Current
Legumes Research Project Outlines and Progress Reports - August 1989

In-House Review
21-24 August 1989

(Groundnut)

ICRISAT

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

Groundnut

Project Number	Title	Project Scientists	Disciplines/ Subprogrammes	Page
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contd.

ICRISAT Research Project Outline

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

2. Old Project Number: G-Brd-1,2

3. Program: Groundnut

4. Discipline(s)/Subprogram(s):Pat/ Brd/ Phy/ Cyt

5. Project Title: Biology and management of foliar diseases of groundnut

6. Project Locations:

Patancheru AICORPO Anantapur Bhavanisagar Darwad Hisar

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

D. McDonald	(DMcD)
R.W. Gibbons	(RWG)
J.H. Williams	(JHW)
J.P. Moss	(JPM)

(b) Project Scientist Names:

		Scientist-Years
P. Subramanyam	(PS)	1.00
L.J. Reddy	(LJR)	0.80
V.M. Ramraj	(VMR)	0.40
A.K. Singh	(AKS)	0.30

(c) Cooperating Scientist Names:

T.S. Walker	(TSW)
V.R. Rao	(VRR)
N.V. Narasimham	(NVN)
M.R. Rao	(MRR)

(d) Supporting Staff:

Research Associate(s)	3.70
Field Assistant(s)	7.00
Field Attendant(s)	5.00

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1989

9. Objectives and Scope:

1. Epidemiological studies on early leaf spot. To understand the aerobiology and pathogen variation of late leaf spot and rust. 2. To determine crop losses from an economic importance of foliar diseases worldwide. 3. To develop screening methods for early leaf spot and improve screening methods for other foliar diseases; to screen germplasm accessions and breeders lines. 4. To breed cultivars resistant to foliar diseases. 5. To develop integrated management systems for control of foliar diseases. 6. To monitor the currently minor foliar diseases, eg., Leptosphaerulina, Phoma and Alternaria diseases.

10. Keywords:

Foliar diseases
Rust
Early and late leaf spots
Cercospora
Phaeoisariopsis
Phoma
Leptosphaerulina

11. Technique in brief (Methodology):

1. Use of standard techniques for isolation of fungi and pathogenicity tests. Manipulation of sowing dates, plant population, intercrop systems etc. for effects on disease epidemics. 2. Use of spore traps, specific fungicides and microclimatological measurements. 3. Field, greenhouse, and laboratory methods for testing disease resistance of germplasm accessions and breeding lines. Growth analysis and biochemical analysis of disease resistant and susceptible genotypes. 4. Hybridization and selection for resistance using appropriate breeding methods. Use of varietal blends. Hybridization with compatible species of section Arachis involving ploidy manipulation and control of meiotic recombination and gene transfer.

12. Source of Funds:Core 100.00

13. Cost Estimates: (Direct) 1985 1986 1987

Operational (recurring)

(a) Labor	25.00
(b) Travel	15.00
(c) POL	15.00
(d) Supplies	10.00
TOTAL	14.50

Capital (non-recurring

Indirect Costs

14. Land Requirements (ha)

Location

Patancheru	17.60
Anantapur	0.50
Bhavanisagar	1.70
Dharward	0.50

15. Review of past background and present status:

Field and laboratory resistance screening methods were developed and used to identify rust and late leaf spot resistant genotypes from the world groundnut germplasm collection. The epidemiology of these diseases was studied. Losses caused by them were assessed at Patancheru - combined attack causing 70% loss in pod yield while each disease alone caused around 50% loss. The genotypes found resistant to rust and late leaf spot were used in a breeding program to combine resistances with high yield and good quality. Wild Arachis spp. immune or highly resistant to rust and the leaf spots were crossed with groundnuts and interspecific derivatives with disease resistance and good agronomic characters selected and entered in the breeding program. Research on early leaf spot has shown slower progress than that on rust and late leaf spot due to lower field disease levels and failure to find highly resistant germplasm lines. Limited research has been done on disease caused by Alternaria, Phoma, Leptosphaerulina and Myrothecium spp. Monitoring of these currently minor diseases continues. Disease management research including economics is in progress for rust and leaf spots. Epidemiological studies continue. Breeding continues to receive high priority.

16. Existing linkage with other centers or research projects:

a) Close linkage is maintained with the All India Coord. Oilseeds Res. Project. b. International disease nursery trials are being conducted in 23 countries. c. There is close cooperation with research institutions in the USA including Peanut CRSP. The latter is particularly concerned with work in E. Asia. d. Research cooperation and training linkages with scientists in Africa and Asia. e. Cooperation with scientists in the University of London on race identification and resistance mechanisms in foliar diseases.

17. Likely future course of development:

New accessions from breeding and cytogenetics projects will be developed and screened for resistance to rust and leaf spots. More emphasis will be given to multiple resistances by breeders and more interspecific hybrid derivatives will be utilized. Further studies will be made on disease epidemics and long distance spread of rust. Mechanisms of resistance and their inheritance will be studied. Resistant cultivars, cultural practices and chemical control will be integrated into management systems.

18. Availability of training facility:

Training on disease recognition, resistance screening and breeding methods, and disease management can be provided.

Approval Date: 15-JUL-1985

Progress Report

Breeding for foliar diseases resistance:

Good progress has been made in increasing the levels of late leafspot resistance and in improving the pod and seed characteristics of foliar diseases resistant (FDR) lines.

Thirty crosses involving lines less susceptible to early leafspot were made and the F2s are being evaluated at Pantnagar during the 1989 rainy season. Release proposals for ICG(FDRS) 4 and ICG(FDRS) 10 were submitted to Central Varietal Release Committee of Govt. of India.

Nine foliar diseases resistant varieties were advanced to the next stage of testing under AICORPO. Two new FDR varieties were accepted for testing under AICORPO during the 1989 rainy season.

In the International Foliar Diseases Resistant Groundnut Varietal Trial, the performance of FDR varieties was excellent in Burma, Vietnam, Sudan and Thailand. In Philippines, ICG(FDRS) 11 has been promoted to advanced stage of testing.

Pathology

Several germplasm lines with resistance to early leaf spot were identified in Pantnagar, India and Nawalpur, Nepal, and to rust and/or late leaf spot at ICRISAT Center. Thirty crosses involving these resistant lines were made and the F2s are being evaluated at Pantnagar during 1989 rainy season.

An interspecific hybrid derivative 259-2 was highly resistant to both early and late leaf spot diseases in field screening trials at Pantnagar and ICRISAT Center, respectively. This was also resistant to early leaf spot in Malawi. In addition, a large number of segregants with resistance to late leaf spot were identified from early generation interspecific derivatives.

In an attempt to transfer early leaf spot resistance from an incompatible species of section Erectoides, first flowering hybrids were established through embryo rescue technique between A. batizocoi and A sp. 30003 (resistant to early leaf spot). The hybrid expressed a high degree of resistance to early leaf spot in detached leaf tests.

Nine interspecific hybrid plants (involving a Rhizomatosae accession) originated from tissue cultures showed high levels of resistance to rust, early and late leaf spots in preliminary studies using detached leaves.

During the 1988 rainy season two interspecific derivative lines ICGV 86669 and ICGV 87780 were promoted to coordinated varietal trial of the AICORPO.

Good progress has been made in increasing the levels of late leaf spot resistance and in improving the pod and seed characteristics of foliar diseases resistant (FDR) breeding lines.

During the 1987-88 postrainy season, the rust and late leaf spot resistant lines ICGV 87350, ICGV 87292 and ICGV 87248 gave highest yields at ICRISAT Center and Bhavanisagar.

In the 1988 rainy season, 35 alternately branching and 39 sequentially branching varieties outyielded controls in multilocational trials.

Plant density influenced severity of foliar diseases. Single plant yield response to disease control increased as plant densities were increased.

Production of antisera for detection of early and late leaf spot pathogens is well in progress.

