?

S. Nahdi : Studies on geocarposphere mycoflora of different cultivars that are resistant to Aspergillus flavus infection viz., J 11 and PI 337394F and genotypes susceptible to seed infection viz., TMV2, EC 76446(292) and NC Ac 17090 showed significant differences in fungal populations. J 11 showed significantly higher populations of A niger, PI 337394F showed higher population of Pencillium spp. while susceptible lines TMV2 EC 76446(292) showed higher populations of A.flavus

6. **Discussion Highlights :**

- o It is desirable to study Aflatoxin contamination even in post harvest stages.
- o Apart from genetic resistance, cultural chemical and biological methods of control be identified.
- o It is desirable to make available information on Aflatoxin to the extension agencies for its avoidance and control.
- o Effect of irradiation on Aflatoxin and groundnut preservation may be tried.

7. [illegible]tion :

The work plans be improved in the light of suggestions in the discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-103(85) IC

2. **Project Title** : Biology and management of groundnut diseases caused by soil fungi, bacteria and nematodes.

3. a) **Project Scientists** : M.J.V. Rao
R.C.N. Rao
V.K. Mehan
P.W. Amin
V.M. Ramraj

4. **Period covered by report** : January 1985 - January 1986

5. **Discussion** :

D. McDonald introduced the project progress report.

Y.L.Nene : There are 8 economically important diseases in groundnut and that genotypes have been identified resistant to different diseases; however, he wondered if there was adequate interaction from breeders to utilize resistance for 2 to 3 diseases and incorporate these into a single variety.

R.W.Gibbons : Genotypes such as J 11 has dry seed resistance to Aspergillus flavus and pod rots; another genotype NC Ac 17090 is resistant to few foliar fungal pathogens and has good drought resistance. The lines under use in breeding programs are having multiple resistance.

6. **Discussion Highlights** : Nil

7. **Recommendations** :

The work planned be carried out.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-104 (85) IC

2. **Project Title** : Biology and management of groundnut diseases caused by viruses, prokaryotes and viroids.

3. **Project Scientists** : D.V.R. Reddy
P.W. Amin
A.K. Singh
S.L. Dwivedi
L.J. Reddy
M.J. Vasudeva Rao

4. **Period covered by report** : January 1985 - January 1986

5. **Discussion** :

D.V.R.Reddy introduced the project progress report along with report on Project G-117(85)IC (Training project).

J.S.Kanwar : How serious is the bud necrosis?

D.V.R. Reddy : In the Rabi crop it is serious in Andhra Pradesh and Karnataka. In the rainy season it is important in M.P. and U.P., particularly, in Manipur district of U.P. It is also important in parts of A.P., Karnataka, and Maharashtra.

P.W.Amin : ICAR recognises bud necrosis as one of the most important diseases of groundnut. We are collaborating with A.P. Agricultural Dept. and APAU, Rajendranagar, on the management of this disease.

L.K. Moghogho : How do you rank 3 virus diseases?

D.V.R. Reddy : Bud necrosis is the most important disease in India. Peanut mottle is important world-wide, including African countries, Philippines, Thailand, and the Peoples' Republic of China. Peanut clump is next to peanut mottle in its importance.

J.A. Wightman : Are these virus disease important to virologists or to farmers?

D.V.R. Reddy : They are economically important. Because of the problems of identification farmers as well as scientists tend to ignore them.

J.S. Kanwar : What are your strategies for breeding for resistance to these diseases?

D.V.R. Reddy : We are looking for resistant sources for all the diseases. We are also finding other methods of controlling the virus diseases.

L.K.Moghogho : Are lines released for cultivation in India resistant to bud necrosis?

D.V.R. Reddy : Yes, for example Robut 33-1 and ICGS-11.

S.B.King : What is the practical use of solarization?

D.V.R. Reddy : I can't positively comment on it. It is an extremely useful technique and it has been quite successful in reducing the soil-borne diseases. Once cheap methodology becomes available, we would like to use it.

J.S. Kanwar : You should make an effort to start training program for quarantine workers. What type of job a post-doc fellow will do?

D.V.R. Reddy : We are training Post-Docs in characterisation, identification and screening. We need trained virologists in India. We hope to hold a workshop in 1988. Efforts will be made to invite people involved in quarantine work in various countries and train them.

A.M.Ghanekar : Whether the peanut genotypes identified as resistant to seed transmission (non-seed transmission) at ICRISAT are resistant to seed transmission in Georgia, USA?

D.V.R. Reddy : I couldn't do this work in Georgia because I was involved in several other projects.

A.M.Ghanekar :
(1) Why to screen peanut varieties for resistance to clump when the disease occurs in isolated patches?
(2) Whether the genotypes of peanut identified as resistant at Bapatla, are resistant at Ludhiana?

D.V.R. Reddy : The disease is economically important and screening must continue. We should concentrate our efforts in Ludhiana and all promising lines must also be tested at Bapatla. In wild species, we are likely to locate resistance.

A.M.Ghanekar : What is the evidence for transmission of PCV by Polymyxa?

D.V.R. Reddy : Polymyxa is present in all clump infested soils. Dried infected roots with polymyxa can produce infection. Root soakates can also produce infection. We successully identified Polymyxa in infected roots.

L.K.Moghogho : Would you like to comment on the witches' broom project?

H.A. Hobbs : The main use of the witches' broom antiserum would be in screening for or detection of witches' broom in S.E. Asia. We can provide antiserum to interested people and tell them how to do the ELISA test. The first thing we need to find out is if the witches' broom MLO in S.E. Asia is the same serologically as the one in India.

D.G. Faris

(1) Peanut mottle is important in Asian countries outside India. What other viruses are important?
(2) Are there any "resistant" material for Asian countries outside India.

D.V.R. Reddy : Peanut stripe is important in all S.E. Asian countries I visited. We have tolerant lines for PMV. In addition, we are training scientists in these countries who will be able to handle these viruses.

C.L.L.Gowda : Regarding non-seed transmission of PMV;
(i) is the seed from infected plant doesn't carry the virus?
(ii) do you have screening techniques developed to help the breeders for breeding for non-seed transmission?

