I C R I S A T

In-House Review
13 April 1987

Research Project Outlines
Legumes Program

ICRISAT Research Project Progress Report

1. Project number : C 102 (85) IC

2. Project title : International Trials for the Semi-Arid Tropics

3. Project Scientists : HAvR/OS/SCS/CLLG/JK

4. Period covered by the report (Month/year) : January to December 1986

5. Summary of progress report:

- The international trials and nurseries included those of Breeding, Entomology and Pathology.

- The F_3 multilocation trials were discontinued for 1986/87, but F_2 populations were made available on request; a list of those populations, showing the parents used in the crosses, was sent to cooperators well in advance of the season.

- An international kabuli trial (ICCT (K)) was initiated with limited distribution.

- Pending results from attempts to evaluate the merits of duplicated augmented designs over simple lattices, the former system of testing continues for the International Chickpea Screening Nurseries (ICSN).

- From 1986/87 the entries of the ICSN's were selected from one set of Preliminary Yield Trials (PYT). However, for 1987/88 they will be selected from two sets of PYT's, one irrigated and one rainfed.

- The International Chickpea Adaptation Trials will only go to cooperators who want to explore possibilities of chickpea production in new areas.

- For the 1986/87 season 199 sets of 15 different international trials and nurseries were sent to 94 cooperators in 27 different countries.

- In addition 542 seed samples of segregating and advanced generation breeding materials were dispatched to cooperators in 9 countries.

- Out of the 199 sets of trials and nurseries 93 were variety trials (ICSN, ICCT of different duration), 63 were disease screening nurseries (ICRRWN, IIUCRRWN, ICSDN) and 43 Heliothis screening nurseries (ICHRN of different duration).

- Out of the 93 variety trials, the ICSN's had a share of 11, 11 and 9 for short, medium and long duration respectively, the ICCT's similarly 15, 9 and 8 respectively, and the ICCT (K) were sent to 8 collaborators.

- In collaboration with the Tamil Nadu Agricultural University, Coimbatore, and the AICPIP Agricultural Research Station, Badnapur, a joint breeding program was started aiming at combining required disease resistances with wide adaptation; four populations were grown during 1986/87.

- During 1985/86, 160 wilt resistant lines were tested at 12 locations in 9 countries. Lines like ICC 1435 and ICC 1437 were resistant at 7 out of the 12 locations, where effective screening had been done. In 1986/87, 27 sets of ICRRWN were supplied to 18 countries; 26 sets of IIUCRRWN to 25 locations in India; and 10 sets of ICSDN to 1 country.

- During 1986/86, ICCX 730008-8-1-P-HR was selected for inclusion in the national crossing program because of its confirmed resistance to H. armigera over 3 years of testing. For 1986/87 43 sets of ICHRN were distributed over 12, 18 and 13 short, medium and long duration nurseries.

- Based on the yield data across locations, the list of new chickpea varieties for submission to the AICPIP trials in 1986/87 contained two short duration, two medium duration, one long duration and two late-planting-adapted desis, and two kabulis. The location with the highest yield was Sriganganagar, and the highest mean yield of 4228 kg ha^{-1} was from ICCL 85443.

- The 1985/86 results of the AICPIP showed the following rankings:

  First: ICCC 43 (CZ), ICCC 47 (CZ), ICCC 37 (SZ), ICCC 41 (CZ).

  Second: ICCC 37 (SEZ), ICCC 42 (SZ), ICCC 32 (NWHZ and NEPZ).

  Third: ICC 48 (CZ), ICCC 36 (SZ).

- GNG 149, a kabuli genotype selected by breeders at the Sriganganagar Agricultural Research Station from ICRISAT material, was identified for release in the North West Plains Zone.

- In minikit trials during 1986/87 are ICCC 32 (CZ and NWPZ) and ICCC 37 (SZ).

- In Ethiopia two varieties have been released, which were developed from ICRISAT crosses; multiplication is in progress. The varieties are 850-3/27 x F 378, and JG 62 x Radhey.

- In Burma, P 436 obtained from ICRISAT has been released as Yezin 1. A selection from K 850 x F 378 was released by ARD, Kyehmon and seed multiplication is on 12 ha.

- In Nepal, candidates for release are ICCC 4, ICCC 13 and ICCL 83120.

- In Bangladesh, ICCL 81248 has been approved for release (as S1) by the Technical Committee of the National Seed Board of Bangladesh in 1986.

- In Kenya, multiplication of ICCL 83110 for release to farmers is going on.

- Four special trials were initiated in Ethiopia during 1986/87.

- Seed multiplication is being carried out for ICCV 1 (for 1.3 ton), ICCC 32 (for about 3 tons) and ICCC 37 (for about 1.5 ton).

- Annual Chickpea Scientists' Meets were organized in Pakistan, at Islamabad, in collaboration with NARC (1986), where 32 participants from 6 different countries gathered; and in India at ICRISAT Center, Patancheru (1987), where 40 scientists from 4 different countries participated.

6. Publications:

Report of International Trials and Nurseries conducted in India during 1985/86. Prepared for the All India Rabi Pulses Workshop held at Jaipur, Rajasthan.

7. Workplan for next years:

- The next Chickpea Scientists' Meet is proposed to be held in Bangladesh.

- It will be attempted to differentiate the ICCT (K) also in short, medium and long duration groups.

- More joint breeding programs in collaboration with national institutions will be initiated.

ICRISAT Research Project Progress Report

1. Project number : C 103 (85) IC

2. Project title : Breeding short duration desi chickpeas for stability and high yield

3. Project scientists : OS/SCS/MVR/SSL/NPS

4. Period covered by the report (Month/year):

   From: January 1986 To: December 1986

5. Summary of progress report:

We effected a major change in our breeding strategy by making disease and insect pest resistance mandatory for all breeding materials, testing progenies on a commercial plant density, and by widening the genetic base among the new cross combinations.

We made 125 single and 45 three-way crosses among the F_1s and parents drawn to complement the deficient components of each other. Crossing program was heavily biased towards incorporation of stress resistance factors (wilt, root rots, Heliothis pod borer, drought etc.) with good agronomic characteristics such as high yield, seed size, novel plant types, high protein, and geographical diversity.

About 9200 progenies and 445 bulks were evaluated in normal, wilt-sick and/or unsprayed fields; about 4800 progenies and 360 bulks were selected for further tests. Highly promising 726 progeny bulks with resistance to wilt, root rots, and pod borer were also selected for inclusion in preliminary yield trials. From among 644 lines tested in preliminary and advanced yield trials, we contributed 72 lines to international chickpea screening nurseries, 49 lines to international chickpea Heliothis resistant nursery and entomological trials, and 16 lines to international chickpea wilt and root rot nursery. Three lines (ICCV 8, -9 and -10) were contributed for testing in AICPIP trials.

6. Publications : 1. ICRISAT Annual Report 1976,
   2. Chickpea Breeding Report of Work 1985/86.

7. Work plan for next year:

More three-way, composite, and back crosses will be made to incorporate resistance to wilt, root rots, pod borer and drought, and large seed size into good agronomic backgrounds.

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Screening for resistance to wilt and root rots in wilt-sick plots under rainout shelters will be initiated in the off-season to clear the backlog of unscreened materials and for speedy progress of collaborative projects with national programs. Efforts to combine wilt and pod borer resistance and to identify genotypes with specific and wide adaptation will be intensified.

Form 'A'

COLLABORATIVE PROJECTS

Project No.

Project title: Diversified Bulk Population Breeding Project

Name of the collaborative Institute: 1) Agricultural Research Station, Badnapur (Jalna) 431202, Maharashtra
2) Tamil Nadu Agric Univ, Coimbatore

Name of scientists responsible for the project: Tamil Nadu

(a) **Collaborative Institute:** 1. Dr V.K. Shinde
2. Mr P. Shanmugasundaram

(b) **ICRISAT** Dr H.A. van Rheenen
Dr M.V. Reddy

Duration

(a) **Date of start:** Rabi season 1986/87

(b) **Date of completion:** Phase I: Rabi season 1992/93

Objectives: To produce stable genotypes with required adaptaton and resistance to stress factors in a collaborative program.

Source of funds: Each collaborative institution provides necessary funding

Progress so far: F_3 populations of 4 crosses, screened at ICRISAT Center for resistance to wilt and dry root rot, were planted at Coimbatore and Patancheru during the 1986/87 Rabi season. Badnapur could not plant because of lack of rain.

Remarks: If the collaboration works out to be satisfactory, it may become continuous, and may be extended to other institutions.

ICRISAT Research Project Progress Report

1. **Project number** : C 104 (85) IC

2. **Project title** : Breeding long duration desi chickpeas for stability and high yield - International

3. **Project scientists** : JA, CLLG, SSL, NPS, MVR

4. **Period covered by the report** (Month, Year):

   From: January 1986 To: December 1986

5. **Summary of progress report:**

We made 150 crosses this year, of which three were three-way crosses. The emphasis was mainly on incorporating multiple resistances. Among the single crosses 15 were for combining Ascochyta blight and Botrytis gray mold resistance with high yield; 44 for combining wilt and stunt resistance with Ascochyta blight resistance; 16 for combining Ascochyta blight, Botrytis gray mold and stunt resistance with wilt and dry root rot resistance; and the remaining 69 crosses involved geographically diverse lines with high yielding lines. About 9600 progenies and 850 bulks were evaluated in normal, wilt sick and/or unsprayed fields. From these we have selected 6400 single plants and 850 bulks. Highly promising and wilt resistant 283 bulks were selected for inclusion in preliminary (PYT) and advanced yield trials (AYT). We screened 8 F_2 and 1082 F_3 progenies in the HAU/ICRISAT Ascochyta blight nursery and selected 155 single plants. In the Botrytis gray mold screening nursery at Pantnagar we screened 405 F_2 to F_7 progeny bulks and selected 471 plants for yield evaluation next year. From among 622 lines tested in PYT and AYT, we contributed 50 lines to International Chickpea Screening Nursery (ICSN)-DS; 12 lines to ICSN-DM and six lines to International Chickpea Cooperative Trial-DL. Two lines (ICCV 11 and -12) were entered for testing in the AICPIP trials.

6. **Publications** :
   1. ICRISAT Annual Report 1986
   2. Chickpea Breeding Report of Work 1985/86.
   3. JA No. 501

7. **Work plan for next year** :

More three-way and double crosses will be made to incorporate resistance to more than one disease and to Heliothis pod borer. Artificial screening for Ascochyta blight and Botrytis gray mold will be pursued vigorously in controlled growth chambers. Efforts towards achieving success through embryo rescue, in interspecific crosses with Cicer species having high degree of resistance to Ascochyta blight and Botrytis gray mold will continue.