ICRISAT Research Project Outline

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

2. Old Project Number: G-Brd-2(85)

3. Program: Groundnut

4. Discipline(s)/Subprogram(s):Pat/ Brd/, Phy/ Ent/ Cyt

5. Project Title: The biology and management of aflatoxin contamination of groundnut

6. Project Locations:

Patancheru APAU

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

D. McDonald	(DMcD)
R.W. Gibbons	(RWG)
J.H. Williams	(JHW)
J.A. Wightman	(JAW)
J.P. Moss	(JPM)

(b) Project Scientist Names:

		Scientist-Years
V.K. Mehan	(VKM)	0.50
R.C.N. Rao	(RCNR)	0.05
M.J.V. Rao	(MJVR)	0.30
G.V. Ranga Rao	(GVRR)	0.05
A.K. Singh	(AKS)	0.05

(c) Cooperating Scientist Names:

V.R. Rao	(VRR)
K.L. Sahrawat	(KLS)
R. Jambunathan	(RJ)

(d) Supporting Staff:

Research Associate(s)	1.50
Field Assistant(s)	2.90
Field Attendant(s)	2.40

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1989

9. Objectives and Scope:

1. To elucidate factors inf[illegible]ng pod and seed invasion by Aspergillus flavus especially p[illegible]arvest, and aflatoxin production.
2. To identify further sources of esistance to seed invasion and aflatoxin production

10. Keywords:

Aflatoxin
Aspergillus flavus
Mycotoxin
Groundnut

11. Technique in brief (Methodology):

1. Soil, postharvest, and storage conditions will be modified to study effects on seed invasion by A. flavus and aflatoxin production. 2. Physico-chemical and ELISA techniques will be used to determine extent of fungal colonization and aflatoxin contamination of seeds. 3. Field screening will be extended to A. flavus hot-spots. Laboratory screening methods will continued to be used. 4. Anatomical, histochemical and biochemical techniques will be used to study possible mechanisms of resistance in seeds to A. flavus invasion and aflatoxin production. 5. To breed for A. flavus and aflatoxin resistance field and greenhouse hybridization will be done. A modified bulk pedigree selection procedure will be used. Hybridization in specific mating systems will be undertaken to determine inheritance of resistance.

12. Source of Funds:Core 100.00

13. Cost Estimates: (Direct)

	1985	1986	1987
Operational (recurring)			
(a) Labor	7.00	7.00	7.00
(b) Travel	7.00	7.00	7.00
(c) POL	10.00	10.00	10.00
(d) Supplies	15.00	15.00	15.00
TOTAL	10.80	10.80	10.80
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location	
Patancheru	8.50
APAU	0.60
Anantapur	0.60
Dharwad	0.30

15. Review of past background and present status:

Recommendations have been evolved in several SAT countries for methods of growing, harvesting, drying, and storage of groundnuts to minimise aflatoxin contamination. As these recommendations have not in general been adopted by SAT farmers, research has recently been concentrated on finding and utilising genetic resistance. Resistance has been found in groundnut germplasm to seed invasion by A. flavus and to aflatoxin production, resistance screening methods have been developed and a breeding program has started to incorporate the resistances found into agronomically acceptable cultivars. An international trial was started in 1982 to test A. flavus resistant genotypes over a wide range of environments and this will in future incorporate advanced breeding lines. Priority is now being given to investigating pre-harvest resistance. Effects of soil water and temperature levels in the geocarphosphere on pod and seed invasion by soil fungi and on aflatoxin contamination are being examined.

16. Existing linkage with other centres or research projects:

Cooperative research with scientists in USDA, University of London (UK). International A. flavus resistance trial in 4 countries.

17. Likely future course of development:

Screening of germplasm and breeding lines and interspecific hybrid derivatives for resistance to seed invasion by A. flavus and aflatoxin contamination will continue and high priority will be given to resistance breeding. Screening and analytical methods will be improved. Integrated management systems for prevention of aflatoxin will be developed and tested. Effects of host infestation on aflatoxin contamination of stored groundnuts will be examined.

18. Availability of training facility:

Training is available on resistance screening methods and on methods of analysing groundnuts for aflatoxin content.

Approval Date: 09-JUL-1985

Progress Report

A. flavus resistance breeding.

We identified 81 new breeding lines derived from crosses between low aflatoxin producing lines, dry seed resistant lines and adapted line crosses for yield evaluation and evaluation for natural seed infection and dry seed resistance during rainy season. Some of these are likely to combine both dry seed resistance and low aflatoxin production lines. This combination has not been found in the germplasm which has been screened till now.

Four breeding lines significantly outyielded the local check variety at ISC, Niamey, Niger during the rainy season. One of them, ICGV 86168, was also found to possess acceptable levels of resistance to natural seed infection by A. flavus in Senegal.

Pathology

We found significant differences between soils for fungal infection and aflatoxin contamination of groundnuts in the 1987 rainy season. Levels of A. flavus infection and contamination were significantly higher in seeds from Alfisol fields than in seeds from Vertisol fields. Fifty-seven breeding lines which had shown IVSCAF-resistance in previous trials were tested for yield potential, IVSCAF levels, and levels of natural A. flavus infection during the 1987 rainy season. Fourteen of the lines recorded natural seed infection levels equal to or lesser than J 11, but only 4 lines had both IVSCAF and seed infection resistances. During the 1987/88 postrainy season, 42 breeding lines which were IVSCAF-resistant in previous tests were evaluated for yield in Alfisol and Vertisol fields. Two breeding lines in the Alfisol field and one in the Vertisol field outyielded the control, J 11.

In the 1988 rainy season there was little or no drought stress during pod maturation and levels of A. flavus infection of seeds were very low even in susceptible controls and no effective screening could be done in the field.

Several of the selected genotypes showed stable resistance to field infection of seeds by A. flavus in multilocational trials conducted in Senegal during the 1988 rainy season.

Selected IVSCAF-resistant breeding lines significantly outyielded the commercial check varieties TS 32-1 and 55-437 in a yield trial at ISC, Niamey, Niger during 1988 rainy season.

ICRISAT Research Project Outline

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

2. Old Project Number: G-Brd-3(85)

3. Program: Groundnut

4. Discipline(s)/Subprogram(s):Pat/ Brd/ Phy

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

6. Project Locations:

Patancheru AICORPO APAU

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

D. McDonald	(DMcD)
R.W. Gibbons	(RWG)
J.H. Williams	(JHW)
J.A. Wightman	(JAW)
J.P. Moss	(JPM)

(b) Project Scientist Names:

		Scientist-Years
V.K. Mehan	(VKM)	0.40
M.J.V. Rao	(MJVR)	0.10
R.C.N. Rao	(RCNR)	0.05
V.M. Ramaraj	(VMR)	0.05

(c) Cooperating Scientist Names:

A.K. Singh	(AKS)
J.C. Wynne	(JCW)
D.D.R. Reddy	(DDR)

(d) Supporting Staff:

Research Associate(s)
Field Assistant(s)
Field Attendant(s)

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1988

9. Objectives and Scope:

1. To establish the aetiology, epidemiology and ecology of diseases caused by soil inhabiting fungi, bacteria and nematodes. Emphasis will be on the pod rot complex and collar rots. 2. To determine crop losses (pod rots, collar rot and 'Kalahasti' melady) and establish economics of the diseases. 3. To identify and evaluate resistance to the diseases, and to develop more effective screening procedures, particularly for pod rots and collar rots.

10. Keywords

Soil-borne diseases
Pod rots
Bacterial wilt
Nematode diseases

11. Technique in brief (Methodology):

1. Use of standard techniques for isolation and pathogenicity tests. Manipulation of environmental factors (biotic and abiotic) to determine their effects upon initiation and development of the diseases. 2. Disease surveys and crop loss assessments. Field trials with pesticides for control of the diseases. 3. Field and laboratory screening of germplasm to identify resistance to the diseases; search for disese hot spots and development of sick plots. 4. Standard hybridization and breeding methods will be employed to exploit resistances when they are identified.

12. Source of Funds:Core 100.00

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	3.00	3.00	3.00
(b) Travel	7.00	7.00	7.00
(c) POL	5.00	5.00	5.00
(d) Supplies	5.00	5.00	5.00
TOTAL	4.80	4.80	4.80
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)			
Location			
Patancheru	5.00	5.00	5.00

15. Review of past background and present status:

Damage to below ground parts of the plant by soil fungi and nematodes can cause significant losses in yield. Attack by soil insects and millipedes, drought stress and nutrient stress encourage pod rot. At ICRISAT we have identified a pod rot disease complex of which Fusarium spp. are dominant. Some 3000 genotypes have been screened for resistance under natural (irregular) disease pressure and six were found to have resistance. Pod rots were severe in crops that were irrigated following late season drought stress. This effect is being investigated with a view to developing a field screening method for pod rot resistance. A new pod disease caused by Tylenchorhynchus brevilineatus was recently identified in India. Pesticides are being screened for control of T. brevilineatus. Germplasm lines are being field screened in natural hot spots for resistance to this nematode.