D.V.R. Reddy : Plants are infected, but the virus is not seed transmitted. We have a screening procedure and we can test nearly 9000 seed per day without destroying the viability. We currently do not know the mechanism of virus seed transmission.

J.P.Moss : How do "direct" and "indirect" ELISA techniques differ, and how is "indirect" more suited to surveys?

D.V.R. Reddy : In direct ELISA coating and conjugated antibodies are the same. In indirect conjugated antibodies are different. In the indirect procedure developed, antigen is coated directly and antisera are used in the next step and anti rabbit r-g are used for conjugation. Entire test can be done in 3 hours.

7. Discussion Highlights :

- o There is need for training Plant Quarantine personnel on diseases caused by viruses. Training of scientists from different countries on disease diagnosis will be useful.
- o Screening for clump disease at Ludhiana and Bapatla should be done only in collaboration with the local program.
- o It is desirable to look for resistance in wild species for clump disease.

7. Recommendations :

Work plans may be improved based on suggestions made in the discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-105(85)IC

2. **Project Title** : Adaptation to specific environments and requirements.

3. **Project Scientists** : S.L. Dwivedi
M.J. Vasudeva Rao
V.M. Raj

4. **Period covered by report** : January 1985 - January 1986

5. **Discussion** :

R.W.Gibbons introduced the project progress report.

S.L. Dwivedi : Substantiated on rainfed and rabi/summar irrigated crops and confectionary types, groundnut meant for export, which are gaining prominance in India. Transgression segregants for large seed from cytogenetics program are now available.

M.J.Vasudeva Rao : Substantiating on Early Maturity Lines mentioned that these types would find a place in situations where
(1) The rainy season is short.
(2) The cropping system forces use of an early type
(3) There are cool temperatures in the later part of the season.
(4) There are rice fallows.

Early maturing lines are presently being tested in the rice based cropping system of IRRI. Although the crop cannot compete with mung bean in duration, the value of crop should make it competitive in this system. A trial consisting of early maturing lines was sent to 52 locations out of which 24 were in Africa, 25 in Southeast Asia and 3 in other continents. In many locations the early types outyielded the local checks by more than 50%. In some locations these outyielded the currently utilized breeding varieties. In Pakistan these matured 30 days earlier than the local, Banki with the same yield. But this 30 days gives an advantge in allowing wheat to be planted on time. Wheat is the major crop of the region.

J.H.Williams : Substantiated on physiological studies and also introduced the project progress report of G-115(85)IC (Training Project). Effect of photoperiod in this crop is subtle. Time to flowering is unaltered. But the effect on crop growth rate, partitioning, and duration are significant. The manipulation of growth hormone normally associated with stem elongation and photoperiod GA had no effect.

D.G. Faris : What is the comparative yield of oilseed and confectionary types?

R.W.Gibbons : Confectionary types have as high a yield potential as other virginia types and given the right growing conditions a higher yield potential than spanish or valentia types is possible because of their plant type. Being large seeded they do, however, have higher requirements for inputs, particularly gypsum, to ensure adequate seed development. Our main thrust is still the oilseed type.

D.G. Faris : In Pakistan there are two situations. One is sowing in March-April with the early rains where the crop undergoes heavy stress during the "Summer" before the rains come in June. This allows the crops to get a head start so that they miss the late season stress. The other situation is a short duration type where the crop is sown in June with the main rains and matures before the end of season drought stress. The second system is new and they are very interested in it—but breeding must provide varieties for both situations.

R.C.N. Rao : We have also had some discussion with people concerned.

J.H. Williams : We have over the past years defined the early stress response patterns as an area to receive attention and have shown that substantial variability exists within species for the recovery response. Such material can be sent to them.

J.M. Peacock : Do you plan to look at other plant hormones? In addition to plant hormones should you be looking at the production of different enzymes? Perhaps electrophoresis methods would be useful.

J.H. Williams : The process is to systematically examine the most likely products and see if they can be modified by photoperiods. Once the product or process involved has been identified a screening process can be developed.

F.R. Bidinger : Off-season, irrigated crops of groundnut in India probably represent a wide range of physical environments depending upon where and when the crop is grown. What is the unifying theme or principle of the breeding program for the off-season crop?

J.H.Williams : In the summar irrigated environment, a very wide range of conditions exist. We don't have the ability to undertake research on all these aspects, but do recognize that they are important and would start research if we could on temperature.

Murari Singh : For determining the adaptation of groundnut genotypes, using a temperature x genotype interaction study, how can one create differential temperatures without confounding the effect of temperature with other factors in the field environment. Can a polythene "tent", which increases above ground temperature, be used for raising temperature since a polythene cover increases under ground temperature in solarization studies?

J.H.Williams : We haven't tried this. We would like to conduct these studies in controlled environments. We are looking at the opportunities to collaborate with other institutions on this aspect.

Y.S. Chauhan : Have any studies been conducted using the photoperiod sensitive varieties under long day conditions and studying the effects of commonly known hormones on various growth parameters of these varieties to understand the basis of responses.

M.L. Flohr : The work was done on only one cultivar. The vegetative growth is modified but not the photoperiod response. We tried only GA(3), there are other gibberlins and hormones which may be involved.

D.C. Sastri : In other crops induction of photoperiod response is through some tissue. Have you identified the tissue in groundnut which could be the target tissue?

J.H. Williams : We don't have a classical photoperiod response so have no basis to build our hypothesis on.

D.G. Faris : There is a great interest in both early and confectionary groundnut varieties wherever I have travelled so these are very important components of the groundnut improvement program.

6. **Discussion Highlights** :

- Many groundnut growing countries in Africa, India and Pakistan are interested in shorter duration and harvesting within 90 days or before the rains are over.
- It is desirable to look for other enzyme activities along with GA on photoperiod responses.
- Temperature and humidity could form additional inputs to study photoperiod effects.
- Agroclimatologists be involved in the project.

7. **Recommendations** :

The work plans should include the suggestions from the above discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-106(85) IC

2. **Project Title** : Water stress effects on groundnuts.

3. **Project Scientists** : R.C.N.Rao
V.K.Mehan
V.M.Ramraj
P.T.C.Nambiar
K.R.Krishna

4. **Period covered by the report** : January 1985 - January 1986.

5. **Discussion** :

J.H.Williams introduced the project progress report.