ICRISAT Research Project Progress Report

1. Project number : C 106 (85) IC

2. Project title : Breeding kabuli chickpeas for stability and high yield in semi-arid tropics

3. Project scientists : SCS/JK/MVR/SSL/NPS

4. Period covered by the report (Month/Year):

   From: January 1986 To: December 1986

5. Summary of progress report:

We made 45 single crosses among parents of adapted backgrounds, resistance to diseases, such as wilt, stunt, ascochyta blight, and botrytis gray mold and Heliothis, large seed size, accessions with different countries of origin etc. In addition, 34 multiple crosses were also made among single crosses mutually compensating for the characters deficient in each other.

We grew 47 F_2s in the normal fields and 24 in the blight nursery at Hisar and selected 437 single plants from the former and 45 from the latter. F_3 to F_7 progenies, 1883, were raised in the normal, and 1478 of these were in a wilt sick plot at Hisar or Patancheru to check for the disease reaction. We selected 610 single plants for progeny rows and individually bulked 110 progenies for conducting preliminary yield trials next season. In all these selections, high selection pressure was exercised for good seed size.

Five PYTs and one AYT comprising 23 entries each were conducted at Hisar and the AYT was also conducted at Gwalior, L 550 and ICCC 32 were included as the checks for comparisons. Ten most promising entries from these trials were contributed to International Chickpea Cooperative Trial (ICCT-k) which was initiated from ICRISAT this season. ICCT-K was sent to seven locations with Hisar, Patancheru and Gwalior as the additional sites.

ICCC 32, identified for Central and North West Plain zones of India was sent for minikit trials in Haryana, Punjab, Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Bihar and U.P.

ICCC 49, a kabuli cultivar contributed to the AICPIP trials last year ranked first at Delhi, second at Kanpur and fourth at Sriganganagar. Two more entries, ICCV 13 and ICCV 14 were contributed to these trials this year.

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With the development of early wilt resistant kabuli, ICCV 2, a new area has been opened for growing kabulis in peninsular India and similar other short duration environments - Ethiopia, Burma, Bangladesh and Nepal. On request from the Pulse Scientist, APAU, and Assistant Director Agriculture, AP, 100 kg of ICCV 2 was supplied to each one of them for conducting minikit trials in the state.

We have already started, though on a small footing, the work on short duration kabulis at Patancheru and accomplished 12 crosses, grew 55 F_4 progenies, selected 30 plants and individually bulked 6 progeny for trials.

6. Publications : ICCV 6 under preparation.

7. Work plan for next year:

1. Making three-way and double crosses to combine resistances to different diseases (wilt, stunt, ascochyta blight, botrytis) and insect pests (Heliothis).

2. Continue screening F_2 and F_3 in wilt sick plot and for blight resistance in blight nursery at Hisar and in pots at Patancheru.

3. Continue exercising higher selection pressure for seed size.

4. Continue contributing high yielding disease resistant lines to AICPIP trials and ICCT-K.

ICRISAT Research Project Progress Report

1. **Project number** : C 108 (85) IC

2. **Project title** : Breeding chickpeas for adaptation to early and late planting, and to increased inputs

3. **Project scientists** : CLLG/OS/MVR/NPS/SS

4. **Period covered by the report (Month/Year):**

   From: January 1986 To: December 1986

5. **Summary of progress report:**

A. Breeding for adaptation to early sowing

We made 26 crosses to incorporate resistance to Fusarium wilt, dry root rot, Colletotrichum blight and Heliothis into adapted high yielding lines. We evaluated 1331 F_3-F_5 progenies in early planting and advanced only the wilt resistant 629 progeny bulks. Highly promising 46 progeny bulks were included in replicated testing. One hundred and forty one new germplasm lines were screened for adaptation to early planting, and selected entries will be retested next season. In the early v/s normal sown comparison trial, the early planted trial gave 1105 kg ha^{-1} compared to 735 kg ha^{-1} in normal planting. Considering that this was a drought year, the yield level in early planting is reasonably good. The early maturing lines such as 1-209-15, NEC 2820 and P 6099-2 have given above 1400 kg ha^{-1}, whereas the medium maturing lines have not fared well this season. Because of severe drought conditions, the demonstrations of early planting at other research could not be planted.

B. Breeding for adaptation to late sowing

We made 50 single crosses between desi and kabuli genotypes adapted to late sowing and sources of resistance to wilt, ascochyta blight and Heliothis pod borer. Nearly 600 F_3 to F_7 progenies and 512 germplasm lines were evaluated under late-sowing; 173 single plants, 34 progeny rows and 23 germplasm lines were selected for further tests. Out of 46 desi and 23 kabuli lines tested in late-sown preliminary yield trials, 23 were selected for advanced yield tests. From two advanced yield trials each comprising 23 desi and kabuli lines, one desi (ICCV 15) and one kabuli line (ICCV 16) were contributed to late-sown AICPIP trials.

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C. Breeding for adaptation to increased inputs

We grew 312 mid-tall lines with erect habit under the high input conditions in a preliminary observation nursery at Hisar. Due to salinity problem, only a part of materials could be scored for lodging resistance and 218 lines were retained for further tests.

6. Publications : 1. ICRISAT Annual Report 1986
2. Chickpea Breeding Report of Work 1985/86
3. CP No. 270

7. Work plan for next year:

A. The early v/s normal sown comparison trial will be continued to confirm the earlier findings. Promising progeny bulks from breeding material of crosses made for early planting will be included in replicated trials. Popularising the early planting of chickpea to researchers and farmers will continue.

B. A late v/s normal sown trial will be constituted next year to determine the interactions between genotypes and dates of sowing. Efforts will continue to identify and develop lines adapted to late-sowing with increased emphasis on combining various resistance.

C. Screening of germplasm/breeding lines for response to increased inputs will continue. Once the adapted lines are identified, breeding to improve them further will commence.

ICRISAT Research Project Progress Report

1. Project Number : C 109 (85) IC

2. Project Title : Studies on genetics and breeding methods of chickpea

3. Project Scientists : HAvR/OS/SCS/CLLG/JK

4. Period covered by the report (Month/Year):

From: January 1986 To: December 1986

5. Summary of progress report:

A. Desi-Kabuli introgression studies

The F_3 bulks from cycle 1 and cycle 2 introgression crosses were compared at both ICRISAT Center and at Hisar. In general, it appears that the variability is reduced in the second cycle of introgression, compared to the first cycle of introgression crosses. However, the second cycle seemed to possess higher proportion of better segregants.

B. Improving the growth of Cicer plants in pots

Chickpea (C. arietinum cv. ICCC 42) and C. judaicum 185 were grown in black and white pots with different soil moistures. The different pot colours gave maximal temperature differences of 30°C. Biomass and seed yield production were twice as much in the white pots as in the black pots, while the soil mixture differences had no significant effect on plant growth.

C. Recombination breeding

We made 51 biparental crosses among the selected F_2 plants to recombine the desirable characteristics of parents, Annigeri, K 850, JG 62, ICC 506, and ICCL 83151. In F_2 progenies of double-crosses, 70 single plants with desired characteristics were selected for further progeny tests. From original single crosses, 23 F_5 progenies each with and without wilt resistance were selected for comparison.

D. Double-podded and multiseeded characters

The F_1s, F_2s, and backcrosses between a double-podded and a multiseeded line were obtained to initiate a new study to determine the relative contributions of these two characters to seed yield.

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E. Male sterility

The recurrent selection program using male sterility initiated in the earlier years by involving good sources of resistance and adapted parents completed the first cycle of intermating selection and testing, and second cycle was initiated in 1985/86 season. The material emerging out of first cycle will be channeled through the normal breeding course by screening it in the disease sick nursery first and selecting single plants thereafter. The second source of male sterility is more or less confirmed now. Unlike ms_1, it is expressed at Hisar suggesting a complete genic control with no influence of environment.

6. Publications : 1. ICRISAT Annual Report 1986
2. Chickpea Breeding Report of Work 1985/86.

7. Work plan for next year:

1. The comparison of cycle 1 and cycle 2 bulks will be repeated for one more season. Bulks from both cycles will be screened in wilt sick plot for further single plant selections.

2. Attempt further improvement of growth.

3. More biparental crosses will be made to start the third cycle of recombination. The lines derived from the first cycle of crossing will be compared with the parents.

4. We will continue with the recurrent selection program in chickpea and the products from this will keep on flowing in the normal breeding program. At some stage we will analyse if this approach has in fact been useful or not.

Form 'A'

14

COLLABORATIVE PROJECTS

Project No.

Project title: Tissue culture for chickpea improvement

Name of the collaborative institute: Colorado State University, Tissue Culture for Crops Project, Fort Colli

Name of scientists responsible for the project:

(a) Collaborative Institute: Dr Oluf L. Gamborg

(b) ICRISAT: Dr Y.L. Nene
Dr H.A. van Rheenen
Dr C.L.L. Gowda
Ms. Sheila Vijaya Kumar

Duration

(a) Date of start: 1 April 1987

(b) Date of completion: 31 March 1988

Objectives: To develop techniques for:

- rapid micropropagation
- embryo rescue from interspecific crosses
- salt resistance screening in cell suspensions
- anther culture

and transfer these techniques to ICRISAT Center.

Source of funds: ICRISAT

Progress so far: A Memorandum of Agreement has been signed. A program has been developed. Seed material has been sent from ICRISAT and has been received by TCCP.

Remarks:

ICRISAT RESEARCH PROJECT OUTLINE - TRAINING

1 **Submitted by :** H.A. van Rheenen **Date :** 30-3-1987

2 **Project No. :**

3 **Program (s) :** Legumes

4 **Discipline(s)/Subprogram(s) :** Chickpea Breeding

5 **Project Title :** Tissue culture for chickpea improvement - M.Sc Project

6 **Project Location :** A.P. Agricultural University, Hyderabad

7 **Objective and Scope :** To develop techniques for:
- rapid micropropagation
- embryo rescue from interspecific crosses.

8 **Expected contribution of this project to ongoing approved research :**

9 **Scientific Staff names :**

(a) **Project Scientist :** Dr C.L.L. Gowda - Chairman
Dr H.A. van Rheenen - Member

(b) **Scholar or Fellow :** (Indicate Level) (MSc, PhD, PostDoc): Name(s)
Mr B. Gopal, M.Sc.