16. Existing linkage with other centers or research projects:

Cooperative research with scientists of Andhra Pradesh Agricultural University and Punjab Agricultural University, India. The International Meloidogyne Project (USA) is currently screening our material for resistance to M. arenaria and M. hapla

17. Likely future course of development:

Surveys will be organised in different parts of the SAT to determine the occurrence and importance of pod rots and nematode diseases. Effects of drought and other environmental factors on pod rot will be studied. Disease scoring the resistance screening methods will be improved. A resistance breeding program will be started. Screening for resistance to collar rot will be expanded to more locations. Genotypes reported resistant to bacterial wilt will be tested for multiple disease resistance. Screening to be intiated on Vertisols at ICRISAT Center.

18. Availability of training facility

Training can be organised if required

Approval Date: 15-JUL-1985

Progress Report

During the 1987/88 postrainy season, we screened 164 genotypes for the incidence of stem and pod rots caused by S. rolfsii. In the preliminary resistance screening trial, we selected 14 genotypes with levels below 10% of both stem rot and pod rot for further screening. In the advanced screening (64 lines), the interspecific hybrid derivatives and breeding lines that had low levels (<10%) of stem rot and pod rot incidence in 1986/87 postrainy season trial again showed low levels of disease.

Testing in the 1988 rainy season failed because of waterlogging. Two pod rot resistant lines, U4-47-7 and U1-2-1 were crossed with five IVSCAF-resistant lines in an attempt to combine the two resistances.

ICRISAT Research Project Outline

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

2. Old Project Number: G.Path.1,6 and 7

3. Program: Groundnut

4. Discipline(s)/Subprogram(s):Pat/ Ent/ Brd/ Cyt

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

6. Project Locations:

Patancheru AICORPO APAU

7. Scientific Staff Names

(a) Discipline/Subprogram Leader Names

D. McDonald	(DMcD)
J.A. Wightman	(JAW)
R.W. Gibbons	(RWG)
J.P. Moss	(JPM)

(b) Project Scientist Names:

		Scientist-Years
D.V.R. Reddy	(DVRR)	1.00
J.A. Wightman	(JAW)	0.30
A.K. Singh	(AKS)	0.05
L.J. Reddy	(LJR)	0.20
S.L. Dwivedi	(SLD)	0.20

(c) Cooperating Scientist Names:

K.R. Bock	(KRB)
S.N. Nigam	(SNN)
J.P. Moss	(JPM)

(d) Supporting Staff:

Research Associate(s)	3.00
Field Assistant(s)	1.00
Field Attendant(s)	2.00

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1990

9. Objectives and Scope:

To characterize casual agents of yellow spot, cowpea mild mottle, chlorotic streak, witches broom, and vein banding; to investigate the epidemiology of diseases caused by viruses, prokaryotes and viroids with emphasis on clump, tomato spotted wilt, mottle, and rosette, to identify and evaluate resistance to tomato spotted wilt, clump, mottle and rosette; to incorporate genetic resistance and to the diseases mentioned above and test its stability; to develop integrated control measures.

10. Keywords

Groundnut virus diseases
Mycoplasma like organisms
Viroids
Detection of viruses
Characterization of viruses
Management of virus diseases

11. Technique in brief (Methodology):

Characterization by employing standard serological and physico-chemical techniques in conjunction with electron microscopy, host range and vector transmission. Epidemiology by investigating vector, virus-vector relationship, various environmental factors (biotic and abiotic); screening of germplasm by mass scale inoculation techniques, by vector feeding, by utilising disease hot spots, and by developing sick plots. Standard hybridization and breeding methods to eploit resistance identified.

12. Source of Funds:Core 100.00

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	3.00	3.00	3.00
(b) Travel	15.00	15.00	15.00
(c) POL	5.00	5.00	5.00
(d) Supplies	11.00	11.00	11.00
TOTAL	9.00	9.00	9.00
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)			
Location			
Patancheru	2.00	2.00	2.00

15. Review of past background and present status:

Prior to 1976 several reports have appeared in India on the occurrence of virus diseases. However, none of the casual viruses were precisely characterized on interrelatinships to similar viruses occurring in other countries determined. Reliable detection methods were not available and agents transmitting the viruses were not identified. Genetic resistance was not exploited by reliable methods for any of the groundnut virus diseases. Similar situations existed in other countries in the SAT. From ICRISAT several reports have been published on the characterisation and diagnosis of groundnut viruses, which include tomato spotted wilt virus, peanut mottle virus, peanut clump virus and groundnut rosette viruses. Minor virus diseases such as cowpea mild mottle virus, yellow spot virus and chlorotic streak virus have been partially characterized. Vectors of economically important virus diseases have been identified and virus-vector relationships determined. Over 700 germplasm lines have been screened for tomato spotted wilt virus. Using cultural practices and field tolerant cultivars it is now possible to manage bud necrosis. A method for mass scale inoculation of peanut mottle virus has been devised. Tolerant and non-seed transmission sources have been identified for mottle.

16. Existing linkage with other cer or research projects:

Cooperative research with scientists of Andhra Pradesh Agricultural University; Sri Venkateswara University; Punjab Agricultural University and the University of Agricultural Sciencies, Bangalore

17. Likely future course of development:-

Surveys will be organised in the SAT to determine the occurrence and importance of virus diseases. Virus will be characterized and methods for their detection developed. Purification methods will be devised and antisera produced. Interrelationships with similar viruses occurring in other countries will be determined. Disease scoring and resistance screening methods will be improved. Data from epidemiological studies and resistant cultivars will be used to integrated disease management.

18. Availability of training facility:

Training can be provided in the characterisation, detection, and purification of viruses. Training can also be provided in the handling of insect vectors, and their utilisation in the transmission of viruses.

Approval Date: 09-JUL-1985

Progress Report

Virus resistance breeding (TSWV):

Crosses involving vector resistance and TSWV tolerant lines were attempted. The material is in various generations (F1-F4).

The crosses involving the PMV non-seed transmission lines and PMV tolerant lines were advanced by single pod descent method and are currently in F4 generation.

Pathology

A method for purifying tomato spotted wilt virus (TSWV), the causal agent of bud necrosis disease (BND) was developed. TSWV isolates in India were shown to be serologically distinct from isolates occurring in several other countries. Additional breeding lines showing field resistance to TSWV have been identified. Peanut clump virus (PCV) was seed-transmitted in both early and late infected plants of two groundnut cultivars and in three cereal crops. All stages in the life cycle of *Polymyxa graminis*, the vector of PCV, have been identified. Solarization was found to be effective in controlling PCV. Several breeding lines showing non-seed transmission of PMV have been identified. Peanut stripe virus (PStV) was found to occur in India. One accession of a wild *Arachis* species was found to be immune to PStV. Several *A. hypogaea* genotypes which showed less than average incidence of PStV have been identified. Peanut chlorotic leaf streak virus (PCLSV) has been identified as a caulimo virus. Sequencing of the major portion of the PCLSV-DNA has been completed. Peanut veinal chlorosis disease was shown to be caused by a rhabdovirus.

ELISA utilising penicillin and pencillinase, which are inexpensive and available readily in developing countries, has been standardized. Dot immunobinding assay, electro immunoblot assay and complementary DNA probes have been introduced for virus detection.

ICRISAT Research ect Outline

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

2. Old Project Number: G-Brd-Phy-5(85)

3. Program: Groundnut

4. Discipline(s)/Subprogram(s): Brd/ Phy

5. Project Title: Adaptation to specific environments and requirements

6. Project Locations:

Patancheru

7. Scientific Staff Names

(a) Discipline/Subprogram Leader Names

S.N. Nigam	(SNN)
J.H. Williams	(JHW)

(b) Project Scientist Names:

		Scientist-Years
S.N. Nigam	(SNN)	0.30
S.L. Dwivedi	(SLD)	0.10
M.J.V. Rao	(MJVR)	0.50
L.J. Reddy	(LJR)	
J.H. Williams	(JHW)	
V.M. Ramraj	(VMR)	0.50

(c) Cooperating Scientist Names:

V.R. Rao	(VRR)

(d) Supporting Staff:

Research Associate(s)
Field Assistant(s)
Field Attendant(s)

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1990

9. Objectives and Scope:

To select genotypes for (a) i) Confectionary purposes. ii) For irrigated sole crop and relay cropping systems. (b) To combine earliness with limited seed dormancy particularly for erratic rainy season duration situations. (c) To establish the role of photoperiod in the adaptation of groundnuts to different latitudes and seasons.