C. Johansen : In previous DRSF discussions on drought tolerance in groundnuts, Dr. M.J.V. Rao spoke of a breeding program for incorporating drought tolerance into groundnuts. Where does this activity fit in, to either this project or another one?

J.H. Williams : As yet we do not have a specific project on breeding for drought tolerance but we intend to have detailed discussions on this aspect.

S.L. Dwivedi : On a limited scale, promising drought tolerant lines have been included in crosses in other projects.

F.R. Bidinger : I doubt the wisdom of a breeding project specifically on drought resistance. A breeding project should be aimed at a target environment and contain the objectives necessary for success in those environments. If drought resistance is one of those then it should be included with other objectives necessary for such environment.

J.H. Williams : Yes, but two approaches exist. Either to go for breeding for drought tolerance or to do it through the already existing breeding emphases.

J.M. Peacock : You indicate that you plan to develop techniques for studies on roots. Can you say more about these studies?

J.H. Williams : Yes, we have a GTZ funded effort to do root studies. The work ultimately will look at root growth of the drought resistant lines to see if a factor can be identified which could be used to screen for these attributes.

C.K. Ong : It is important to have close cooperation between the crop physiologists and agroclimatologists who have made a lot of agroclimatological maps of groundnut growing areas. Can you elaborate on the types of cooperation between the Scientists of the project and our agroclimatologists?

R.C.N. Rao : It has just started with 0.05 man-year involvement by myself.

J.H. Williams : In short, there is not enough cooperation but it should also embrace the economists.

C.K. Ong : How are you making use of agroclimatological data?

J.H. Williams : At this stage we should be able to make use of it. We now have lines with various characteristics. They can be fitted to various defined environments.

C. Johansen : Can Dr. Ong suggest the ways in which the agroclimatologists can best cooperate in this project?

C.K. Ong : In using probabilities of duration of season to predict timing of stress for various genotypes. This should permit selection of appropriate genotypes for particular areas.

J.H. Williams : My philosophy is that the duration of season is not important as a drought problem. It is the unpredictable nature and variation in its duration that is important. We have found under such conditions that mixing of early and late varieties gave a 10-12% yield advantage. Depending on rainfall pattern, either early or late or both will do better.

P. Somman : The project defines the involvement of pathologists, microbiolgists, etc. Except for a brief mention of the work on micorrhizae, the contribution of others is not given in the Summary. I would like to know the contribution of others in the project.

J.H. Williams : The other scientists are currently active, but the progress report spans the experiments started before the project was initiated.

D.G. Faris : It seems important to include a breeding component in this project, both to identify the material in the multilocation trials that does well under drought conditions and also to start making crosses using the lines already identified as having resistance. Thus, when the appropriate drought screening procedure has been developed, there will be breeding material with drought resistant parents which can be screened. This should put you further ahead than waiting to make crosses once you know what all the drought components are.

J.H. Williams : Yes, that is one approach but the other possibility is to consider the drought problem pertinent to all the other improvement efforts and utilize the materials developed in other projects for that purpose.

P.W. Amin : Drought interacts strongly with insect pests and vectors. When rainfall is less, the insects multiply faster. So the plant/crop is under double stress—drought and insects. Also, since crops are affected by drought, farmers will not apply pesticides although insects will give more setback to droughted crops than to vigorous crops. I suggest we give priority to breed for combined drought and insect resistance. This is preferable to just screening existing lines.

J.H. Williams : Yes, but what needs to be decided is whether the lines with drought tolerance should be used in all breeding programs or in a separate breeding effort.

C. Johansen : I wish to know whether results of screening for drought tolerance in rabi will hold good for kharif also.

J.H. Williams : We recognise the problem. We work at two places - at Anantapur in the rainy season and at ICRISAT in the rabi season. Given the limited resources one cannot do more.

J.M. Peacock : I would like to take up the point of clarifying drought environments of India and Africa with agroclimatologists and ask them to tell us which areas have seedling drought stress, mid season stress and terminal stress. It seems important that we have this information readily available for those locations where we have scientists and resources to do research. If we do not, who will do the analysis? Dr. Sivakumar, in Niamey, has done this for a few locations in West Africa and it is very informative.

C. Johansen : Is any agroclimatologist working on Groundnut?

A.K.S.Huda : We have a collaborative project with groundnut improvement program on groundnut modelling. Agroclimatologists at ICRISAT have produced reports and bulletins on rainfall and PE for many locations in the SAT. This information could be useful for the groundnut program if they intend to select locations for testing their material. Proceedings of the ICRISAT-WMO symposium on agrometeorology of groundnut (to be published soon) could be a valuable source of information.

6. **Discussion Highlights**

- o There is need for greater involvement of agroclimatologists in this project. The data available on agroclimatology to be used for selection and suggestion of genotypes suitable for different drought situations. Analysis of SAT groundnut areas likely to face seedling, mid season and terminal stress is essential.

- o There is need for screening for drought in different seasons.

- o The breeding strategy for drought needs to be established and if necessary a breeding component incorporated.

- o Screening for drought stress should be integreted with other aspects of the groundnut improvement project including pests and diseases.

6. [illegible]tion :

Work plans should be improved to reflect the suggestions made in discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : G-107(85) IC

2. Project Title : To investigate nutrient stresses and to exploit rhizobium and mycorrhizae to increase groundnut yields.

3. Project Scientists : K.R.Krishna
P.T.C.Nambiar
V.M.Ramraj
M.J.V.Rao
V.K.Mehan

4. Period covered by report : January 1985 - January 1986.

5. Discussion :

J.H.Williams introduced the project progress report.

K.K.Lee : Has NC 92 consistently shown an inoculation response? How many trials have been conducted and how many trials showed a response?

J.H. Williams : "Consistently" is the wrong word to use. Often there has been a response but Dr. Nambiar can provide the exact details.

P.T.C. Nambiar : In our earlier trials, 4 out of 7 trials showed statistically significant yield advantage of NC 92 inoculum, and pooled ANOVA showed significance over all seasons. Based on three years tests in different locations, AICORPO has recommended this strain for inoculating cultivars Robut 33-1 and JL 24. Other cultivars include 28-206 in north Cameroon, ICGS 11, ICGS 5, ICGS 24 at ICRISAT, E Hua and Hang Hua in China.