(c) **Cooperating Scientist names :** Dr C.S. Reddy

(d) **Support staff :** Man-years

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

10 (a) Date to start : 1 July 1987

(b) Date of completion : 30 June 1988

11 Anticipated Supervisor (s) : _____

12 Recommendation of Project Scientist: Priority (1,2,3,4,5,6,7,8,9)

_____

Signature/date

13 Recommendation of Subprogram/Group Leader:Priority (1,2,3,4,5,6,7,8,9)

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Signature/Date

14 Recommendation of Program Director : Priority (1,2,3,4,5,6,7,8,9)
High Low

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Signature/Date

15 Recommendation of Deputy Director General

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Signature/Date

16 Received by Principal Training Officer :

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Signature/Date

ANNEX :

[illegible] RESEARCH PROJECT OUTLINE - [illegible]

1 **Submitted by :** H.A. van Rheenen **Date :** 30-3-1987

2 **Project No. :** _____

3 **Program (s) :** Legumes

4 **Discipline(s)/Subprogram(s) :** Chickpea Breeding

5 **Project Title :** Inheritance of resistance to ascochyta blight - Post Doctoral Project.

6 **Project Location :** ICRISAT Center

7 **Objective and Scope :** To develop efficient screening techniques in the chickpea growth room. To study the inheritance of ascochyta blight resistance.

8 **Expected contribution of this project to ongoing approved research :**

9 **Scientific Staff names :**

(a) **Project Scientist :** Dr Y.L. Nene
Dr H.A. van Rheenen
Dr Jagdish Kumar
Dr C.L.L. Gowda

(b) **Scholar or Fellow :** (Indicate Level) (MSc, PhD, PostDoc): Name(s)

PDF - Post has still to be advertised

(c) **Cooperating Scientist names :**

(d) **Support staff :** **Man-years**

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

10 (a) Date to start : 1 November 1987

(b) Date of completion : 31 October 1989

11 Anticipated Supervisor (s) : _____

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12 Recommendation of Project Scientist: Priority (1,2,3,4,5,6,7,8,9)

Project listed as high priority.

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Signature/date

13 Recommendation of Subprogram/Group Leader:Priority (1,2,3,4,5,6,7,8,9)

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Signature/Date

14 Recommendation of Program Director : Priority (1,2,3,4,5,6,7,8,9)
High Low

_____

Signature/Date

15 Recommendation of Deputy Director General

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Signature/Date

16 Received by Principal Training Officer :

_____

Signature/Date

ACTION :

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : P-101(77)C

2. **Project Title** : International Trials

3. Project Scientist: Laxman Singh, N.V. Reddy, S.S. Lateef

4. Period Covered by Report: January 1986 to December 1986

5. Summary of progress report:

Objective 1 :

Multilocation pigeonpea varietal trials outside India

- The data received from the cooperators during 1980-85 have been compiled in a draft report.

- Trials were sent to 20 countries and 15 other countries were supplied seed material specifically requested. Results from 8 countries have been received (summarised in Table 1) and 5 have responded to reminders.

Objective 2 :

Develop international programs to strengthen pigeonpea improvement and provide material and assistance to development projects not engaged in breeding.

- Supplied 120 lines to the University of Queensland pigeonpea program in Australia geared to mechanised commercial production. In Fiji line ICP 7035 has been released as 'Komica'. Fifty kg seed of ICPL 151 was supplied to Government of Suriname for pilot production.

- Cooperative net work of pigeonpea varietal testing for adaptation to various production systems in Eastern, Central, and Southern Africa was initiated in 1986 with the support from special funds of DDG. Details of this program are given seperately.

Objective 3 :

Cooperation with pigeonpea improvement research and development in India.

- Produced breeders' seed of ICPL 87, 151, and ICP 8863 for national and state seed corporations and several other varieties chosen for multilocation trials of AICPIP, adaptive and minikit trials.

- Collaborative program initiated and followed up in 1986-87 has been reported seperately.

- Continued participation in AICPIP workshops and multilocation trials.

Table 1: Summary of international pigeonpea varietal trials 1986

Country/Location	Trial (no. of entries)	Date planted	Top yielding entries			Mean plant stand
			Entry	Days to flower	kg ha-1	
Zimbabve						
Marundera (18 S, 1640 m)	PON (20)	20.11.85	ICPL 179	70	1790	48
			ICPL 1	78	1600	28
			ICPL 312	82	1100	58
			ICP 7035	96	1100	11
Chiredzi (21 S, 1200 m)	PON (20)	20.12.85	ICP 6997	94	3780	27
			ICPL 87	67	3360	103
			ICPL 1	67	2990	88
		—	ICPL 138	88	2920	28
Panmura (17 S, 880 m)	EPIT (20)	18.12.85	ICPL 151	71	3760	127
			ICPL 1	79	3690	89
			ICPL 8327	73	3470	70
			ICPL 8329	72	3400	50
			ICPL 87	71	3270	86
			Trial mean		2840	
			SEm ±		580.0	
			CV%		35.0	
	EVPIT (10)	17.12.85	ICPL 84039	81	3350	126
			ICPL 140	73	2930	107
			ICPL 84038	81	2760	120
			ICPL 151	70	2500	121
			ICPL 87	73	2320	130
			Trial mean		2500	
			SEm ±		245.0	
			CV%		17.0	

Notes: For high density sole crop system, ICPL 151, 8327, 1 and 84039 were good and for wider spaced intercrop system ICP 6997 and ICP 7035 would be useful.

Country/Location	Trial (no. of entries)	Date planted	Top yielding entries			Remarks
			Entry	DF	kg ha-1	
Argentina						
Salto (34° S, 50 m)	EPIT (14-16)	Dec.'84	ICPL 8313	68	4840	
			ICPL 87	67	4840	
			ICPL 8310	66	4390	
			Trial mean	65	3340	
			SEm ±		464.0	
			CV%		27.8	
	EPIT (14-16)	13.12.85	ICPL 8311	64	3520	Not analysed.
			ICPL 151	65	3090	Several missing
			ICPL 146	67	2760	values
			Trial mean		2150	
	EPAY-DT (17)	13.12.85	ICPL 8311	71	2380	
			ICPL 84027	66	2120	
			ICPL 151	73	2050	
			Trial mean		1820	
			SEm±		224.3	
			CV%		21.3	
Green Villages (34° S, 117 m)	EPIT (17)	27.11.85	ICPL 8324	-	4420	Not analysed.
			ICPL 151	-	4360	Several missing
			ICPL 87	-	4070	values
			ICPL 8311	-	3590	
			Trial mean		2520	
	EPAY-DT (18)	27.11.85	ICPL 8321	-	3850	
			ICPL 151	-	3480	
			ICPL 8316	-	3140	
			Trial mean		2630	
			SEm ±		620.6	
			CV%		40.8	

Notes: At Salto the trials were planted in mid-December whereas at Green Villages they were planted in November. Besides location effects it appears that higher mean yields were obtained in November plantings. Considering the phenology and agronomic performance it appears that 65-80 days to flower and 90-120 day maturity are desirable. Promising genotypes are ICPL 8311, 151, 8324 and ICPL 87. ICPL 8324 has large seeds and pods, hence suitable for vegetable purpose.

Country/Location	Trial (no. of entries)	Date planted	Top yielding entries			Remarks
			Entry	DF	kg ha-1	
Thailand						
Taphra (16 N, 186 m)	EPAY-DT (18)	5.8.86	ICPL 8324	64	2040	
			ICPL 85033	62	1520	
			ICPL 85016	62	1510	
			ICPL 151	64	1140	
			Trial mean		1260	
			SEm ±		-	
			CV%		12.5	
Khon Kaen (16 N, 186 m)	EPAY-DT (18)	11 8 86	ICPL 8324	66	2520	
			ICPL 85033	65	2140	
			ICPL 84037	68	1750	
			Trial mean		1590	
			SEm ±		-	
			CV%		11.5	

Note:- ICPL 8324 and 85033 are promising. Should be followed up on large production plots. In another trial at Taphra when planted on 18.6 86, cultivar H 82-1 yielded 2630 kg/ha. H 82-1 has seed index of 6.8 g as compared to 16 5 g of ICPL 8324 and 11.1 g of ICPL 85033.

Philippines						
Echegue (Isabela) (16 N, 56 m)	EPIT (20)	18.8.85	ICPL 6	70	2350	Short duration
			ICPL 146	69	2100	genotypes had
			ICPL 312	68	1800	better performance
			ICPL 87	71	1730	in delayed
planting						
			Trial mean		1300	
			SEm ±		361.5	
			CV%		48.1	
	MPIT (15)	22.8.85	ICPL 304	124	1600	
			ICPL 85060	122	1580	
			ICPL 270	120	1310	
			Trial mean		920	
			SEm ±		193.9	
			CV%		41.9	

Country/location	Trial (no. of entries)	Date planted	Top yielding entries			
			Entry	DF	DM	kg ha-1
Burma						
Yezin (19 N, 130 m)	EPIT (20)	8.10.85	ICPL 87	80	117	4050
			ICPL 316	65	114	2400
			ICPL 155	67	117	2150
			Trial mean			1920
			SEm ±			234.1
			CV%			21.2
	MPIT (15)	16.7.85	ICPL 84001	109	171	470
			ICPL 84060	104	173	430
			ICPL 332	107	170	240
			Trial mean			180
			SEm ±			179.4
			CV%			103.4
	LPIT (10)	7.10.85	ICPL 83103	74	149	1720
			ICPL 366	74	159	1400
			ICPL 83132	70	112	1090
			Trial mean			890
			SEm ±			275.9
			CV%			61.6
	MPAY (20)	7.10.85	ICPL 8339	94	157	2710
			C 11	97	165	2510
			ICPL 84060	78	150	2380
			Trial mean			1730
			SEm ±			550.0
			CV%			55.2

Remarks: Delayed planting (October) appears suitable. Short-duration types are far more productive in delayed planting as compared to medium and long duration types. ICPL 87 should be advanced to on-farm testing.

Country/location	Trial (no. of entries)	Date planted	Top yielding entries			
			Entry	DF	DM	kg ha-1
Bangladesh						
Ishurdi	EPIT (20)	20.9.85	ICPL 149			2920
			ICPL 6			2860
			ICPL 87			2830
			Trial mean	66	179	2020
			SEm ±	-	-	-
			CV%			24.3
Pabna	EPIT (20)	6.10.85	ICPL 6	-	-	1780
			ICPL 292	-	-	1720
			ICPL 87	-	-	1520
			Trial mean	81	181	1100
			SEm ±	-	-	-
			CV%			16.5

Notes: First flush of flowers were lost to insects and/or rainfall hence delayed maturity at both locations. Short-duration genotypes in post-rainy season planting yielded between 1.5 to 3.0 tons/ha.

South Korea

Pigeonpea varietal and agronomic trials were conducted in 1986 at Suwon (37 N latitude). Short-duration types flowering in 65-70 days and maturing between 105-115 days were adaptable considering short growing season (May-September). When planted on 10 May 1986, ICPL 179 gave an yield of 2090 kg/ha at 30x10 cm as against 1500 kg/ha at 60x10 cm. ICPL 4 gave yields of 1590 and 1250 kg/ha at 30x10 cm and 60x10 cm spacings.