10. Keywords:

Short season
Dormancy
Confectionary
Adaptation
Photoperiod
Cropping Systems

11. Technique in brief (Methodology):

(1) Use of established crop breeding technologies using identified sources with the desired characteristics. (2) Growth and biochemical analysis in manipulated photoperiod and temperature combinations.

12. Source of Funds:Core 100.00

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	20.00	20.00	20.00
(b) Travel	15.00	15.00	15.00
(c) POL	20.00	20.00	20.00
(d) Supplies	7.00	7.00	7.00
TOTAL	12.00	12.00	12.00
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)			
Location			
Patancheru	12.00	12.00	12.00

15. Review of past background and present status:

Confectionary groundnuts require different quality attributes to those intended for oil. Segregating populations have been established, and selections made. Dormancy combined with early maturity is a combination of traits which does not exist naturally. A screening method has been established and selections from appropriate populations are being made. Early maturing cultivars for relay cropping situations are being tested and distributed. Groundnuts have been considered to be day neutral. However, although flowering is not influenced it has been shown that photoperiod may influence fruit initiation. The extent of variations in photoperiod response are large in some cultivars. We have shown that there are genotype x season interactions and we have selected genotypes for postrainy irrigated situations. The improvement objectives of this project are progressing well although more direct methods of assessing quality need to be established. Photoperiod research is progressing with current emphasis on identifying a screening method which will allow large scale characterization of germplasm.

16. Existing linkage with other centres or research projects:

Collaborative research with University of Bonn, Peanut CRSP and commercial confectionary organisations.

17. Likely future course of development:

Continue selections for genotypes combining the desired traits. Once a screening method for photoperiod responses has been established characterization of existing lines and or conversion of elite lines to day neutral types may be undertaken.

18. Availability of training facility:

Opportunities for student research.

Approval Date: 15-JUL-1985

Progress Report

I. Breeding for earliness

We identified several promising spanish breeding lines which possessed limited fresh seed dormancy by screening about 150 breeding lines from other projects.

Four early maturing lines, were selected by our cooperator in Karnataka for their better performance in the residual moisture tract of coastal Karnataka.

All the three lines entered into the IVT stage of AICORPO trials were promoted to the next stage of testing (AVT-1) in the rainy season. ICGV 86015 was promoted to the AVT-2 stage in Zone I. Two new lines in rabi and two new lines in kharif were contributed for AICORPO testing.

14 early-maturing lines bred at ICRISAT Center significantly outyielded the local control variety, Sen Nighe Au, in Vietnam. The highest yield was obtained with ICGV 86085 (2.91 t ha-1 dry pod yield).

II. Breeding for medium and late varieties

Several high yielding populations/varieties adapted to rainfed and/or irrigated postrainy season culture have been identified. Crosses involving resistant lines with major biotic and abiotic stresses have been attempted with a range of high yielding genotypes. Material is in F1-F4 generations.

Eleven varieties each in rainy and postrainy rabi/summer seasons are presently in AICORPO trials. Of these, ICGV 86010 in rainy season Zone V; ICGV 86309 and ICGV 87189 in 88/89 rabi/summer Zone I & II; and ICGV 87145, ICGV 86309, ICGV 87191, ICGV 87189 and ICGV 87148 in 1988/89 rabi/summer Zone III, are in National Elite Trials.

ICGV 87141 (ICGS 76) is identified for pre-release multiplication for rainy season Zone V.

III. Breeding for confectionery types

Several lines with uniform seed size, and shape, and lines with resistance to foliar diseases (rust and late leafspot) have been crossed with high yielding confectionery varieties. The material is in F1-F5 generation. High yielding bold-seeded lines with improved oleic/linoleic acid ratio ($\geq$ 1.6) were selected for further testing. Two hundred groundnut germplasm lines with possible boiling traits are in seed increase for further observation and evaluation.

Three lines are in AICORPO, Hand Picked Selection Varietal Trial (HPSVT) in 1989 rainy season.

IV. Breeding for virginia runner varieties

Two hundred virginia runner germplasm accessions were evaluated for two seasons both in rainy and postrainy seasons at ICRISAT Center. Forty promising lines were selected for further testing during 1989 rainy season.

Twenty-seven crosses involving virginia runner types and parents with high yield and multiple pest and disease resistance were made.

V. Photoperiod effects

Photoperiod was established as an important attribute for groundnut adaptation; we gained some understanding of mechanisms by which photoperiod influences yields. Screening of breeders lines for photoperiod insensitivity has commenced. While most lines emerging from biotic stress projects were sensitive, early- and medium-duration, high-yielding lines were insensitive to photoperiod.

ICRISAT Research Project Outline

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

2. Old Project Number: G-Phy-Path-Ent-6(85)

3. Program: Groundnut

4. Discipline(s)/Subprogram(s):Phy/ Pat/ Ent

5. Project Title: Water stress effects on groundnut

6. Project Locations:

Patancheru Anantapur Bangalore

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

J.H. Williams	(JHW)
D. McDonald	(DMcD)
J.A. Wightman	(JAW)

(b) Project Scientist Names:

		Scientist-Years
R.C.N. Rao	(RCNR)	0.80
V.K. Mehan	(VKM)	0.05
V.M. Ramraj	(VMR)	0.05
P.T.C. Nambiar	(PTCN)	0.05
L.J. Reddy	(LJR)	0.10

(c) Cooperating Scientist Names:

V.R. Rao	(VRR)
R.W. Gibbons	(RWG)

(d) Supporting Staff:

Research Associate(s)	1.00
Field Assistant(s)	
Field Attendant(s)	

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1990

9. Objectives and Scope:

Identification of germplasm able to perform better in droughts. To understand the mechanisms underlying drought tolerance and susceptibility in selected genotypes. To study the effects of abiotic and biotic factors influencing yields and quality under drought conditions. To identify and improve cultivars for specific and general drought tolerance/resistance.

10. Keywords:

Drought
Germplasm
Drought tolerance
Abiotic factors
Biotic factors
Yield
Quality

11. Technique in brief (Methodology):

Drought stress will be manipulated at different growth stages. Germplasm grouped according to maturity will be screened. Selection for drought tolerance or susceptibility. Detailed physiological studies of lines selected as tolerant/susceptible to establish the mechanisms responsible. Studies of the effects of management, abiotic and biotic factors influencing yield and quality under drought. Improvement of screening methods to identify water use efficient plants and those with superior recovery from mid-season drought. Detailed studies on crop physical environments as influenced by agronomic practices.

12. Source of Funds:Core 100.00

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	15.00	15.00	15.00
(b) Travel	7.00	7.00	7.00
(c) POL	15.00	15.00	15.00
(d) Supplies	10.00	10.00	10.00
TOTAL	10.80	10.80	10.80
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location	
Patancheru	4.50

15. Review of past background and present status:

Screening germplasm using the line source sprinkler system is established. Twelve lines have been identified with superior performance. Cultivars with varied recovery responses from mid-season drought have been identified. Experiments done so far established genotype difference in water use efficiency and dry matter partitioning in drought. Progress reports Nos. 1, 2, 3 and 6 are available on screening methodology and results.

16. Existing linkage with other ce[illegible] or research projects:

Prof. J.L. Monteith, ODA. Microclimatology Unit, School of Agriculture, University of Nottingham. Crop Physiology Division, Univ. Agricultural Sciences, Bangalore. AICORPO, Peanut CRSP and American Universities.

17. Likely future cou[illegible] of development:

To establish the impact that intercropping may have on the resistance or susceptibility of [illegible]terial identified in sole crop screening. Studies will be cond[illegible] on the interaction of drought with pests, and diseases (incl[illegible] soilborne diseases). To initiate breeding programs once suitab[illegible]terial becomes available.

18. Availability of t[illegible]ing facility:

Opporunities exist for [illegible]aduates and post-graduate research projects

Approval Date: 15-JU[illegible].

Progress Report

1. Screening done duri[illegible] 1987-88 for drought tolerance and drought recovery responses of 66 GRU and 78 breeders lines has been reported. During 1988-89, 115 GRU and 276 breeding lines were screened for drought tolerance and recovery responses.