J.H. Williams : Looking at the response pattern, it appears you may get a response in low yield environments. In high yield environments, it may not give response. I suspect interaction between environmental quality and the response.

C. Johansen : What is the current explanation of NC 92—is it fixing extra N?

P.T.C. Nambiar : It is not extraordinarily superior. The advantage may not be due to N fixation, but perhaps is due to other reasons such as release of iron chelating compound, thereby increasing the availability of iron to the plants.

P. Somen : Al and Mn toxicity—is this work out of scientific curiosity or is Al and Mn toxicity a real problem in groundnut growing areas?

J.H. Williams : These toxicities are problems in the more tropical areas of groundnut cultivation.

P.T.C. Nambiar : Yes, they are relevant to areas such as Malaysia, Thailand, etc. Manganese is a problem in part of India, such as in the Tirupati area.

J.V.D.K. Kumar Rao : What is the practical utility of the stable, non fixing mutants of Rhizobium strain NC 92?

P.T.C. Nambiar : They serve as a good tool as non-fixing NC 92. Field experiments involving these strains indicated that inoculating non-fixing mutant decrease pod yield of Robut 33-1. These mutants could also be used to understand the genetics of NC 92.

J.S. Kanwar : Did you simulate the Al toxic conditions of Thiland in your glasshouse?

P.T.C. Nambiar : Yes, in seed culture by applying more Al and making the root environment more acidic.

J.H. Williams : We intend to retest the promising material for Al tolerance in Thailand.

P.T.C. Nambiar : We could very well get the genotypic differences and strain differences for Al tolerance.

C. Johansen : Many legumes have already been studied for Al-Mn toxicity. I wonder if groundnut varieities already studied elsewhere in solution culture could be tested in the field where these problems exist.

P.T.C. Nambiar : There are only two reports known to me. The reason for taking up the toxicity studies was nonresponsiveness of NC 92 strain at Tirpuati, which may be due to its Mn intolerance.

J.S. Kanwar : Has groundnut originating in Latin America, which may be grown in toxic environments, been tested here?

J.H. Williams : It is not our priority area so emphasis is at a very small scale.

D.G. Faris : Regarding the work plan for the next year in what countries have Rhizobium inoculation trials been made? Have there been worthwhile responses? What difficulties need to be overcome? Will you be going into other countries. Should you consider more such trials until you can adequately monitor them, especially in other countries?

J.H. Williams : The countries where trials have been conducted are listed in the project progress report. Responses have been observed at only one site but we have doubts about conducting trials unless we can do the trials properly. Perhaps we should not continue with these trials.

Y.L. Nene : How do you plan to exploit mycorrhizal fungi? Are you thinking of ways by which mycorrhizal fungi could be used on a practical scale on groundnuts?

J.H. Williams : There are two possible exploitation routes. 1—selection of genotypes with greater affinity to native VAM, 2—using inoculation. Although difficulties exist in the second, the first exists as an immediate opportunity.

K.R. Krishna : Mycorrhizal infection is like an endemic disease for which you need to have horizontal susceptibility to increase the infectivity. We are exploring the possibility of producing mycorrhizae through tissue culture. Also it can be easily multiplied in a patch by the farmers themselves.

D.C.Sastri : What is the competitiveness of NC 92 in relation to the native Rhizobium strains? Symbiotic association, nodulation and N2 fixation can be three aspects different from each other. Similar is the situation with mycorrhizae. How does one knock off the native population to introduce the new and more efficient one?

J.H. Williams : By management introduced strains can be increased and manipulated in the soil.

P.T.C. Nambiar : We have conducted studies on competitiveness of rhizobia and reported earlier.

K.R. Krishna : As far as selection of mycorrhizae is concerned, first select for higher infectivity and then for effectivity and competitiveness.

P. Soman : Have you got any preliminary ideas on the effect of water stress on N fixation?

P.T.C. Nambiar : The objective of the concerned experiment was to understand sowing depth x water use efficiency. Our earlier experiments indicated that farmers in southern India could achieve a more or less 30% yield advantage by changing the sowing depth alone.

C. Johansen : A lot of good information has been generated in both projects. There are however, several aspects that should receive attention in future. These are breeding for drought tolerance, agroclimatologists involvement, screening for droughts in different seasons, NC 92 response, how to run multilocation trials to get reliable data, and to continue the approach of screening for genotypes susceptible to mycorrhiza infections.

J.S. Kanwar : Regarding NC 92, J.H.Williams mentioned earlier that it only works in poor environments. Is it strain x environment interaction? We should give the strain to National Program for further work on this aspect. However, work is required on understanding the basis of its response. As far as mycorrhizae is concerned, we should know whether its effectiveness is in low P environments only. We should look into the problems of application of this technique for improving plant nutrient.

6. **Discussion Highlights** :

- o Rhizobium response studied in relation to genotype x environment and in relation to native rhizobium need be strengthened. Better understanding is required between symbiotic asssociation, nodulation and N2 fixation.

- o It is desirable to test the promising material for Alluminium tolerance in Thailand.

- o Strain x environment interaction study can be tried by National programs.

- o Effect of mycorrhizae at different levels of Phosphorus fertilization is desirable.

- o Work on applied aspects of rhizobium and mycorrhizae need be explored.

7. **Recommendations** :

Work plans be improved based on discussion highlights.

ICRISAT RESEARCH PROJECT [illegible] REPORT

1. Project Number : G-108 (85) IC

2. Project Title : Exploitation of wild Arachis species for the improvement of the cultivated groundnut.

3. Project Scientists : A.K. Singh
D.C. Sastri
J.P.Moss

4. Period covered by report : January 1985 - January 1986.

5. Discussion :

J.P. Moss introduced the project progress report and mentioned that new wild species accessions with rust and late leaf spot resistance are being utilized in the introgression work. Stable advanced interspecific derivatives with high yield potential are now available. Genomes of three new accessions were cytogenetically characterized. In the utilization of species not normally compatible with A. hypogaea attempts were made to cross three species, belonging to three different sections, with A. hypogaea and refinement in hormone treatment was underway.