U.S.A.

At San Leandro, California (37 N latitude, 130 m) two short-duration cultivars ICPL 151 and 312 were planted between April 20 and May 27, 1986. It took almost 15 days for all the seedlings to come up. The plants attained the height of 60-70 cm and dry grain yields obtained were 2230 for ICPL 312 and 2110 for ICPL 151. It was also observed that ICPL 151 suffered from zinc deficiency whereas ICPL 312 did not.

NEW INITIATIVES OUTSIDE INDIA

Pigeonpea Initiatives in East and Central Africa

Project Number and Title: P-101(77)IC - International Trials

Sub-project Title : Cooperative pigeonpea varietal adaptation trials for production systems in Africa

Sub-project Scientists : Laxman Singh, C. Johansen

Background and Objectives:

A workshop on pigeonpea in Nairobi, Kenya, in April 1986 and consultative group meeting on grain legumes for Eastern and Central Africa, in November 1986 brought together representatives of several African countries for strengthening research and development on pigeonpea in the region. Special funds were also made available by DDG for pigeonpea research support in Africa. After consultations with the cooperators in Africa and pigeonpea scientists at ICRISAT, a cooperative net work of trials was formulated with the following objectives.

1. To develop commercial pigeonpea production system by use of short-duration cultivars. Presently long-duration pigeonpea is grown as small plot crop as an intercrop with maize, sorghum or millets for home consumption and limited marketable surplus.
2. To improve upon traditional production systems by use of medium-duration cultivars and changed intercropping practices.
3. To study the phenology of pigeonpea in Kenya.

Project locations: Kenya, Malawi, and Tanzania, to be extended to Ethiopia and Uganda in 1987.

Date of start : October 1986

Date of completion: To continue

Methodology: Following four sets of trials shall be undertaken (the details are given in Appendix).

Trial set 1 - Adaptability and production potential of short- duration pigeonpea in Eastern Africa (Kenya, Malawi, Tanzania, Ethiopia, and Uganda).

Trial set 2 - On-farm trials of promising medium-duration genotypes under improved intercropping system with sorghum/maize in Zambia.

Trial set 3 - Study of phenology of some pigeonpea lines in Kenya and ICRISAT Center

Trial set 4 - On-farm trials with medium-duration pigeonpea ICPL 270 and ICPL 322 in Ethiopia.

Review of background and present status

Cooperators were identified in Kenya, Malawi, Ethiopia, and Tanzania in 1986 and details of above mentioned trials were developed in consultation with them. The seed materials and experimental details have been sent to the cooperators.

Report has been received from Kenya. Trial set 1 was planted at 3 locations (Katumani, Kiboko, and Kitui) on 11-15 November 1986. Six ICRISAT lines (ICPL 87, 146, 151, 269, 312, and 8316) and three Kenyan lines (IIRA, NPP670, and 60/8) have been planted in RBD design with four replications.

Trial set 3 has been planted at 5 sites on different altitudes ranging from sea level to 2000 m after every two months commencing from late November 1986. Twenty six lines (19 ICRISAT and 7 Kenyan) are being studied for phenology in this trial.

In Malawi the trial set 1 has been planted.

In Tanzania seed material for trial set 1 and for large production plot of ICPL 87 has been sent. The special fund of US $ 10,000.00 made available in 1986 by DDG were used to meet the partial

operational cost of the trials in Kenya ($3500), Malawi ($4000), and Tanzania ($2500).

Future Plans

The program will continue in 1987-88 and reviewed in 1988-89. It will be extended to Ethiopia and Uganda in 1987. For effective monitoring of the program it is necessary that scientists from ICRISAT visit the experimental sites.

Trial set 1: Adaptability and production potential of short duration pigeonpea in Eastern Africa.

Objective:

With a view to develop suitable technology for small to large scale (semi-mechanised) commercial cultivation both for dry grain and green peas, the production potential of short duration pigeonpea cultivars will be evaluated in different agro-climatic situations and planting seasons.

Background:

The presently grown tall, late (200-250 days maturity), and photo-sensitive cultivars are not amenable for large scale commercial cultivation for market and processing. Hence in spite of export and local market potential, the production of pigeonpea has not increased. With the availability of shorter duration (110-130 days maturity) and relatively photo-insensitive genotypes, the potential for rendering this crop for large scale cultivation for market and processing can be increased in Africa.

Locations: Malawi - Two sites
Kenya - Two sites
Ethiopia - One or two sites
Uganda - One or two sites

Seasons:

Appropriate planting seasons for each site should be worked out by the cooperators. The suggested ones, as per earlier discussions in Malawi, are October and January where pigeonpea can fit well in the rotation with Tobacco and Maize crops. In the areas where irrigation becomes necessary, locations should be chosen accordingly.

Cooperators:

Malawi - Ministry of Agriculture

Kenya - Mr. P.G.A. Omanga
Ministry of Agriculture/University of Nairobi

Ethiopia - Institute of Agril. Research/ Alamaya Agricultural University

Tanzania - Tanzania Agriculture Research Organization (TARO)

Uganda - Ministry of Agriculture/Makerere University

Varieties:

ICPL 87, 146, 151, 269, 312, 8316 and one or more local checks.

Four kilograms seed of each of six varieties will be sent to one of the cooperators to share for planting at two location in each country.

EXPERIMENTAL DETAILS

Title:

Location:

Name and Address of Scientist Incharge of the Trial:

Cooperators and Organization:

Soil type:

Drainage: (Good, Fair, Poor)

Rainfall (mm): Jan ..... May ..... Sep .....

Feb ..... Jun ..... Oct .....

Mar ..... Jul ..... Nov .....

Apr ..... Aug ..... Dec .....

History of Experimental Site: Previous crop and subsequent rotation

Experimental parameters

No. treatments/entries .....

Experimental Design: Single observation plots

Suggested plot size : 500 sq m

(plot length and width to be determined by the cooperator)

Spacing: Between rows ..... cm.

Between plants within row ..... cm.

Record of operations

Date of planting (If planted dry, from effective date of planting i.e. day of first rain or first irrigation)

Dates of each harvest till final removal of the crop .....

.....

Fertilizer applied:

Date	Kind	Amount
.....	.....	.....
.....	.....	.....

Herbicide used and rate .....

Date applied .....

Weedings:

Date ..... **Method** .....

Date ..... **Method** .....

Date ..... **Method** .....

Dates and Amounts of Irrigation:

Insecticides applied

Date	Kind	Rate
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Any other observations: .....

.....

.....

.....

A. Data required for all tests:

1. Days to 50% flowering: from planting* to when 50% of plants have at least one flower.

2. Days to 75% maturity: from planting to when 75% of pods ripe.

3. Plant height: average plant height of plot in cm at full flowering.

4. g/100 seeds: Weight of 100 undamaged seeds in grams.

5. Final plant stand: Rating: Good, fair, poor.

6. Yield in kg per plot.

Green pod yields: Five rows on each side of each plot be assessed for green pod yield. Pick green fully developed pods (saleable as green pods) at proper stage. Record date of picking and fresh weight of harvested pods at each picking. Continue pickings as long as pods are available. After final picking the plants may be removed either by uprooting or cutting at ground level. The weight of so harvested and dried woody stalks may be recorded for assessment of fuel wood production.

Dry grain yields: The remaining central rows are to be used for assessment of dry grain yields. When 80 to 90% pods in the central rows mature, cut top 1/3 portion or pod bearing portion of the plants with a sickle. Let it dry thoroughly and thresh it in a suitable thresher, or by beating with sticks to shell out dried grain out of pods. Let the threshed grain dry well and weigh. The weight of dried grain should be used for computing yield per hactare.

If ratoon crop is possible, record similarly the dry grain yield from second harvest.

Finally, then, after both the assessments plants may be removed by pulling or by cutting at the base. The weight of dried

*If planted dry, from effective date of planting i.e. day of first rain or first irrigation.

vood harvested finally should be recorded.

7. Diseases: Percent incidence of wilt, sterility mosaic, Phytophthora or others on plot basis.

8. Insects: S = Severe
   M = Moderate
   L = Lov

   For Heliothis pod borer, podfly and any other identified.

9. Cost of production: Record of labor time on all operations and cost of material inputs may be kept to estimate the cost of production.

10. Remarks: Any other observation of importance.

Trial set-2 Title: On-farm trials of promising medium maturing genotypes under improved intercropping system with sorghum/maize in Zambia.

Background and Objective

Varietal trials with local and introduced materials, conducted over the past few years at experiment stations indicated the superiority of ICP 7035 both under sole and intercropping systems. It is now necessary that on-farm validation of improved intercropping system with ICP 7035 be done in comparison with local practice of intercropping with local pigeonpea cultivar.

Locations:

Four to six on-farm sites in major pigeonpea growing regions of Zambia will be identified by the cooperators. At each site three plots shall be established. (1) Variety ICP 7035 sole crop (75 cm x 30 cm), (2) ICP 7035 with improved intercropping system (2 rows of cereal + 1 row of pigeonpea), and (3) local variety with local practice of intercropping.

Season:

Appropriate planting time will be decided by the cooperators.

Cooperators:

Dr. J. Kannaiyan/Dr. M.S. Reddy and the Ministry of Agriculture, Zambia.

Trial set-3: Study of phenology of some pigeonpea genotypes in Kenya.

Background and Objective:

Phenology is the primary factor in the eco-physiological adaptation of pigeonpea. Flowering and maturity duration in pigeonpea are influenced by photo-period, temperature and their interactions. Preliminary experiments conducted earlier at ICRISAT Center and at Katumani, Kenya have shown that flowering behvior of medium and late maturing genotypes differ grossly at the two experiment stations. The genotypes flowering in about 120 days at ICRISAT Center generally flowered in about 90 days in Kenya. Also when Kenyan material planted at ICRISAT Center a substantial delay in flowering was observed. These observations indicate that the phenology of pigeonpea in the two environments differ greatly and therefore its proper understanding in Kenyan and Indian environments is essential before launching any joint breeding program. The cooperators in Kenya have expressed their keen interest in this study and hence this project is being proposed.