2. Physiological bas[illegible] for differences in drought response have been shown to be r[illegible]ted to root growth differences, water-use efficiency, and p[illegible]tioning during drought.

3. Study of root characteristics of varieties with contrasting drought responses have shown resistant/tolerant varieties to have more respiration during drought than susceptible ones.

4. Water-use efficienc[illegible] was related to carbon isotope discrimination in leaves, but found to be also promoted by early drought.

5. Basis of genotypic differences in recovery responses seem to be related to cytokinin concentration in xylem sap during recovery.

Breeding for drought resistance

6. During the 1988/89 postrainy season we conducted one advanced trial with 27 drought resistant (DR) selections and a preliminary trial consisting of 22 DR selections using three controls in each trial. In the advanced trial ICGV 87259 gave 2120 kg ha-1 pod yields under drought treatment and it significantly outyielded all the 3 controls.

7. A new preliminary trial comprising 13 DR selections and 8 early maturity lines and 4 controls was constituted and planted during the 1989 rainy season, we selected 308 F3 and F4 progenies for further evaluation during the 1989 rainy season.

ICRISAT Res[illegible] Project Outline

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

2. Old Project Number: G-Phy-Brd-Path-7(84)

3. Program: Groundnut

4. Discipline(s)/Subprogram(s):Phy/ Brd/ Pat

5. Project Title: To investigate nutrient stresses and to exploit Rhizobium and mycorrhizae to increase groundnut yields

6. Project Locations:

Patancheru ALCORPO

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

R.W. Gibbons	(RWG)
D. McDonald	(DMcD)
J.H. Williams	(JHW)

(b) Project Scientist Names

		Scientist-Years
K.R. Krishna	(KRK)	0.20
P.T.C. Nambiar	(PTCN)	0.90
V.M. Ramraj	(VMR)	0.50
V.K. Mehan	(VKM)	0.05

(c) Cooperating Scientist Names:

K.L. Sahrawat	(KLS)
T.J. Rego	(TRJ)
V.R. Rao	(VRR)

(d) Supporting Staff:

Research Associate(s)	2.00
Field Assistant(s)	
Field Attendant(s)	

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1990

9. Objectives and Scope:

1. To identify efficient strains of bacteria and factors which influence the use of these strains. To manipulate the host and rhizobium to increase productivity. To improve methods of inoculation for small farmers. 2. To establish the role of mycorrhizal fungi and establish what scope exists to exploit these. 3. To establish the physiological basis for crop responses to nutrition and inoculants. 4. To improve the potential of groundnut cultivars in circumstances of nutritional limitations to yield. 5. To establish the interactions of nutrition and disease development.

10. Keywords:

Rhizobia
Mycorrhiza
Nitrogen
Phosphorus
Calcium
Iron
Nutrition

11. Technique in brief (Methodology):

1. Collection, identification, maintenance and evaluation of microorganisms using laboratory, glasshouse and field experiments and procedures. 2. Manipulation of host plant, agronomic practice and environment to allow study of the factors which control nutrient acquisition. 3. Study of the basic process of infection, nutrient acquisition using serological, biochemical, plant and crop physiological techniques. 4. Study of the efficiency of nutrient utilization within the plant.

12. Source of Funds:Core 100.00

13. Cost Estimates: (Direct) 1985 1986 1987

Operational (recurring)

(a) Labor	5.00		
(b) Travel	4.00		
(c) POL	5.00		
(d) Supplies	12.00		
TOTAL	8.40		

Capital (non-recurring

Indirect Costs

14. Land Requirements (ha)

Location

Patancheru	2.00

15. Review of past background and present status:

Research at ICRISAT has identified NC 92 as being able to increase yields on specific cultivars in many circumstances. Methods of rhizobium inoculation have been investigated to a limited extent. The basis for this yield increase is not well established. Non-nodulating lines have been found and are being used in N balance studies. The genetics of non-nodulation have been workd out and isogenic lines are being produced. Mycorrhiza are implicated in P nutrition and have increased yields in reported experiments. Calcium nutrition is a major problem in S.E . Asia and Africa while iron deficiency is identified as a major problem in Indian conditions. Both nutrients interact with water supply. Nitrogen fixation research has progressed well but the basis for physiological responses to strains, management of these in the field and screening methodology needs to be improved. Mycorrhiza need investigation to establish the extent of infection, the role of mycorrhiza and the effect of environment on these. Ca and Fe nutrition have not received much attention although genetic differences in nutritional efficiency have been observed. The basis for a screening method was to be established before breeding can proceed.

16. Existing linkage with other cer or research projects:

Dr. Hartzook, Israel, Peanut CRSP (Dr. J. Elkan and Dr. J.C. Wynne, NCSU).

17. Likely future course of development:

In nitrogen fixation the basis for increased yields by successful bacteria will be established. Factors which influence the survival of introduced bacteria will be studied. Improved screening methods will be developed to allow effective breeding technologies to be applied. Other nutrient research is at a preliminary stage and some basic research on the topic will be conducted. We will intensify breeding work on improving BNF fixation by manipulation of the host and the bacteria.

18. Availability of training facility:

All aspects of microbiology, including maintenance of strains, ELISA techniques, etc. line source techniques for interaction of stress and nutrient effects for Ca and Fe are being refined.

Approval Date: 15-JUL-1985

Progress Report

1. Pot and field experiments showed that strains of Bradyrhizobium and vesicular-arbuscular mycorrhizae interact with each other.

2. There is an interaction of nitrogen nutrition and iron deficiency-chlorosis.

3. Haulm and pod yield losses due to high pH induced iron deficiency chlorosis were quantified; correction of chlorosis resulted in 16 percent improvement in pod yields.

4. Amongst the generally highly chlorosis susceptible spanish and valencia groundnuts, a few tolerant genotypes were identified.

5. In an alkaline soil, nitrogen applied during pod filling increased yields in some cultivars while decreasing it in others.

6. Responses to applied gypsum under end season drought conditions were different in a number of genotypes.

ICRISAT Research Project Outline

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

2. Old Project Number: G-Cyt-8(85)

3. Program: Groundnut

4. Discipline(s)/Subprogram(s):Cyt/ Brd/ Ent/ Pat/ Agr

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

6. Project Locations:

Patancheru AICORPO TNAU

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

J.P. Moss	(JPM)

(b) Project Scientist Names

		Scientist-Years
J.P. Moss	(JPM)	0.50
A.K. Singh	(AKS)	1.00
D.C. Sastri	(DCS)	0.50
J.A. Wightman	(JAW)	

(c) Cooperating Scientist Names:

P. Subrahmanyam	(PS)
P.W. Amin	(PWA)
L.J. Reddy	(LJR)
V.K. Mehan	(VKM)
D.V.R. Reddy	(DVRR)

(d) Supporting Staff:

Research Associate(s)	3.00
Field Assistant(s)	3.00
Field Attendant(s)	3.00

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1988

9. Objectives and Scope:

To investigate the genomic constitution in, and phylogenetic interrelationship between Arachis wild sp. and A. hypogaea for the following objectives. 1) To transfer desirable traits from compatible wild species to groundnut and to develop stable tetraploid lines with desirable traits. 2. To investigate barriers to interspecific hybridization between A. hypogaea and useful species from other sections to develop methods to produce hybrids. 3. To adopt cell/tissue cultures for groundnut improvement.

10. Keywords

Cytogenetic analysis
Genome relationships
Gene transfer
Ploidy manipulations
Incompatibility
Cell/Tissue culture
Haploidy

11. Technique in brief (Methodology):

Genome analysis: Standard cytological, cytogenetic and biochemical methodologies. Breeding with compatible species: hybridization, ploidy manipulations, manipulation of meiotic recombinations, and gene transfer. Incompatibility: Light and fluorescence microscopy, regulation of peg, pod and seed development by hormones, and tissue culture. Tissue culture: Interspecific hybridization; anther/pollen culture for haploidy; and cell/tissue culture.