A.K. Singh : Supplemented that characterization of advanced lines of interspecific derivatives was done. Along with traits under transfer, such as late leaf spot resistance, other desirable traits were also transfered. Electrophoretic studies, to develop some chemical markers are in progress.

C. Johansen : Main aim of the cytogenetics work is to transfer pest and disease resistance from wild species to cultivated types. What about the transfer of other, possibly physiologically important characters such as root or partitioning characters, high or low temperature tolerance, leaf or canopy characters?

A.K. Singh : We will be looking for such traits in stable advanced lines.

C. Johansen : I meant looking amongst wild types for good characters and then trying to cross.

J.P. Moss : Original aim was very specific, that is disease resistance - controlled by a few genes only. We do not know genetics of other physiological characters. If we transfer large groups of genes, we may also be transfering many undesirable characters. Thus we prefer to look for desirable physiological characters among segregants or advanced lines.

A.K. Singh : Some results from China on rooting and drought tolerance have indicated the physiological potential of some of the interspecific derivatives. However, we are not making any specific effort for screening of wild species for these characters and their transfer to cultivated groundnut.

J.H. Williams : Most of the physiological traits for which wild species are providing derivatives with advantage over cultivated species are transgressive segregants and there is no obvious advantage for them in the parent wild species. It seems therefore that there will be little advantage in screening the wild species for these often difficult-to-measure attributes.

R. Jambunathan : Do we know about the quality of the seeds of wild species including oil quality and the presence of any other factors?

A.K. Singh : In the initial stages total fat content of the interspecific derivatives was determined. However, no significant differences were observed. So we discontinued this.

M.J.V. Rao : I suggest that one set of all the advanced generation derivatives from interspecific crosses be deposited in GRU for posterity.

J.P. Moss : Part of the objective of the efforts to eliminate duplicates was to determine the advanced lines to be deposited in GRU.

D.V.S. Reddy :
(1) Could you identify sources of resistance to early leaf spot in wild species before you embarked on exploitation?
(2) You said that 13 of the 59 derivatives "significantly out yielded the checks" - what are the checks you are referring to? Do they include the best selections of foliar disease resistant project?
(3) You said that 28 of the 78 near uniform lines were selected at ICRISAT. What is the selection criterion? Do they have late leaf spot resistance as shown at Bhavanisagar?

A.K. Singh :
(1) We did not concentrate on early leaf spot resistance. However, for the late leaf spot the resistant sources were identified in 1974 in USA and they were confirmed at ICRISAT.
(2) There were four checks which included a late leaf spot resistant cultivated groundnut; national check, JL 24; local check R 33-1 and a FDRS breeding line.
(3) The 28 selections at ICRISAT were made on the basis of resistance to late leaf spot, rust and other agronomic traits including yield. The selections made at Bhavanisagar, where rust disease is less severe, were based only on late leaf spot resistance. These selections were different from those made at ICRISAT Center.

L.D. Swindale : I suggest that during 1986 you concentrate on solving the problem of transferring plants in tissue culture to soil.

J.P.Moss : I fully agree. We have discussed this matter in project meetings and have already planned experiments.

P.N. Amin : In many areas groundnut is valued for fodder and farmers are looking for cultivars with normal pod yield and more fodder. Are we looking for such lines?

A.K. Singh : We have identified a few lines with greater haulm yield as well as good pod yield. However, they have been supplied only on request, to workers in countries like Philippines, Thailand and Australia.

M.H. Mangesha : It may be desirable to transfer as many wild species accessions as possible to GRU for conservation, so that all the available genotypes of the wild species are conserved. Later on the problem of duplicates could be studied and handled.

J.P. Moss : We can transfer to GRU whatever GRU can handle.

J.R. Witcombe : If you have good evidence of yield increase in wild species derivatives, over and above that due to absence of disease, because you have transferred disease resistance, then this should be documented. How many accessions are you going to analyse using the chromosome banding technique?

A.K. Singh : Genome analysis using banding technique now will be confined to new accessions which are to be incorporated in gene transfer program. However, experience indicates its limited value in developing cytological markers in groundnut. Electrophoretic studies on protein profiles and isozymes will be more useful.

J.P. Moss : Chromosome banding was done using eight species and may be done for another eight species. Chromosome banding could be very important in detecting new genomes eg. the 'D' genome which Dr. Stalker (NCSU) has recently reported, and this will help in planning crosses and routes to be followed.

J.S. Kanwar : Zimbabwe farmers are interested in forage groundnuts.

6. **Discussion Highlights** :

- o In future possibility of transferring of physiological and agronomic traits be looked into from interspecific derivatives of wild species apart from resistance to diseases and pests.
- o Deposition of advanced generation derivatives from interspecific crosses is desirable.
- o There is immediate need for concentration on solving the problem of transfering plants in tissue culture to soil.
- o It is desirable to also look for segregants for higher fodder without loss in pod yield to meet the requirements of farmers in some countries.

7. [illegible]nations :

The work plans be improved based on the suggestions made in the discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-109(85)IC

2. **Project Title** : Identification and utilisation of host plant resistance to insect pests and associated organisms

3. **Project Scientists** : P.W. Amin
S.L. Dwivedi
A.K. Singh

4. **Period covered by report** : January 1985 - March 1986

5. **Discussion** :

J.A. Wightman introduced the project progress report. and mentioned that a number of germplasm lines have shown resistance to thrips, jassids, leafminer, pod borer, and Spodoptera A few lines resistant to various pests are being used in a breeding program to combine pest and disease resistance. Wild species and their interspecific derivatives have also been screened for insect pest resistance. He further said that there has been good collaboration with AICORPO in testing material for various pests. Basic studies to elucidate factors responsible for resistance and mechanisms to various pests have been started.

S.L. Taneja : In the report it has been mentioned that a total of 500 lines were sent for preliminary testing against key pests at 10 locations. Are these locations operated by ICRISAT staff? or National program staff? If by national staff, are they able to screen this large number of lines?

P.W. Amin: A set of 50 germplasm lines were sent to each of 10 locations for general screening. These centers are identified by AICORPO and have an entomologist to screen the material. A uniform screening procedure was developed by ICRISAT and has been distributed to entomologists and breeders to ensure uniform testing procedure.