Experimental Details

(A) Genotypes: 25

From ICRISAT: 19 Lines

10 Early (ICPL 4, 146, 151, 179, 289, 316, 312, 8306, 85059, 8324)

5 Medium (C 322, ICPL 138, 131, 265, 270)

4 Late (T 7, ICP 8102, NP(WR) 15, Gvalior 3)

From Katumani: 6 Lines

2 Early (

2 Medium (

2 Late (

(B) Locations: 6

At ICRISAT = 2 Sites (normal photoperiod, 16 hr photoperiod)

In Kenya = 4 sites

Matuga (coastal)	Lat. 2	Alt. < 50m
Kiboko	1.6	1050m
Katumani	1.1	1600m

Manyuki	**0.0**	**1800m**

(C) **Planting dates**

Kenya:	1	Nov 1986
	2	Jan 1987
	3	March 1987
	4	May 1987
	5	July 1987
	6	Sept 1987
ICRISAT:		June/July 1987

(D) **Design:** Randomized Block Design

(E) **Replications:** 2

(F) **Rows/plot:** 1

(G) **Plot size/spacing:** 4 meter long, 75 cm apart, plant to plant 30 cm

(H) **Irrigation:** As necessary

(I) **Observations:** To be recorded on the available competitive plants (5-10) excluding border plants on either side. Individual plants should be tagged for floral bud initiation (if the facilities available) and number of days taken to first flower to open on a plant.

Method: The experimental material should be visited at least twice a week from the time of floral bud initiation and individual plants tagged for number of days taken when first flower opens. The worker has to use his judgement for tagging the plants which flowered between the two visits.

Scientist may like to help in roguing the rows and the line not uniform for plant type etc., may be rejected. This will ensure quality data.

The seed of Kenyan lines included in these study should be sent to ICRISAT for inclusion in the trial.

The temperature data for each location will be essential.

Trial set-4: On-farm trials with medium maturing pigeonpea ICPL 270 and ICPL 332 in Ethiopia.

Background and Objective:

Preliminary yield trials in lowlands of Hararge region in Ethiopia were conducted in 1985-86 season. Two medium maturing lines, ICPL 270 and ICPL 332, showed a great promise and yield levels of 4 to 5 tons/ha were recorded. These yield levels were obtained on small research plots and for validation of the performance of these cultivars, a set of on-farm trials has been suggested by the cooperators in Ethiopia.

Locations:

Four on-farm sites in lowlands of Hararge region will be identified by cooperators to conduct the trial. At each suitable on-farm site three plots consisting of ICPL 270, ICPL 332 and the best local check will be planted.

Seasons:

Appropriate planting season for each site would be worked out by the cooperators.

Cooperators:

Alamaya Agricultural University/Ministry of Agriculture

ICRISAT RESEARCH PROJECT PROGRESS REPORT

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

2. Project Title : Development of short-duration cultivars and superior breeding lines for grain production

3. Project Scientist(s) : Satish C. Gupta, K.C. Jain, M.V. Reddy, S.S. Lateef, Y.S. Chauhan

4. Period covered by report (Month/Year) :

From: January 1986 To: December 1986

5. Summary of progress report :

Objective 1 :

To develop extra short and short-duration cultivars and superior breeding lines for grain production

(a) Thirty-three replicated trials, including AICPIP coordinated, multilocation, preliminary multilocation, advanced lines station and population trials, were conducted.

(b) Seven lines were included in the AICPIP coordinated tests. Three of these (ICPLs 83015, 83022 and 84048) were entered during 1986.

(c) In summer sown (April) tests, five short duration pigeonpea lines (ICPLs 87, 186, 83027, 84032 and 84048) gave more than 25 tons/ha of dry stalk yield (5-7% moisture). Mean dry stalk yield of three tests were 16, 17 and 20 tons/ha.

(d) Several large seeded, short statured, extra short and short-duration lines have been developed (Tables 1 and 2). After one more year of multilocation testing some of them shall be entered in AICPIP tests.

Objective 2 :

To supply the short-duration pigeonpea lines to the cooperators.

(a) Ninty replicated tests were supplied to 41 cooperators in 14 countries including India.

(b) In addition, 510 seed samples were supplied to 52 locations in India and abroad.

6. Publications : NIL

7. Work plan for next year :

(A) At Hisar

(a) Emphasis will be strengthened to develop extra short-duration lines with short stature, large seed and high yield.

(b) Emphasis on developing determinate lines will be increased. Less emphasis will be given on indeterminates.

(c) Dwarfness with large seed and high yield shall be incorporated in tall indeterminates.

(d) The promising lines will be screened for resistance/tolerance to diseases, pests and physiological stresses.

(e) Male sterile composite populations will be enriched.

(B) At Patancheru

1. Development of extra short-duration types

(a) To identify promising extra short-duration genotypes (maturing in about 100 days) about 60 genotypes will be evaluated in Alfisols under normal (June) sowing for low rainfall situation and in delayed (July) sowing for relatively high rainfall areas to avoid rains at maturity.

(b) Adaptation trials of a few promising extra short-duration genotypes will be conducted in Andhra Pradesh, Karnataka, Tamil Nadu, West Bengal and Orissa in normal and delayed sowings.

(c) To identify sources of resistance to SM, Phytophthora blight and wilt about 60 genotypes will be screened in different

disease nurseries.

(d) Crosses will be made to incorporate resistance to sterility mosaic and Phytophthora blight (P3 isolate) into high yielding gentoypes.

(e) Crosses will be made to improve the seed size of a few high yielding lines using ICPL 8324 and a few white seeded vegetable types.

2. Development of short-duration lines of T 21 maturity group for rainfed conditions

(a) Two yield trials (one for DT and another for NDT types) will be conducted on Alfisols and Vertisols.

(b) Crosses will be made to incorporate wilt and SM resistance.

(c) Crosses will be made to improve the yield and seed-size using BDN1, ICP 8863, ICPL 95, ICPL 211 and Hy-4.

3. Development of lines suitable for multiple harvests

(a) About 40 genotypes found promising earlier will be ratooned to identify genotypes having high yield in normal and ratoon harvests.

4. Improvement of specific triats:

White seeded ICPL 87.

(a) About 70 BC1F4 white seeded progenies derived from two back crosses involving ICPL 8323 and ICPL 289 as donor parents and ICPL 87 as recurrent parent will be evaluated for yield and ratoonability.

Table 1 : Characteristics of some promising extra short and short duration determinate pigeonpea lines (1986).

Lines	Days to flover	Days to mature	100-seed mass(g)	Grain Yield (kg ha-1)			
				Hisar		Mean	
				I	II	(11 Loc)	(4 Loc)
EXTRA SHORT-DURATION :							
ICPL 83019	58	105	11.7	2281	-	1694	-
ICPL 85010	58	104	10.6	2560	-	1680	-
ICPL 85015	61	105	9.8	3246	-	1876	-
ICPL 85024	53	86	9.0	-	2279	-	1534
ICPL 85030	60	104	11.9	-	2813	-	2118
ICPL 86003	56	101	10.3	-	2199	-	1943
SHORT-DURATION :							
ICPL 85012	62	118	12.1	2821	-	1788	-
ICPL 85014	65	106	10.0	2339	-	1877	-
ICPL 85016	60	107	10.8	3320	-	1763	-
ICPL 85033	64	105	11.1	3244	-	1771	-
ICPL 86005	62	109	12.9	-	3555	-	3060
ICPL 86007	59	111	11.3	-	3558	-	2702
ICPL 86012	62	111	12.6	-	3563	-	2857
ICPL 85017	66	121	10.6	-	3464	-	2798
ICPL83024	76	129	17.6	-	2448	-	2521
CHECKS :							
ICPL 4	67	103	6.4	2129	2405	1526	2099
UPAS 120	79	112	7.9	2431	2995	1528	2383
ICPL 151	60	112	11.8	2595	2674	1750	2465
SE ±				258	184		
CV %				20	14		

Table 2 : Characteristics of some promising extra short and short-duration indeterminate pigeonpea lines (1986).

Lines	Days to flower	Days to mature	100-seed mass(g)	Grain Yield (kg ha-1)			
				Hisar		Mean	
				I	II	(6 Loc)	(4 Loc)
EXTRA SHORT-DURATION:							
ICPL 85055	79	109	10.9	3129	-	2222	-
ICPL 86020	63	98	9.7	-	2704	-	1982
SHORT-DURATION:							
ICPL 85036	81	120	10.9	3059	-	2193	-
ICPL 85046	81	122	8.5	3019	-	2121	-
ICPL 85049	85	126	12.3	2496	-	2152	-
ICPL 85050	84	128	14.4	3085	-	2080	-
ICPL 85054	82	128	10.4	3304	-	2207	-
ICPL 85048	83	105	10.7	-	2866	-	2577
ICPL 85051	84	107	11.6	-	3418	-	2660
ICPL 85058	83	131	12.7	-	3321	-	2062
CHECK:							
UPAS 120	80	125	8.4	2259	2521	1862	1891
SE ±				306	239		
CV %				23	18		

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project No.CO-P-1(77) Link Project No.P-102(85)IC

Sub-Project Title : Development of cultivars and production systems for early maturing pigeonpea.

Name of the Collaborating Institution : Department of Agriculture
University of Queensland
St. Lucia, Queensland 4067
Australia

Project Scientist(s):

(a) Collaborating Institute:

D.E. Byth, E.S. Wallis, S. Meekin

(b) ICRISAT:

Laxman Singh, K.B. Saxena, D.G. Faris, S.C. Gupta

Duration: Date of start: 1977

Date of completion: Nov an informal continuing cooperation

Objective:

To develop cultivars and appropriate production systems for short-duration pigeonpea. This involves integrated research into plant introduction, genetics and breeding, aspects of crop and plant physiology, and agronomy.

Progress: From the advanced generation (F6/F7) of short-duration introductions from ICRISAT cultivars 'Hunt' and 'Quantum' were released for cultivation in Australia. A few more breeding lines are under advance stages of multilocation testing. Ms. Susie Meekins visited ICRISAT to select materials for introduction to Australia.

2. Project No.CO-P-XX(87) Link Project No. P-102(85)IC

Project title: Adaptation of extra-short-duration types in arid regions of Rajasthan and Punjab.

Name of collaborating institutes:

(a) Sukhadia University, Udaipur, Rajasthan

(b) Central Arid Zone Research Institute, Jodhpur, Rajasthan

(c) Punjab Agricultural University, Ludhiana

Scientists:

(a) Collaborating Institutes

i) Sukhadia University - Dr. H.G. Singh
Dr. P. Joshi

ii) CAZRI, Jodhpur - Mr. A. Henry

iii) PAU, Ludhiana - Sr. Scientist (Pulses)

(b) ICRISAT

Dr. Laxman Singh
Dr. S.C. Gupta

Duration: Date of Start: 1987
Date of completion:

Objective:

To identify extra-short-duration types suitable for arid regions of Rajasthan and Punjab both under rainfed and irrigated conditions.

3. **Project No.CO-P-XX(87) Link Project No.P-102(85)IC**

Sub-project title: On-farm adaptation of short-duration cultivars in the production systems in Akola, Sholapur, and Mahboobnagar districts.

Sub project Scientists: Laxman Singh, C. Johansen, T.S. Walker
Collaboration Pigeonpea Breeding, Pulse Agronomy, RMP-Economics

Locations: One village each in the districts of Akola, Sholapur and Mahboobnagar.