12. Source of Funds:Core 100.00

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	5.00	5.00	5.00
(b) Travel	10.00	10.00	10.00
(c) POL	5.00	5.00	5.00
(d) Supplies	15.00	15.00	15.00
TOTAL	11.10	11.10	11.10
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (hn)			
Location			
Patancheru	6.00	6.00	6.00

15. Review of past background and present status:

Past background: 1. Genome relationships in genus Arachis were not studied satisfactorily. 2. A few compatible species were crossed with A. hypogaea. Ploypoidy was used previously for inducing fertility in sterile triploids. 3. Reasons for incompatibility in failing crosses were not studied. 4. Regeneration of plants from cell/tissue cultures in groundnut was not achieved. Present status: 1. Genome analysis in section Arachis by conventional cytogenetical methods accomplished. It is to be extended to other sections. 2. A number of fertile interspecific tetraploid commercial derivatives with desirable genes from 8 species of section Arachis have been produced and a large number of segregants resistant to late leafspot and rust have been selected. 3. A method for increasing peg and pod production by hormone application in incompatible crosses is standardised. 4. Ovule and embryo from hormone aided incompatible crosses have been cultured and hybrid calli and shoots obtained. 5. Regeneration of plants from tissue culture has been achieved.

16. Existing linkage with other groundnut research projects:

1. Closely linked with other groundnut projects on different diseases and pest stresses. Material generated is assessed for yield and other traits. 2. Linkages with NCSU and Reading University for exchange of information and material. 3. Linkage with Southern African Center in Malawi for early leafspot and rosette resistance. 4. Future linkage with national and international tissue culture centers for exchange of information.

17. Likely future course of development:

1. Extending of genome analysis to the member of section Rhizomatosae and certain new accessions of interest. 2. Production of wider range of interspecific derivatives. 3. Screening of advanced selections resistant to rust and/or late leafspot and other pest and pathogens, and agronomic evaluation at various national and international locations. 4. Expanding the range of incompatible crosses and use tissue culture for genetic improvement. 5. Registration of resistant selections.

18. Availability of training facility:

1. Hybridization. 2. Cytological techniques. 3. Cytogenetic theory and methods. 4. Theory and use of tissue culture for incompatibility and crop improvement.

Approval Date: 15-JAN-1985

Progress Report

1. Foliar diseases resistant advanced interspecific derivatives were agronomically evaluated and from early generation interspecific derivatives 195 plants were selected with resistance to late leaf spot. Five lines were identified with resistance to early leaf spot at Malawi and Pantnagar.

2. Progress has been made for genetic introgression of early leaf spot and rosette resistances into A. hypogaea from A. sp. 30085, A. sp. 30017 and A. chacoense. An incompatible species A. sp. 30003 has also been crossed with annual species of section Arachis using in-vitro embryo rescue technique.

3. Hybrid Plant (A. hypogaea x A. sp. 276233) has been established using in-vitro regeneration techniques.

4. In-vitro regeneration has been achieved in A. villosulicarpa and A. hypogaea.

5. A protocol for selection of flower buds with right stage of microspores for induction of divisions has been standardized.

ICRISAT Research ,ect Outline

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

2. Old Project Number: G-Brd-9(8')

3. Program: Groundnut

4. Discipline(s)/Subprogram(s):Ent/ Brd

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

6. Project Locations:

Patancheru AICORPO SAT

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

J.A. Wightman	(JAW)
S.N. Nigam	(SNN)
D.V.R. Reddy	(DVRR)

(b) Project Scientist Names:

		Scientist-Years
J.A. Wightman	(JAW)	0.20
G.V.R. Rao	(GVRR)	0.40
S.L. Dwivedi	(SLD)	0.10
S.N. Nigam	(SNN)	
A.K. Singh	(AKS)	

(c) Cooperating Scientist Names:

L.J. Reddy	(LJR)
M.J.V. Rao	(MJVR)
V.K. Mehan	(VKM)
V.R. Rao	(VRR)

(d) Supporting Staff:

Research Associate(s)	1.00
Field Assistant(s)	2.00
Field Attendant(s)	3.00

8. (a) Date of Start: 1984

(b) Years Revised:

(c) Year of Completion: 1989

9. Objectives and Scope:

1. To identify sources of resistance in cultivated and wild Arachis species. 2. To breed varieties for multiple pest resistance. 3. To investigate mechanisms of resistance. 4. To investigate inheritance of resistance.

10. Keywords:

Insect pests
Resistance
Utilisation
Mechanism of resistance
Inheritance of resistance

11. Technique in brief (Methodology):

1. Field screening methods for leafminer and Spodoptera will be improved by artificial release. 2. Factors responsible for resistance to pests will be studied. 3. Biology of pests on resistant and susceptible cultivars will be studied under controlled conditions. 4. Genetic techiques such as diallel mating will be used to study inheritance of resistance.

12. Source of Funds:Core 100.

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	15.00		
(b) Travel	7.00		
(c) POL	15.00		
(d) Supplies	3.00		
TOTAL	7.20		
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location

15. Review of past background and present status:

Literature review completed, several papers and reports have been produced. Several sources of resistance to jassids and thrips have been identified and crossed with high-yielding susceptible cultivars. Screening for aphid resistance will continue and concentrate on wild species. Resistance to pod scarifying termites has been identified. Interactions of pod damage and Aspergillus flavus are being studied. Attempts to identify better sources of resistance to leafminer and Spodoptera will continue. Identification of pod boring insects is underway. Several field resistant genotypes to BMD have been identified and are being tested on farm in cooperation with APAU and the Department of Agriculture. High yielding multiple pest resistant lines have been entered into AICORPO trials and supplied to cooperators.

16. Existing linkage with other centers or research projects:

1. North Carolina State University, USA (Dr. Wynne and Campbell).
2. AICORPO. 3. ICIPE, Nairobi, Kenya

17. Likely future course of development:

Breeding lines will be tested internationally. Materials will be checked for reactions to other constraining factors such as diseases and drought. Efforts will be made to identify other sources of resistance and develop resistant lines. Resistant lines will also be tested in Integrated Pest Management Programs.

18. Availability of training facility:

Training facilities exist for host plant resistance, field screening methodology, mechanisms of resistance to jassids, identification and culturing thrips, aphid transmission of viruses, sampling techniques

Approval Date:

Progress Report

Sufficient sources of resistance to minor pests jassids and thrips (except virus vectors) are available and have been incorporated in breeding programs. There are insufficient sources of resistance to defoliators, groundnut leafminer and Spodoptera litura, which cannot be field screened at IC. Attention has switched to developing a new technique for finding resistance to those species in A. hypogaea and Arachis spp. Glasshouse and field screening for resistance to Aphis craccivora in India and Malawi has lead to some good results. Field survey of GBU 9 AICORPO is attempted each season. See Collaborative Project reports. CO-9-XX (87) for collaborator X-link. Observations in farmers' fields have been initiated.

Insect-pest resistance breeding

Excellent progress has been made in combining resistance to jassids/thrips in improved genotypes. Several lines with high level of resistance to jassids were selected. Further crosses involving aphid and spodoptera resistant lines have been attempted and the material is in various generations (F1-F5).

Three varieties each in rainy and postrainy season are presently in AICORPO trials. Of these, ICGV 86005 is in National Elite Trial, Zone V in rainy season.

ICRISAT Research Project Outline

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

2. Old Project Number:

3. Program: Groundnut

4. Discipline(s)/Subprogram(s): Ent/ Pat/ Brd

5. Project Title: Biology and management of pests of stored groundnuts

6. Project Locations:

Patancheru AICORPO

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

J.A. Wightman	(JAW)
D. McDonald	(DMcD)
S.N. Nigam	(SNN)

(b) Project Scientist Names

		Scientist-Years
J.A. Wightman	(JAW)	1.00
D. McDonald	(DMcD)	
S.N. Nigam	(SNN)	
V.K. Mehan	(VKM)	

(c) Cooperating Scientist Names:

V.K. Mehan	(VKM)
P.W. Amin	(PWA)

(d) Supporting Staff:

Research Associate(s)
Field Assistant(s)
Field Attendant(s)

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1989

9. Objectives and Scope:

1. To develop methods for the evaluation of the nature and extent of pest problems of stored groundnuts. 2. To develop methods and screen germplasm for resistance to storage pests. 3. To collect samples of pest-damaged groundnuts to determine possible linkages with aflatoxin contamination.

10. Keywords:

Pests
Harvested groundnuts
Resistance
Losses
Aflatoxin

11. Technique in brief (Methodology):

1. To monitor insect infestations from tissue of harvest to the end of the storage period. 2. Regular sampling of local markets and/or mills over an extended period to assess storage losses caused by pests.