H.C. Sharma:
(1) What is the basis to conclude that there was non preference to thrips in some cultivars?
(2) Are 1000 moths sufficient to get a leaf-miner infestation of 70-100%?
(3) It would be more useful to form nurseries for individual pest or a group of pests and then send them to different locations, instead of sending hundreds of lines to different locations.

P.W. Amin:
(1) Thrips resistant genotypes differ from susceptible ones in that they have low thrips infestation under field conditions compared to susceptible control genotypes. Laboratary test indicates non-preference. Such cultivars are however susceptible to the virus and show the range of symptoms that occur on susceptible cultivars. So the low BND incidence under field conditions is due to low infestation of thrips resulting from non-preference towards these cultivars.
(2) Yes! if done at the seedling stage. The leaf miner has a relatively high reproduction rate and 3-4 generations in a season.
(3) This is being done in the All India program (AICORPO).

R.A.E. Mueller : Why are selections screened for multiple pest resistance under high input conditions which may not reflect management conditions of real farmers? Will high fertilizer doses not lead to confounding the effects of fertilizer response and of pest resistance?

S.L. Dwivedi : Material was screened in both high and low input conditions. High input means irrigation plus fertilizer. These high and low treatment represent the conditions found on farms.

D.V.R. Reddy : Nonpreference in the case of thrips needs more investigation because the thrips require such a short interval to transmit the virus. In the case of rosette there is evidence that aphid resistance will help in disease control because they require long periods for transmitting the virus.

P.W. Amin: I agree that thrips require short period for transmission. However, the low BND lines have always lower infestation of thrips than susceptible lines thus reducing the probability of transmission (not all thrips are viruliferus). More investigations are under progress on this aspect.

D.G. Faris : Your tour report of SE Asia indicates that some of the pod insects such as millipedes and ants are serious problems in that area. What is being done or can be done to identify lines resistant to the pests in countries such as Thailand, Indonesia or the Philippines? (I also wanted to ask what cooperative work is being planned with Dr. Bill Campbell from NCU who is on six month sabbatic in Thailand to find resistant genotypes?)

P.W. Amin: I have sent a set of 40 lines to Philippines and Thailand. Many of these are derived from the "borer" resistant parent NC Ac 343. This parent is resistant to wireworm in the US and to termites at ICRISAT. We are hoping that these may have cross resistance to other borers as well. The results are awaited. There is a very real need for increasing and coordinating entomological research in SE Asia.

W. Reed : Have you tried to determine what combination of resistance to yield limiting factors (particularly insect-pests) are needed for any specific region? if so what are the results?

P.W. Amin: We have identified the high risk areas where a particular pest or complex of pests are important e.g. entire South and Central India for leafminer, Saurashtra region for jassids, Orissa for thrips, Andhra Pradesh, Tamil Nadu coastal Andhra Pradesh and Karnataka for Spodoptera. We have a continuing program of monitoring pest-caused losses at several location in India. So we have a fair idea what sort of material will be required in different regions. Southern Africa needs lines resistant to Aphis craccivora.

Y.L. Nene : Since Aphis craccivora is an important vector of several legume viruses, including groundnut and chickpea, there is a need to study the bionomics of this insect.

P.W. Amin: We have trap catches of Aphis craccivora for the last 6 years collected daily. These can be considered in association with weather conditions to explain the rapid increase or decrease in relation to seasonal differences in weather.

6. **Discussion Highlights** :

- o Non-preference in the case of thrips needs more investigation.
- o There is need for increasing and coordinating entomological research in South-East Asia.
- o It is desirable to study bionomics of Aphis craccivora.

7. **Recommendations** :

Work plans should be improved based on suggestions from discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-110(85)IC

2. **Project Title** : Pests of harvested groundnuts

3. a) **Project Scientist** : K.M. Dick

   b) **Supervisor** : J.A. Wightman

4. **Period covered by report** : January 1985 - March 1986

5. **Discussion** :

J.A. Wightman introduced the project progress report and pointed out that this project is handled by Dr.Dick (an International Intern) who is looking into the methodology to estimate yield loss from storage pests particularly Caryedon serratus, Tribolium castaneum, Oryzaephilus mercator, Corcyra cephalonica and Tenebroides mauritanicus. He is also involved in developing techniques for screening groundnut pods and kernels for resistance to storage pests particularly T. castaneum, Corcyra cephalonica and Ephestia cautella.

R.A.E. Mueller :
(1) What is the time period after insect damage occurs in relation to the average storage time of groundnuts?
(2) Pest damage may also be avoided by speeding up processing when processing plants operate at low capacity levels.

K.M. Dick :
(1) Damage by Caryedon serratus builds up to a 'terminal' level over a period of 5 months.

(2) Correct, but not necessarily practical if an extraction plant is to be in continuous production.

B.K.Varma :
(1) Is Caryedon serratus a specific pest of groundnuts? Have there been other hosts nearby or previously kept in the same godowns such as tamarind etc.?
(2) Does moisture play any role in C. serratus damage?

K.M. Dick :
(1) This could be an important factor, but in our experiment Caryedon built up independently.
(2) This is possible.

J.S. Kanwar : Do you have any data regarding how much groundnut is stored by small farmers?

J.A. Wightman : Yes - very little

C.S. Pawar : How does the infestation of Caryedon start? Does it start from the field or only in the stores?

K.M.Dick : It can start in either place

M.Singh : What are the two CV's you have presented in your table? and why are both required?

K.M.Dick : The CVs represent inter- and intra- treatment (weeks) variability.

H.C. Sharma: You have indicated some problems in screening for resistance to storage pests. I presume that it is easier to screen for storage pests than for field pests. What ideas do you have in mind to refine the screening techniques?

K.M. Dick : The problems for screening for resistance to stored product pests are as great as for field pests. They include obtaining uniform laboratory cultures, variability in the product and problems caused by contamination.

6. **Discussion Highlights** :

- o It is desirable to know the host range in godowns for Caryedon serratus.
- o Role of moisture in C.serratus damage could be studied.