Objective and work plan:

There is an on-going program of village level studies in RMP of ICRISAT (Akola, Sholapur and Mahboobnagar), where new short-duration cultivars recently released/identified (ICPL 87 and ICPL 151) are proposed to be tested in existing and new potential production systems.

The areas chosen for the study conventionally grow medium-duration pigeonpea as minor component in intercrop with cotton, sorghum, pearl millet, groundnut or with other pulses. The production level of pigeonpea in these area/production systems is very low (almost nil to 300 kg/ha). The adaptability of short duration pigeonpea as a sole crop has to be carefully studied in different nitches of production systems (rainfed and limited water supply conditions) for their utilization as remunerative commercial crop. The objective of this study therefore is to assess the suitability of new short duration genotypes in different production systems in terms of their phenology, production potential, and commercial viability both under rainfed and limited water supply conditions.

Objective 1 :

Adaptability of ICPL 87 in Akola district during rainy season on medium Vertisols as a sole crop in relation to declining cotton crop under

a) Rainfed conditions, (b) Irrigated conditions (ICPL 151 will also be included) with and without pre-emergence herbicide.

Objective 2 :

(a) Adaptability of ICPL 87 on deep Vertisols in Sholapur

district under July and September plantings in relation to rabi-sorghum.

(b) Adaptability of ICPL 1 on light Vertisols under unprotected conditions where other pulses, minor millets, and pearl millets are generally grown.

Objective 3 :

(a) Adaptability of ICPL 87 and ICPL 1 on Alfisols under rainfed and protected conditions in Mahboobnagar.

(b) Adaptability of ICPL 87 on Alfisols in irrigated conditions, for double cropping and ratoonability in Mahboobnagar.

Experimenteal details

The details of 6 sets of on-farm tests are given below.

Set 1: Akola district: Village - Kanzara

(a) Four sites 1/2 acre each of ICPL 87, rainfed, protected and as per package of practices.

b) (Four sites 1/2 acre each with 1/4 acre of ICPL 87 and 1/4 acre of ICPL 151 under irrigated and protected conditions. At two of these sites pre-emergence herbicide shall be used.

Set 2: Sholapur district: Village - Shirapur

a) i) July planting wherever adequate rainfall has occured and planting conditions are ideal - 4 sites 1/4 acre each of ICPL 87 shall be set up under plant protection.

ii) September planting - 4 sites - other details same as (i)

b) Rainy season planting - 4 sites - 1/4 acre each of ICPL 1 under unprotected conditions.

Set 3: Mahboobnagar district: Village - Aurepalle

a) Rainfed rainy season planting - 4 sites - 1/2 acre each with 1/4 acre ICPL 87 and 1/4 acre ICPL 1 under plant protection.

b) Irrigated planting by mid June - 4 sites - 1/2 acre ICPL 87 under plant protectin.

Tr-P-XX(86) Link Project: P-102(85)IC

Title: Adaptation studies in short-duration pigeonpeas

Name of the trainee: Dr. Pramod Pundhir

Over 150 genotypes ranging from Prabhat to T 21 duration were evaluated in a replicated trial in six environments at ICRISAT Center, Patancheru during 1986. Five genotypes (ICP 3251, -7104, -7457, -8739 and ICP 7638) were found to be relatively stable and more productive than controls (Table 1). In addition three genotypes (ICP 12210, -8812 and ICP-7100) were found productive in specific environments. All these eight genotypes will be tested further.

Table 1. Mean performance of short-duration genotypes grown in six growing conditions at ICRISAT Center, rainy season 1986.

Sl. No.	Genotypes	Days to 50% flover	Days to mature	100-seed mass (g)	Yield kg/ha						Mean yield kg ha-1
					Environments*						
					1	2	3	4	5	6	
1	ICP 3251	77	119	8.5	3936	2583	482	781	3903	1439	2187
2	ICP 7104	73	114	9.0	3646	2830	956	768	2274	2408	2147
3	ICP 7457	75	116	8.6	1688	2331	821	868	3194	1464	1728
4	ICP 8739	77	117	8.5	1922	2125	583	342	3299	1254	1588
5	ICP 7638	77	118	8.1	3220	1544	526	772	3479	900	1740
6	ICP 12210	74	115	8.5	4278	2000	421	789	2472	1499	1910
7	ICP 8812	77	117	8.7	4184	1763	781	268	2259	1622	1813
8	ICP 7100	77	118	8.3	2127	1817	732	364	3931	2004	1829
9	ICPL 87 (C)	68	108	8.8	3622	1475	618	430	1693	720	1426
10	ICPL 6 (C)	74	111	7.3	1857	2042	500	268	1982	762	1235
	SE±				484.2	270.1	112.4	55.1	263.8	232.9	
	Trial mean				2076	1261	467	342	1235	888	

* 1 = Alfisols, Irrigated, normal sowing; 2 = Alfisols, Irrigated, delayed sowing
3 = Alfisols, unirrigated, normal sowing; 4 = Alfisols, unirrigated delayed sowing
5 = Vertisols, irrigated, normal sowing; 6 = Vertisols, irrigated delayed sowing

ICRISAT RESEARCH PROJECT PROGRESS REPORT

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

2. **Project Title** : Development of medium-duration cultivars and superior lines for grain production

3. **Project Scientist(s)** : K.C. Jain, M.V. Reddy, S.S. Lateef

4. **Period covered by report** : June 1985 to December 1986

5. **Summary of progress report**

Objective 1 :

To develop high yielding medium-duration cultivars with resistance to yield constraints such as diseases and insects and of acceptable grain quality that are adapted to pure and companion cropping with other crops.

1. Breeding for disease resistance :

(a) Advanced breeding lines have shown stability in yield and disease resistance during the past three years (Table 1). Four of these lines combine wilt and sterility mosaic resistance. The yield potential of three wilt resistant lines (ICPL 8357, 8358 and 8356) and one sterility mosaic resistant line (ICPL 343) was almost similar to the control variety, C11. Two of these lines, ICPL 227 (wilt and SM resistant) and ICPL 8357 (wilt resistant) have been promoted to the ACT2 trial.

(b) Twelve wilt resistant M3 progenies of susceptible cultivar LRG30 were tested for yield. One progeny (with 10 kR dose) produced 2202 kg/ha grain yield as compared to 1730 kg/ha for LRG30 control. The seeds of this line are also large (9.4 g/100 seeds) as compared to the LRG30 control (6.6 g/100 seeds).

(c) Three composite populations developed for disease resistance using male sterile gene were grown in isolations. These populations were reconstituted by collecting seeds from male sterile plants. About 500 fertile plants were also selected for screening in disease nurseries for identification of desirable genotypes.

(d) To incorporate wilt resistance into cultivar C11, the first backcross using ICP 8863 as a donor parent for wilt resistance and C11 as a recurrent parent was made in 1986.

2. **Breeding for insect resistance**

(a) One advanced line (ICPX 80321-E34-E1-EB) significantly outyielded the resistant control and was higher yielding than C11 control (Table 2).

(b) Two composite populations, one for improving the level of Heliothis resistance and the other for podfly resistance were grown in pesticide-free isolations. These populations have been reconstituted by collecting seeds from male steriles. About 500 fertile plants were selected for screening in pesticide-free area for identification of resistant genotypes.

3. F2 yield test

To identify higher yielding populations for single plant selections, nine F2 populations were tested for yield with C11 and ICPL 270 controls. One F2 population (ICPX 840152) yielded 2744 kg/ha as compared to 2526 kg/ha for C11 and 2485 kg/ha for ICPL 270 controls.

4. Determinate progenies

Ninety-five determinate progenies in F4 generation were evaluated for their yield potential in 4 m long two-row plots with ICPL 211 control grown after four plots. Twenty-eight progenies yielded more (upto 2958 kg/ha) than the highest yield recorded for the control (2130 kg/ha).

5. Evaluation for intercropping

Twelve breeding lines and two control cultivars were evaluated in cooperation with the Resources Management Program. The yield of both sole and intercrop pigeonpea were low. None of the lines was found significantly better than the control cultivars.

Objective 2 :

To contribute breeding lines and populations to pigeonpea breeders throughout the semi-arid tropics.

We have supplied Medium-duration Pigeonpea Advanced Lines Yield Trial (MPAY), Medium-duration Pigeonpea International Yield Trial (MPIT), Medium-duration Pigeonpea Unselected Bulk Populations Test (MPUB) and Arhar Regional Trial (ART) to our cooperators. The results are reported in P-101(77)IC.

Work plan for next year

1. Disease resistance:

(a) About 200 progenies in wilt nursery, 130 in SM, 27 populations and 500 progenies in wilt and SM, and 70 progenies in multiple disease nursery will be screened.

(b) Fifteen F2 populations of crosses involving five determinate and nine disease resistant lines will be screened in wilt and SM nursery.

(c) Three composite populations will be grown in isolation blocks for the next cycle of random mating. About 500 fertile plants selected from each population will be screened in disease nurseries for identification of resistant genotypes.

2. Insect resistance:

(a) Eighteen F2 populations and 300 single plant progenies will be screened in wilt and Heliothis screening nursery.

(b) About 300 single plant progenies will be evaluated for reduced susceptibility to Heliothis and yield in pesticide-free area.

(c) Two composite populations (one for Heliothis and the other for podfly resistance) will be grown in isolation blocks in pesticide-free area for random-mating. About 500 fertile plants selected from each population will be screened in pesticide-free area for identification of resistant genotypes.

3. Determinate progenies:

Twenty-eight determinate progenies which were better than ICPL 211 control will be yield tested along with two indeterminate cultivars (C11 ad BDN1).

4. All the advanced lines included in multilocation MPAY trial will be evaluated for their performance in sorghum intercrop.

Publications:

Jain, K.C. and D.G. Faris (1986). The potential of medium-duration pigeonpea. Presented in Food Legumes Improvement for Asian Farming Systems Workshop, 1-5 Sept. 1986, Khon Kaen, Thailand. (CP 273.)

Table 1: Mean performance of wilt and sterility mosaic resistant lines in the Medium-Duration Pigeonpea Sterility Mosaic and Wilt Resistant Lines Yield Trial (MPSMWRT) grown in a disease-free fields, ICRISAT Center, rainy seasons 1983-1985.