12. Source of Funds:Core 100.00

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	1.00	1.00	
(b) Travel	1.00	1.00	
(c) POL	1.00	1.00	
(d) Supplies	3.00	3.00	
TOTAL	2.00	2.00	
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location
Patancheru

15. Review of past background and present status:

Preliminary research and observations at ICRISAT by Dr. P.W. Amin has indicated that some genotypes possess resistance to seed damage by Tribolium sp.

16. Existing linkage with other centres or research projects:

Cooperative linkage has been established with the pest infestion laboratory and TDRI in the U.K.

17. Likely future course of development:

It is hoped that the major causes of insect related losses in harvested groundnuts in India can be ascertained. Sources of resistance to storage pests should be identified and used in resistance breeding.

18. Availability of training facility:

Can be arranged

Approval Date: 15-JUL-1985

Progress Report

Techniques for screening for resistance to stored product pests have been established and implemented. Breeders elite material has been screened. Experiments on protecting groundnut from stored product pests centre on an inert clay dust. It appears to be highly effective. Its role in protecting the stored product from aflatoxin incidence induced by insect attack is being examined.

(Breeding): Twenty-two lines were screened for resistance to Corcyra sp. and varietal differences for % damage were noticed.

ICRISAT Research Project Outline

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

2. Old Project Number: G-Brd-10(85)

3. Program: Groundnut

4. Discipline(s)/Subprogram(s): Ent

5. Project Title: Integrated pest management with emphasis on Spodoptera litura and groundnut leaf minor (GNLM)

6. Project Locations:

Patancheru

7. Scientific Staff Names

(a) Discipline/Subprogram Leader Names:

J.A. Wightman (JAW)

(b) Project Scientist Names — Scientist-Years

J.A. Wightman	(JAW)	0.50
G.V. Ranga Rao	(GVRR)	0.50
M. Pimbert	(MP)	
C.S. Gold	(CSG)	
C.K. Ong	(CKO)	

(c) Cooperating Scientist Names:

J.H. Williams	(JHW)
R.A.E. Mueller	(RAEM)
A.B.S. King	(ABSK)

(d) Supporting Staff:

Research Associate(s)	1.00
Field Assistant(s)	1.50
Field Attendant(s)	2.50

8. (a) Date of Start: 1984

(b) Years Revised:

(c) Year of Completion: 1989

9. Objectives and Scope:

1. To determine the economic significance of the major groundnut pests in the SAT expecially the groundnut leafminer (GNLM) and Spodoptera litura. 2. To evaluate methods of controlling the major pests of groundnuts that do not involve host resistance directly or the use of broad spectrum insecticides.

10. Keywords:

Integrated Pest Management
Groundnut leafminer
Spodoptera Lithura
Broad spectrum insecticides
Resistances

11. Technique in brief (Methodology):

1. Field trials using insecticides to regulate pest numbers in a differential manner. 2. Laboratory studies of insect growth rates and consumption. 3. Field studies of parasites and predators of pests. 4. Evaluation of formulations and procedures for machine applied viruses. 5. Computer simulation of the life systems of pests. 6. Determination of economic threshold. 7. Evaluation of farmers' needs.

12. Source of Funds: Core 100.00

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	5.00	5.00	5.00
(b) Travel	10.00	10.00	10.00
(c) POL	3.00	3.00	3.00
(d) Supplies	9.00	9.00	9.00
TOTAL	7.90	7.90	7.90
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location			
Patancheru (Rabi)	2.00	2.00	2.00
Patancheru (Kharif)	2.00	2.00	2.00

15. Review of past background and present status:

Observations on a one hectare block have commenced. Pest investigations on the biology and resistance available have been assessed and published in annual reports and progress reports.

16. Existing linkage with other centers or research projects:

1. TDRI, UK on S. litura phermones. 2. Southampton University, UK, on GNLM pheromones

17. Likely future course of development:

Integrated pest management systems will be developed. Joint projects with the University of Southampton, University of Harare (Zimbabwe), ICIPE (Nairobi, Kenya) and Peanut CRSP will be developed.

18. Availability of training facility:

A full training program for all groundnut entomology projects will be developed by 1986.

Approval Date: 15-JUL-1985

Progress Report

General: We continue to monitor the influence of insecticides on the insects living on groundnut at ICRISAT Center to accumulate information about the judicious use of insecticides, damage thresholds, and insect flight patterns. The difference between the rabi and Kharif crops and the poor insect population in recent years means that this work will continue a little longer.

ICRISAT Research Project Outline

1. Project Number: G-112(85)IC

2. Old Project Number:

3. Program: Groundnut

4. Discipline(s)/Subprogram(s):Ent

5. Project Title: Termite control in groundnuts

6. Project Locations:

Patancheru Bangalore

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

J.A. Wightman (JAW)

(b) Project Scientist Names — Scientist-Years

J.A. Wightman	(JAW)	0.10
C.K. Ong	(CKO)	0.50
G.V. Ranga Rao	(GVRR)	0.05
C.S. Gold	(CSG)	

(c) Cooperating Scientist Names:

J.W.W. Logan	(ODNRI)	(JWWL)
G.K. Veeresh	(UAS, Bangalore)	(GKV)
D. Rajagopal		(DR)

(d) Supporting Staff:

Research Associate(s)	0.50
Field Assistant(s)	0.50
Field Attendant(s)	0.10

8. (a) Date of Start: 1986

(b) Years Revised:

(c) Year of Completion: 1989

9. Objectives and Scope:

1. To test and establish new techniques involving baits treated with insecticides and fungicides in India. 2. To test and improve the techniques under African conditions. 3. To evaluate relationship between termite density and crop losses.

10. Keywords:

Termites
Groundnuts
Insecticides
Fungicides

11. Technique in brief (Methodology):

Standard applied entomological procedures using newly developed techniques and pesticides.

12. Source of Funds: Core 70.00 TDR! 30.00

13. Cost Estimates: (Direct)

	1986	1987	1988
Operational (recurring)			
(a) Labor	0.50		
(b) Travel	2.00		
(c) POL	0.50		
(d) Supplies	0.50		
TOTAL	3.50		
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location	
Patancheru	

15. Review of past background and present status:

Termites cause severe damage to groundnuts in many areas of the SAT. By tunneling in roots and stems they cause wilting and death of plants; some species cut through branches (common in Malawi and other countries of Southern Africa); some species scarify and penetrate shells exposing seeds to invasion by soil fungi including A. flavus. Studies in Nigeria have shown yield loss of up to 20% from termite damage to roots. Some species can be partially controlled by cultivation and a limited success has been achieved by use of insecticides and fungicides, the latter being effective through damage to the fungal gardens cultivated by the termites.

16. Existing linkage with other centers or research projects:

Collaborative project with TDRI. Museum, UK, who have considerable expertise in the field of termite research. Collaborative project with TDRI

17. Likely future course of development:

If successful this project will lead to the replacement of treating the soil in groundnut beds with persistant cyclodiene insecticides with a cheap, effective, and safe method of termite control.

18. Availability of training facility:

Apprentice will receive training in field testing pesticides

Approval Date: 26-SEP-1986

Progress Report

A collaborative project with ODNRI is completed and lead to recommendations about the insecticidal control of termite - not realy applicable to most SAT farmers.

Current research is centred on protecting the harvested crop from termites with mulches. This work has lead to the observation that the leaves and stems of a bush, Ipomaea fistulosa, can protect groundnut from termite attack.

ICRISAT Research Project Outline

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

2. Old Project Number:

3. Program: Groundnut

4. Discipline(s)/Subprogram(s): BN / BRD.

5. Project Title: Evaluation of Nutritional and food quality of groundnut

6. Project Locations:

Patancheru

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

R.W. Gibbons	(RWG)
R. Jambunathan	(RJ)

(b) Project Scientist Names

		Scientist-Years
R. Jambunathan	(RJ)	0.10
S.L. Dwivedi	(SLD)	0.10
A.N. Other	(ANO)	1.00

(c) Cooperating Scientist Names:

V.R. Rao	(VRR)

(d) Supporting Staff:

Research Associate(s)	2.00
Field Assistant(s)	
Field Attendant(s)	1.00

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1990

9. Objectives and Scope:

1. Determine the protein and oil content in groundnuts. 2. Determine the proximate composition of groundnuts including vitamins, sugars and protein quality using chemical methods. 3. Determine the oil quality including fatty acid composition in groundnuts. 4. Initiate and standardize taste panel evaluation studies.