7. **Recommendations** :

Work plans should be improved based on suggestions from discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : G-111(85)IC

2. Project Title : Integrated pest management with emphasis on Spodoptera litura and groundnut leafminer

3. Project Scientists : J.A. Wightman
G.V. Ranga Rao
P.W. Amin

4. Period covered by report : January 1985 - March 1986

5. Discussion :

J.A.Wightman introduced the project progress report and informed that the control of the groundnut leaf miner using insecticides during 1984/85 postrainy season indicated that damage threshold is more than 60 larvae per plant during the pod filling stage. These data are being used in the developing a dynamic programming procedure designed to determine the amount of host resistance needed to avoid the need for applying insecticides. Further he said that the effect of temperature on the development rate of Spodoptera litura indicated that development threshold for egg, larval, pupal and preoviposition stage are 8,10,10 and 11 C respectively. Degree days requirement for egg, larval, pupal and preoviposition periods are 64,301,155 and 29 days, respectively. This information will be used in evolving computer models.

R.W. Gibbons : Have you tested your resistant material over a large area? in other words what will be the effect of growing resistant cultivars over a large areas?

J.A. Wightman : This question relates to Spodoptera. The line which we are talking about deters feeding by Spodoptera and a corresponding low growth rate. Under no choice conditions, fewer in larvae will grow slowly on such lines. Thus an infestation may buildup, but it will take longer than on susceptible lines.

D.G. Faris : In your future plans you indicate your plan to develop joint projects with Peanut CRSP. What are your plans for doing this in SE Asia? Right now would seem to be a good time to start this as Dr. Bill Campbell will be in Thailand for a six month sabbatic.

J.A. Wightman : There is a great need to extend our activities into S.E.Asia.

H.C. Sharma: In the write up you have used the term 'damage threshold'. Is it the same as 'economic threshold'?

J.A. Wightman : Damage threshold is the population density that results in yield loss. It is clearly related to plant phenology.

S.L. Taneja : In your leafminer insecticidal control experiment, you have number of insecticides (dimethoate, difluorbenzuron, dichlorvos), with different doses (higher and lower) and number of application. What experimental design have you used?

J.A. Wightman : Latin square (5x5). The treatments were designed to give us a range of pest densities during the season.

W. Reed : I congratulate the groundnut entomology program on the high productivity of their research.

6. **Discussion Highlights** :

   - o For better understanding resistant material for Spodoptera need be screened on larger areas in appropriate locations.
   - o There is need for extending activities on Spodoptera into S.E.Asia.

7. **Recommendations** :

Spodoptera resistant lines should be screened on larger plots in endemic areas. These activities need be extended into S.E.Asia.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-113(85) IC

2. **Project Title** : Evaluation of nutritional and food quality of groundnut.

3. **Project Scientists** : R. Jambunathan
S.L. Dwivedi

4. **Period covered by report** : January 1985 - January 1986

5. **Discussion** :

R. Jambunathan introduced the project progress report and mentioned that there is good collaboration with Breeding and GRU. Further he said that the project to be looked from the angle of breeding for nutritional and food quality of groundnut and not just evaluation.

O.P.Rupela : Why there is variability in protein content in groundnut from field to field and season to season?

S.L.Dwivedi : Protein content is relatively constant and values vary from 3-5% but work is in progress to assess the interaction between location x genotype season.

D.G.Faris : Why do you require a taste panel?

S.L.Dwivedi : The taste panel is concerned with confectionery types of groundnut.

S.K.Dasgupta : The breeding objective should concentrate on selecting high linoleic acid content and less fatty acid as landraces have fairly high nutritioonal quality.

S.L. Dwivedi : High linoleic reduces stability of the fatty acids and the aim of the project is to select lines with low linoleic and higher oleic acids content.

J.R. Burford : There is difficulty in isolating the compounds responsible for confectionery quality because such efforts on tea and wine quality were not successfull.

6. Discussion Highlights :

- o The project needs emphasis from the angle of breeding for nutritional and food quality of groundnut.
- o Protein content to be assessed taking account of genotypes x locations x seasons.
- o Caution should be exercised while looking for compounds responsible for quality in confectionery groundnuts.

7. [illegible]uations :

The points in discussion highlights be borne in mind while carrying out the work plans.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-114(85) IC [Training Project]

2. **Project Title** : Water stress effects on groundnut

3. a) **Project Scientist** : S.N. Azam Ali
   b) **Supervisor** : J.H. Williams

4. **Period covered by the report** : January 1985 - January 1986

5. **Discussion** :

J.H.Williams introduced the project progress report along with G-106(85)IC and discussion reported on page numbers 14-16.

6. **Discussion Highlights** :

Details on page number 17.

7. **Recommendations** :

As this training project is completed, project report should be prepared and results published early.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-115(85) IC [Training Project].

2. **Project Title** : Photoperiod effects in groundnut.

3. a) **Project Scientist** : M.L. Flohr
   b) **Supervisor** : J.H. Williams

4. **Period covered by report** : December 1984 - January 1986

5. **Discussion** :

   J.H.Williams introduced the project progress report. This project was discussed along with G-105(85)IC. Details on page numbers 11-13.

6. **Discussion Highlights** :

   Details on page number 13.

7. **Recommendations** :

   The work planned be carried out along with the suggestions made in discussion highlights in project G-105(85)IC, page 24.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : G-116(85) IC [Training Project]

2. Project Title : Breeding for enhanced nitrogen fixation in groundnut - some preliminary investigation.

3. a) Project Scientist : M. Dutta
   b) Supervisor : J.H. Williams

4. Period covered by the report : January 1985 - December 1985.

5. Discussion :

J.H.Williams introduced the project progress report along with project G-107(85)IC and discussion reported on page numbers 18-21.

6. Discussion Highlights :

Details on page number 21.

7. Recommendations :

As this training project is concluded, project report should be prepared and results published. The breeding lines selected should be handed over to the groundnut breeders for further studies.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : G-117(85) IC [Training Project]

2. Project Title : Epidemiology of and screening for resistance to peanut clump disease; serological methods for diagnosis of Witches' broom disease.

3. a) Project Scientist : H.A. Hobbs
   b) Supervisor : D.V.R. Reddy

4. Period covered by report : January 1985 - January 1986

5. Discussion :

D.V.R.Reddy introduced the project progress report along with G-104(85)IC. Details on page numbers 8-10.

6. Discussion Highlights :

Details on page number 10.