Entry	Days to flower	Days to mature	100-seed mass (g)	Grain yield (kg ha-1)	In disease nursery	
					Wilt (%)	Sterility1 mosaic(%)
Wilt resistant						
ICPL 8357	118	177	9.9	2250	9	100
ICPL 8358	118	176	9.0	2180	7	100
ICPL 8356	111	169	9.7	2130	8	92
Sterility mosaic resistant						
ICPL 343	107	165	9.8	2190	100	0
Wilt and SM resistant						
ICPL 227	122	181	11.0	1930	9	2
ICPL 8363	129	186	8.5	1890	8	0
ICPL 8362	128	189	8.4	1850	8	0
ICPL 335	121	181	9.2	1750	8	0
Control						
C 11	114	174	10.3	2180	75	100
SE ±	0.3	0.6	0.2	132		
Trials mean (n=20-23)	116	175	10.0	1980		
CV% (range)	0.4-0.6	0.5-1.0	3.5-5.6	9.4-18.6		

1 Mean of 1984 and 1985 seasons.

Table 2. Performance of entries in Pigeonpea Insect Resistant Lines Yield Test (PIRYT) grown in pesticide-free field at ICRISAT Center during 1985-86 season.

Entry	Days to flower	Days to mature	100-seed mass (g)	% Borer damage	Grain yield (kg ha-1)
ICPX 80321-E34-E1-EB	98	147	7.0	9.8	1620
ICPX 76239-B-1-17-EB-EB	114	165	7.9	8.1	1490
ICPX 76239-B-12-E1-EB-EB	113	164	7.9	8.7	1470
ICPL 84060	114	165	8.0	9.8	1450
ICPX 80322-E1-E1-EB	109	160	7.4	8.5	1370
Resistant control					
ICPL 332	115	168	6.7	8.2	1170
Susceptible control					
ICPL 131 (C 11)	121	179	10.8	18.0	1340
SE ±	0.5	0.8	0.17	2.14	131
Trial mean (n=30)	116.0	174.0	8.7	17.5	1190
CV(%)	0.8	1	4	24	22

Tr-P-3(86) Link Project P-103(85)IC

Title: Determine the inheritance of resistance to wilt (*Fusarium udum*)

Background and report:

No full time trainee was available for this work in 1986. However, a part time post-doctoral fellow made preliminary studies on the inheritance of resistance to Fusarium wilt. Seven parents, their F1's and F2 populations along with a standard susceptible control (ICP 2376) were grown in polythene bags containing autoclaved sand in a green house. The roots of test plants were dipped in seven-day-old single spore culture of *Fusarium udum* for 60 seconds and transplanted in pots containing autoclaved sand.

It was observed that in certain crosses resistance is governed by a single dominant gene. These findings need further confirmation.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project No. : P-104(85)IC

2. Project title : Development of long duration cultivars and breeding populations for grain production and stability.

3. Project scientist(s) : D. Sharma, M.V. Reddy, S.S. Lateef, Laxman Singh, N.P. Saxena

4. Period covered by report (Month/Year):

   From: July 1985
   To : June 1986

5. Summary of progress and salient achievements:

Research work on long duration pigeonpeas was initiated informally in the year 1975 at Gwalior in collaboration with JNKVV College of Agriculture, Gwalior. In 1978, a formal memorandum of understanding between ICRISAT and JNKVV was signed to establish an ICRISAT managed testing sub-center. Subsequently a plant breeder and an agronomist were posted to intensify the research work on late duration pigeonpeas.

ICPL 366 and ICPL 8398 were identified and included in ACT-3 in 1984 and 1986 respectively. ICPL 366 is resistant to SMD and Alternaria blight, while ICPL 8398 first found to be resistant to SMD was found to segregate later and needs to be purified. Both these lines have larger seeds than the popular variety Gwalior-3. ICPL 366 has consistently given higher yield in the All India Coordinated Trials and in a number of station trials (Tables 1 and 2).

A number of lines have been improved for specific characters such as short plant stature, prolific branching, seed size and resistance to wilt and SMD. These are being evaluated in advanced yield trials for their yield potential (Table 3).

During 1986, six lines have been identified from ICPX 76029 (Gwalior-3 x TTB 7) in F_9 generation; which have high yield potential, improved seed size and resistance to SMD.

6. Future plans:

In 1986 the breeding objectives were redefined to focus attention on:

(i) Development of SMD and wilt resistant lines with acceptable yield levels.

(ii) Development of genotypes superior in yielding ability than the existing cultivars.

The two objectives are complementary to each other and need to be approached through seperate breeding populations meant for specific selection and genetic advance.

Systematic evaluation and characterization of speading, semi-spreading and compact late pigeonpea germplasm for agronomic potential, specific trait (branching habit, pod size, grain/pod, seed size etc.) and reaction to diseases and seed quality will continue.

Thorough agronomic and special characteristic evaluation of parents will be emphasised for specific crosses.

A limited number of well directed crosses for specific purposes will be made; and selection will be done in large segregating populations and F2 or F3 derived lines of few superior crosses.

Table 1. Performance of ICPL 366 across locations over years.

Test & Location	Days to 50% flowering					g/100 seeds					Yield kg/ha.				
	ICPL366	GWL3	SE+	Trial mean	CV%	ICPL366	GWL3	SE+	Trial mean	CV%	ICPL366	GWL3	SE+	Trial mean	CV%
1983-84															
LPAY Gwalior	167	159	2.7	165	3.3	8.6	8.3	0.3	8.0	o.7	3074	2713	505	2692	23
LPAY Morena	152	151	1.6	149	1.8	9.6	8.4	0.4	8.6	7.4	2915	2457	219	2578	15
Mean	160	155		157		9.1	8.4		8.3		2995	2585		2635	
1984-85															
ACT 3 Gwalior	141	135	2.2	133	3.3	9.3	7.9	0.3	9.4	6.7	2671	2057	160	2112	15
LPAY Gwalior	146	139	1.9	145	2.7	8.7	8.1	0.2	8.5	4.9	2221	2049	269	1757	31
LPAY Morena	190	154	4.0	162	4.9	8.7	7.5	0.2	8.2	5.2	1570	1907	296	2186	27
ALT 1 Gwalior	150	142	2.2	141	3.1	9.6	9.0	0.2	9.3	5.0	2672	3152	211	2566	17
ALT 1 Morena	155	143	2.9	143	4.1	8.8	7.7	0.2	8.5	5.6	3181	2464	206	2603	16
ALLT 3 Gwalior	149	139	1.8	140	2.6	9.4	8.4	0.3	9.0	7.7	2779	2573	179	2425	15
ALT 3 Morena	138	132	3.7	136	3.8	10.1	7.8	0.4	8.5	8.0	2647	2471	302	2177	20
Mean	151	141		142		9.2	8.0		8.8		2523	2382		2261	
1985-86															
ACT 3 Gwalior	160	154	0.7	155	0.9	10.3	9.0	0.3	10.8	5.1	2277	1298	145	1503	22
LPAY Gwalior	161	152	1.6	157	2.0	9.7	8.8	0.1	9.0	3.7	1675	1106	160	1095	29
LPAY Morena	173	168	7.1	170	8.4	9.8	8.7	0.2	8.9	5.3	1376	1466	228	1376	33
ALT 2 Gwalior	162	162	0.8	161	1.0	8.9	9.8	0.2	10.4	4.3	1837	1239	146	1208	24
ALT 2 Morena	176	171	1.0	172	1.2	10.1	10.2	0.5	9.2	10.6	2486	1449	232	1538	30
Mean	167	162		163		9.8	9.3		9.7		1950	1312		1304	

Table 2. Performance of ICPL 8398 across locations over years.

Test & Location	Days to 50% flowering					g/100 seeds					Yield kg/ha.				
	ICPL8398	GWL3	SE+	Trial mean	CV%	ICPL8398	GWL3	SE+	Trial mean	CV%	ICPL8398	GWL3	SE+	Trial mean	CV%
83-84															
AVT-1 Gwalior	170	175	3.8	173	4.4	8.1	7.7	0.5	7.8	11.5	2299	2125	277	2147	26
AVT-1 Morena	153	148	1.3	149	1.5	9.7	8.5	0.2	8.8	5.2	2941	2572	245	2596	16
Mean	161	162		161		8.7	8.1		8.7		2620	2248		2371	
84-85															
AVT-3 Gwalior	136	135	2.2	135	3.3	9.0	7.9	0.3	9.4	6.7	2145	2057	160	2112	15
AVT-1 Gwalior	148	143	2.2	141	3.1	9.4	9.0	0.2	9.4	5.1	2765	3152	211	2966	17
AVT-1 Morena	144	143	2.9	143	4.1	9.2	7.7	0.2	8.5	5.6	2574	2464	206	2603	16
AVT-3 Gwalior	144	139	1.8	141	2.6	9.2	8.4	0.4	9.0	7.7	2345	2572	179	4.5	15
AVT-3 Morena	147	132	3.7	138	3.8	8.4	7.8	0.5	8.5	8.0	1[illegible]	2471	[illegible]	127	20
Mean	144	138		139		9.0	8.2		[illegible]		[illegible]	2542		[illegible]	
85-86															
AVT-1 Gwalior	160	152	1.6	157	2.0	8.7	8.8	0.2	9.0	3.7	1[illegible]	1106	160	1095	29
AVT-1 Morena	174	168	7.1	170	8.4	9.1	8.7	0.2	8.9	5.3	1220	1466	228	1376	33
AVT-1 Gwalior	163	158	0.8	160	1.1	8.9	9.4	0.4	9.2	7.5	1611	940	248	1213	15
AVT-1 Morena	166	165	1.6	166	1.9	8.6	8.7	0.3	8.8	7.0	1721	1680	206	1552	28
AVT-2 Gwalior	165	163	0.8	161	1.0	10.3	9.8	0.2	10.0	4.3	1369	1239	146	1208	24
AVT-2 Morena	166	171	1.0	173	1.2	9.6	10.2	0.5	9.2	10.6	1538	1449	232	1538	30
Mean	166	163		164		9.2	9.3		9.3		1349	1313		1330	

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Table:3

Characteristics of promising lines with special traits

S.No.	Pedigree	Days to 50% fl.	q [illegible] seed	Yield/ha (q)	Remark
1.	ICPX 80479-661-62-6B	147(152)	9.9(9.0)	20[illegible]	Short plant height like D, and improved seed size.
2.	-6101-62-6B	156(162)	10.1(8.5)	[illegible]	do
3.	-676-62-6B	159(162)	10.[illegible](8.5)	[illegible]	do
4.	-684-66-6B	160(158)	9.5(8.6)	[illegible]	do
5.	-6182-64-6B	160(153)	10.5(8.7)	[illegible]	do
6.	ICPX 76029-F$_4$-6-6183-6B-622	151(150)	8.4(7.1)		Resistant to SMD & large seed size.
7.	6241-6B-6B	141(150)	8.4		do
8.	ICP 5097-1-5Y0-W5Y0-SWF8-SWF7-SWP8-SWF8Y0-SWF8Y0-6B-6B	154(161)	8.5	[illegible]	Multiple disease resistance & high branching.
9.	ICP 5097-1-5Y0-W5Y0-SWF8Y-SWF7Y0-SWP8Y0-SWF8Y0-SWF8Y0-6B-6B	152(161)	8.7	14[illegible]	do
10.	ICPX 78097-640-6B-6B-6B-6B-6B	154(158)	9.4	[illegible]	SMD resistance & high branching
11.	ICPL 85104	152(159)	8.4	[illegible]	Wilt & SMD resistant

1. Data in parenthesis are of check variety Gwalior 3.
*Some segregation for SMD, needs purification.

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ICRISAT RESEARCH PROJECT PROGRESS REPORT

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

2. Project Title : Development of hybrids and their seed production technology

3. Project Scientist(s) : K.B. Saxena, M.V. Reddy

4. Period covered by report (Month/Year):

   From: January 1986
   To : December 1986

5. Summary of progress report:

Objective 1 :

To identify new male sterile stocks

Progress: Four new male sterile sources identified at Hisar were planted at Patancheru for maintenance and use in breeding program. Interestingly, in this material no sterile plant was found at Patancheru. Next year we plan to grow this material at both the locations to examine the expression of this trait in the two environments.