10. Keywords:

Groundnut
Nutritional quality
Oil quality
Flavor
Acceptability

11. Technique in brief (Methodology):

1. Using standardized methods, the protein content and oil content in groundnut cultivars will be determined using the Technicon autho analyser and nuclear magnetic resonace spectrometer (NMR) methods respectively. 2. Proximate composition, sugars, vitamins and amino acid composition of groundnut cultivars will be determined using standardized methods. 3. Fatty acid composition will be determined and flavor components monitored as and when equipment/facilities become available. 4. Environmental effects on quality factors will be tested by analysing cultivars obtained from different locations/seasons. 5. In cooperation with the staff of ICRISAT, a taste panel will be constituted to evaluate the advanced groundnut cultivars.

12. Source of Funds:Core 100.00

13. Cost Estimates: (Direct)

	1985	1986	1987
Operational (recurring)			
(a) Labor			
(b) Travel			
(c) POL			
(d) Supplies			
TOTAL	18.00	18.00	18.00
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location			
Patancheru	5.00	5.00	5.00

15. Review of past background and present status:

Various reports, manuals and other publications are available to carry out these analyses. Analysis of oil content of groundnuts by nuclear magnetic resonance spectrometry - R. Jambunathan, S.Madhusudhana Raju and S.P.Barde, Journal of the Science of Food and Agriculture (Accepted). Methods have been established for the determination of protein content by the Technicon auto analyser method and for oil content by the NMR. These two methods are being used for routine estimation in the laboratory.

16. Existing linkage with other centers or research projects:

Linkages have been established with various scientists in North Carolina State University, USA and commercial companies in the UK.

17. Likely future course of development:

Depending on the results obtained on initial investigations, further basic biochemical work can be carried out to ascertain the appropriate time for harvesting groundnuts and to determine the factors that affect the keeping quality of groundnut oil. Consumer acceptance studies can also be carried out on selected cultivars.

18. Availability of training facility:

Training facility for oil and protein determination is available.

Approval Date: 15-JUL-1985

Progress Report

Chemical composition and amino acid composition of ICGS 1, ICGS 5, ICGS 11, ICGS 21, ICGS 44, Kadiri 3, and J 11 (controls) was determined. Fatty acid composition of these genotypes was determined. ICGS 21 had a significantly higher oleic to linoleic ratio among the above mentioned 7 genotypes. Biological evaluation using rats was conducted on these genotypes to determine protein digestibility, biological value, net protein utilization, and protein efficiency ratio. ICGS 21 showed superior performance when compared to other genotypes.

We have initiated experiment to study the stability of oil content and oil quality and 25 genotypes grown in Bhavanisagar, Dharwar, Hisar and ICRISAT were analyzed for their oil content and oil quality. The mean O/L ratio was highest at Bhavanisagar and lowest at Hisar.

Studies showed no useful association of 100-seed mass with oil and protein content. However, oil and protein themselves were negatively correlated. Correlation studies further revealed that oil content in the same variety increased as the seed size increased ($r = 0.976$) and such variation in oil content was up to 6-7%.

A multilocational quality trial with 13 varieties is in progress in 1989 rainy season.

ICRISAT Research Project Outline

1. Project Number: G-119(87)IC

2. Old Project Number:

3. Program: Groundnut

4. Discipline(s)/Subprogram(s): Brd

5. Project Title: International cooperative activities

6. Project Locations: Patancheru, ICRISAT Center

7. Scientific Staff Names:

a) Discipline/Subprogram Leader Names

S.N. Nigam	(SNN	

(b) Project Scientist Names

		Scientist-Years
S.N. Nigam	(SNN)	0.25

(c) Cooperating Scientist Names:

All groundnut scientists IC	( )
ICRISAT Reg.Prog.Breed.	( )
Scientists from Nat.prog.	( )

(d) Research Associate(s)	0.50
Field Assistant(s)	1.00
Field Attendant(s)	1.50

8. (a) Date of Start: 1987

(b) Years Revised:

(c) Year of Completion: 1992

9. Objectives and Scope:

1. To organize and coordinate international evaluation of breeding material and nurseries. 2. To participate in regional and national evaluation networks. 3. To initiate and develop proposals for strengthening national programs. 4. To interact regularly with breeders in ICRISAT regional programs. 5. To provide consultancy services on request.

10. Keywords:

International Cooperation
Breeding
G x E effects
National programs
Nurseries
Networks

11. Technique in brief (Methodology):

1. International adaptation trials. 2. Supply of specific genotypes to national evaluation network. 3. Contract hybridization and supply of segregating populations to regional/national programs. 4. Training of national scientists. 5. Participation in the national, regional, and international workshops/meetings. 6. Organization of scientists' meet/international workshops. 7. Interaction with other international programs.

12. Source of Funds:

13. Cost Estimates: (Direct)

Operational (recurring)

(a) Labor
(b) Travel
(c) POL
(d) Supplies

Total

Capital (nonrecurring)
Indirect Costs

14. Land Requirements (ha)

Location

15. Review of past background and present status:

Large number of genotypes have been supplied to breeders in various countries over the last many years. More recently uniform trials have been sent out comprising sets of genotypes having desirable attributes - confectionery qualities, foliar diseases resistance, pests resistance, and short, medium, and late duration. Participation in the AICORPO has been very active and useful. ICGS 11 and ICGS 44 have been released in India. Many other varieties have been identified for adaptive trials. Promising materials have also been identified in other countries and are under evaluation in national networks/farmers' fields.

16. Existing linkage with other centers or research projects:

AICORPO and other national programs, AGLN, ACIAR, Peanut CRSP, ICRISAT Regional programs, G-102(85)IC to G-109(85)IC.

17. Likely future course of development:

1. It will lead to better coordination and documentation of information.
2. It will help accumulate data to study G x E effects which will be used to identify stable and adapted genotypes for the next cycle of crossing.
3. The project will lead to GCRN (Groundnut Cooperative Regional Network) in due course.

18. Availability of training facility:

.. In groundnut breeding techniques. 2. In regional/international evaluation methodologies.

Progress Report

In Pakistan, 'BARI 699', a composite of two ICRISAT groundnut varieties, ICGS 44 and ICGS 37 has been approved for release for general cultivation. 'Jinpengtangkong', a selection from ICGS 35 possessing higher oil content (52.3%) and low oleic:linoleic acid ratio with superior yield performance over local controls has been released in the Korea Republic.

During 1989 we sent 4, 3, and 1 sets of the international trials, IEGVT, IFDRGVT and IMGVT respectively to Thailand, Niger and Pakistan. In addition, 707 advanced breeding lines and F_2 to F_4 generations of early, medium and late maturity types, foliar diseases and drought resistant varieties and confectionery types were supplied to our cooperators in 12 countries.

We received yield data for the international trials conducted in Vietnam, Burma, Sudan and Benin. In the IEGVT, 14 early maturity varieties significantly outyielded the local control in Vietnam and in Burma ICGV 86015 and 86053 outyielded the local control.

In the IMLGVT, 15 medium and late maturity varieties significantly outyielded the local control in Burma. In Sudan ICGV 87141 gave 5-6 t ha^{-1} pod yields compared to that of 4.8 t ha^{-1} for the local control, Ashford.

In the IFDRGVT, two foliar diseases resistant varieties, ICGV 87183 and 87175 gave 223% and 130% higher pod yields respectively over the local cultivation in Burma. In Sudan, ICGV 87182 gave a pod yield of 4.8 t ha^{-1} as against the 4.4 t ha^{-1} pod yield for the local cultivar. In Vietnam, six foliar disease resistant varieties gave higher pod yields ranging from 10 to 19% over the local control.

In Niamey, six foliar disease resistant varieties, ICGV 87185, 87156, 87183, 87160, 87172 and 87157 and four *A. flavus* resistant varieties, ICGV 87118, 87078, 86168 and 87087 significantly outyielded the local check during 1988 rainy season. In addition, ICG(FDRS) 11 has been promoted to advanced yield trials at the Institute of Plant Breeding, Philippines.

In the Indian National Program, ICGS 76 has been identified for release in peninsular India by the AICORPO group. Several other ICRISAT entries have been promoted to the higher stages of AICORPO testing during 1989 rainy season.

Approval Date: 13 OCT 1988