7. Recommendations :

Work planned be carried out under project G-104(85)IC.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : G-118(85) IC [Training Project]

2. **Project Title** : Study of genotypic variation in respect of groundnut pod and seed invasion by A. flavus and other fungi, and aflatoxin contamination.

3. a) **Project Scientist** : S. Nahdi
   b) **Supervisor** : V.K. Mehan
   D. McDonald

4. **Period covered by report** : March 1984 - January 1986

5. **Discussion** :

The project was discussed along with G-102(85)IC. Details on page numbers 5-6.

6. **Discussion Highlights** :

Details on page number 6.

7. **Recommendations** :

Project report be completed soon and information published. In case of a proposal for new training project the suggestions in discussion highlights under project G-102(85)IC be considered.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : GR-114 (85)IC

2. **Project Title** : Collection and assembly of Arachis genetic resources from national and international sources; classification and documentation

3. **Project Scientist** : V. Ramanatha Rao

4. **Period Covered by report** : January 1985 - December 1985

5. **Discussion** :

V.R.Rao introduced the project progress report.

R.W. Gibbons : expressed that good progress has been made by GRU in groundnut on germplasm enhancement based on the recommendation by EPR. Some groundnut germplasm lines are assembled by Dr.S.N. Nigam from East African countries and are being tested for early leaf spot resistance. The technique developed for testing virus-free seed would be helpful in quarantine clearance.

M.H. Mengesha : explained to the group that so far emphasis was placed mainly on the assembly, maintenance, conservation, and distribution for utilization of groundnut germplasm by scientists in India and elsehwere. Germination tests conducted have indicated that the viability of groundnut germplasm at ICRISAT is maintained at a satisfactory level. More emphasis had to be given on the collection as some of the germplasm material, although available now, may not be present in future. There is good collaboration between the GRU and other groundnut disciplines which would continue. As the work on assembly and evaluation become less and less, more attention will be given to enhancement of germplasm.

D.G. Faris : It is important that you carry through your plan to collect groundnut germplasm in Burma. At what place are your plans for clearance for collecting in Burma?

V.R. Rao : Collection of groundnut germplasm in Burma is given highest priority. However, the execution depends on the clearance from the Government of Burma. We are looking forward for help from Asian Grain Legume Program.

J.P.Moss : What alternate methods of importing germplasm are considered and when could imports resume?

V.R.Rao : I don't exactly have any idea about alternate methods of importing germplasm from USA. Mr. B.K. Varma, Chief Plant Quarantine Officer may have more information.

J.P.Moss : Can germplasm (especially wild species) be imported to Malawi from USA possibly after ELISA screening for stripe virus to be used in our thrust for early leaf spot resistance.

V.R. Rao : Malawi quarantine officials are very much concerned on the import of groundnut seed from USA due to the prevelance of peanut stripe virus in USA. I do not know whether the Malawi quarantine officials would agree for the import of ELISA tested groundnut seed. The matter has to be taken up with them.

J.S.Kanwar : The whole quarantine procedure is under review by ICAR.

D.V.R. Reddy : We have now a method to test nearly 9000 seeds per day for seed borne viruses. I hope this method is followed to clear up the seed lots in other countries and especially for export purpose. Unskilled labour are required to perform this test.

V.R. Rao : We appreciate greatly the cooperation from Groundnut Virologists in carrying out the tests. We plan to continuously test the seed that is planted for rejuvenation.

W.Reed : You intend to publish a catalog. I welcome this. However, it appears you will restrict this to passport data. I would like to suggest that evaluation data if only in a distribution form would be a useful part of a catalog.

V.R. Rao : I wish to make it clear that we intend to publish groundnut germplasm catalog of passport data and also evaluation data. As and when the entire evaluation data are computerized, a catalog based on analyses of characters and their distribution will be prepared. It may be possible to give a tentative date for the publication of catalog by August 1986.

R.W. Gibbons : It is better to have a catalog in some form as soon as possible rather than to wait for a perfect catalog for a long time.

M.H. Mengesha : There are two schools of thought on the preparation of catalog. One to include the passport data and the other not to include the passport data. Would some of you offer your views on this two conflicting ideas?

R.W. Gibbons : This issue pertains to all crops not just for groundnut. This should be discussed in a special meeting of all programs.

J.S. Kanwar : This point will be one of the items for discussion at the next program leaders' meeting.

6. **Discussion Highlights**

- o Problems arising due to new Plant Quarantine regulations need to be taken up with ICAR and Government of India for quick resolution.
- o The problem of quarantine on import of groundnut to Malawi need to be resolved.
- o Catalog to be published soon without waiting for perfection.
- o The point on inclusion or not of passport data in catalog need to be viewed at Program Leaders meeting.

7. [illegible]tions :

Publication of catalog should be on high priority. The other points in discussion highlights to reflect in program of work.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : GR-115 (85)IC

2. **Project Title** : Maintenance and evaluation of groundnut germplasm

3. **Project Scientist** : V. Ramanatha Rao

4. **Period Covered by report** : January 1985 - December 1985

5. **Discussion**

V.R.Rao introduced the project progress report.

J.H. Williams : You said that you were screening for fresh seed dormancy without curing. Our research has shown this to be unreliable as a method of screening.

V.R. Rao : We are using the freshly harvested seed for determining the "fresh seed dormancy". We are mainly interested in this because of in situ germination problem and also due to the fact that this character is one of the descriptors.

R.W. Gibbons : I think this should be discussed separately in a small group consisting of VRR, JHW and MJVR to decide upon correct technique for determining the fresh seed dormancy.

S.L. Dwivedi : What characters are you testing in your multilocation trials which you wish to do?

V.R. Rao : The multilocation tests as envisaged in collaboration with NBPGR are going to be a general evaluation, mostly for morphoagronomic descriptors. There is a need to identify locations and also determine the characters to be recorded in consultation with NBPGR and National Center for Groundnut Research, Junagadh.

6. **Discussion Highlights** :

- o Correct techniques for screening of fresh seed dormancy to be identified. Discussion by V.R.Rao, J.H.Williams and M.J.V.Rao might help solve the problem.

7. **Recommendations** :

Group discussion be held to identify technique for screening of fresh seed dormancy. inc