Objective 2:

To correct the deficiencies of already available 'ms' stocks by transferring the 'ms' alleles into promising genotypes of different maturity groups.

Progress:

(A) Transfer of 'ms1' allele

(i) Purification of newly converted male sterile lines:

MS 3783: The converted lines have shown high level of resistance to wilt. These were maintained by sibbing in wilt sick nursery. The lines exhibiting less wilt incidence in sick nursery were also purified and maintained by sibbing using wilt resistant segregants.

IMS-1: This male sterile line was found to have some variation for maturity. The male sterility in this line is being

maintained in plants flowering in less than 55 days at Patancheru.

MS-QPL 5: This male sterile line was also not pure for maturity. Two maturity groups are now being maintained seperately by sibbing.

(ii) Conversion of elite lines of different maturity groups.

Three medium and three short-duration lines are being used for conversion to male sterility. The details are summarized below:

Gen.	msl donor	Recurrent Parent
BC2F1	MS-Prabhat (NDT)	ICPL 288: Short-duration, high yield, tolerant to wilt, SM, and Phytophthora
BC2F1	MS-BDN 1	BDN1 (SMR): Medium-duration, high yield, SM resistant
BC1F1	MS-Prabhat (DT)	ICPL 8324: Short-duration, high yield, SM resistant, large pods
BC1F1	IMS 1	ICPL 87091: Short-duration, very large pods, SM resistant
BC1F1	MS-NP(VR)15	ICP 10976: Medium-duration, resistant to 3 races of SM
F1	MS-3783	ICP 8863: Medium-duration, high yield, resistant to wilt

(iii) Maintenance of male steriles:

MS-Prabhat (DT) and MS-ICP7035 were maintained in isolation.

(B) Transfer of ms2 allele

Ten male sterile lines carrying ms2 gene were purified for various economic traits. These lines vary greatly with respect to their phenology and have large seeds. For the first time a few experimental hybrids were also made.

Objective 3 :

To identify superior hybrids by testing different cross combinations mainly in short-duration.

Progress:

(i) ICPH 8 a short-duration hybrid was entered in EACT trial of AICPIP. This hybrid continued to perform well in north and central Indian locations as shown in Table 1.

Table 1. Performance (yield kg ha-1) of short-duration hybrid ICPH 8 at north and central Indian locations, 1981-1986

Year	Trials	ICPH 8	UPAS 120	% Superiority of hybrid
1981	1	3900	2225	75.3
1983	1	3560	2569	38.6
1984	15	2642	2060	28.3
1985	7	1854	1287	44.0
1986	8	2852	2008	42.0
Mean		2962	2030	45.9

(ii) Four short-duration hybrids were included in EPAY trials organized in Project P-102(85)IC.

(iii) This year 179 short-duration hybrids were evaluated at Hisar (13 trials) and Patancheru (6 trials). Twelve hybrids recorded high yield levels and exhibited a superiority over the national check cultivar (Table 2).

Table 2. Performance of some new short-duration indeterminate hybrids at Hisar, 1986

Hybrid No.	Days to maturity	Yield (kg/ha)	% increase over		
			UPAS 120	H77-216	T21
ICPH 140	114	3574	43	64	
ICPH 184	116	3287	74	48	52
ICPH 138	116	3221	29	48	
ICPH 153	116	3167	27	45	
ICPH 192	121	3077	63	38	42
ICPH 93	113	3050	46	66	
ICPH 156	115	3012	22	25	
ICPH 139	116	3002	47	59	
ICPH 169	114	3000	22	25	
ICPH 158	116	2944	20	22	
ICPH 130	117	2940	51	29	
ICPH 126	114	2924	42	56	

Mean days to maturity

UPAS 120 = 118 (n=8)
H77-216 = 116 (n=6)
T 21 = 120 (n=1)

Objective 4 :

To develop efficient hybrid seed production methodologies.

Progress: To evaluate the possibility of developing perennial hybrid seed production nursery for reducing the cost of hybrid seed, this year from a hybrid seed production block of ICPH 8, four harvests were made and then the plants were left for next season's crop. The plants survived the summer with the help of life-saving irrigations and in June good canopy was established. The crop, however due to severe infection of sterility mosaic, was removed. This experiment showed that under good management system and with SM resistant lines a good perennial seed production nursery can be established and hybrid seed can be produced with less investment.

Objective 5 :

To make male sterile lines available to pigeonpea breeders.

Progress: Besides Hindustan Lever and MAHYCO Hybrid Seed companies, Pioneer Hybrid Seed Company (USA, Australia, India) have shown interest in hybrid pigeonpea. We supplied short-duration male sterile lines and relevant literature to these organizations.

Male sterile lines were also made available to various research organizations in China, West Indies and 7 national research stations.

6. Publications:

*Saxena, K.B., Faris, D.G., Reddy, L.J., Sharma, D., Reddy, B.V.S., Gupta, S.C., and Green, J.M. (1986). Prospects for hybrid pigeonpeas. Proc. Fifth International Congress, SABRAO, Bangkok. pp 379-388.

*Saxena, K.B., Faris, D.G. and Gupta, S.C. (1986). The potential of early maturing pigeonpea hybrids (CP271). Paper presented at Workshop on Food Legume Improvement for Asian Farming Systems. Khon Kaen, Thailand.

7. Work plan for next year:

Work on the transfer of male sterile gene into elite pigeonpea genotypes of different maturity groups will be continued. Hybrid seed of high yielding combinations will be produced for multilocational tests. New hybrids involving short-duration advanced breeding (F6/F5) lines will be made to identify short-duration heterotic crosses.

Project No.CO-P-XX(87) Link Project No.P-105(85)IC

Sub-project title: Development and evaluation of long-duration pigeonpea hybrids.

Collaborative institute: Directorate of Pulses Research (DPR), Kanpur

Sub-project scientists:

ICRISAT: K.B. Saxena, Laxman Singh, D. Sharma, M.V. Reddy.

Directorate of Pulses Research, Kanpur: Dr. A.N. Asthana

Period: From : 1987 To: Continue

Review of background and plan:

Performance of short- and medium-duration hybrids at ICRISAT and MAHYCO Seed Company has demonstrated that substantial level of heterosis, present in this crop, can be exploited commercially through the use of genetic male sterility and natural out-crossing. The yield levels in long-duration pigeonpeas have been almost static over decades of breeding research at various Indian research stations. An attempt nov will be made to explore the possibility of increasing yield in this maturity group through heterosis breeding. Since SM is an important disease of this region we will concentrate on developing SM resistant hybrids.

At ICRISAT, we have developed medium-duration male sterile lines which show resistance/tolerance to SM disease. In 1987, about 50 experimental hybrids will be made at DPR Kanpur and ICRISAT using MS 7035 and MS 3785 and long-duration SM resistant pollen parents.

The experimental hybrids thus made will be evaluated at Gwalior, Kanpur, Varanasi, Faizabad, and Dholi for their performance. The superior combinations will be remade in the following year in isolation blocks to produce large quantity of seed. Scientists/technicians from national program will be trained in developing hybrids and maintenance of male sterile lines.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

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

2. Project Title : Breeding for special traits (new variability, high protein, vegetable types)

3. Project Scientist(s) : K.B. Saxena, Laxman Singh, U. Singh, Y.S. Chauhan

4. Period covered by report (Month/Year):

   From: January 1986 To: December 1986

5. Summary of progress report:

Objective 1 :

Genetic variability by exploiting inter-generic crosses and mutagenesis.

Progress:

(i) Studies into overcoming some crossability barriers involving pigeonpea and related Atylosia species: Work completed during a post-doctoral internship by Dr. I.S. Dundas. Progress report is given in training project.

(ii) With the objective of developing photo-insensitive pigeonpea lines four extra-short-duration cultivars were irradiated with 30, 40, and 50 Kr gamma rays. M1 generation was raised and selfed during 1986-87. In 1987-88, M2 seeds will be grown along with the checks of known photo-period response under extended photo-period to identify the earliest flowering mutants. M3 progenies of the selected insensitive mutants will be grown in normal as well as extended photoperiods.

Objective 2 :

Incorporate new important trait (cleistogamous flowers) in elite varieties.

Progress: Cleistogamous flower trait, which ensures high level of selfing was incorporated into two short-duration and two medium-duration cultivars. This trait was found to be linked

with shrivelled seed. Intensive selection in breeding populations resulted in the identification of lines having acceptable seed size and cleistogamous traits. In 1986-87 season, the selected lines were evaluated and the results (Table 1) clearly show that besides high yield and acceptable seed characters, these lines have shown good level of resistance to SM. In 1987-88 multilocation testing of the lines is planned.

Table 1. Performance of some short- and medium-duration cleistogamous lines at Patancheru, 1986

Line	Days to mature	Plant height (cm)	100-seed mass (g)	Grain yield (kg/ha)	% wilt*	% SM*
(I) ICPL 87 Derivatives						
5406	118	108	7.9	2260	85	22
5409	124	118	8.6	2090	100	26
ICPL 87 (control)	113	86	8.9	1730	75	39
SE +	0.8	2.8	0.20	204	-	-
CV(%)	1.4	5.5	4.87	23.0	-	-
(II) UPAS 120 Derivatives						
5504	127	146	7.2	2490	72	24
5503	128	150	7.0	2150	88	6
UPAS 120 (control)	112	132	6.6	1500	73	86
SE +	1.2	6.5	0.22	219	-	-
CV (%)	1.6	7.5	5.51	24.3	-	-
(III) C 11 and BDN 1 Derivatives						
BDN 1 (control)	163	143	11.0	1380	55	100
5907	163	163	7.0	1250	73	73
5909	169	175	6.7	1250	88	30
SE +	2.2	9.4	0.15	137	-	-
CV (%)	2.3	10.5	3.58	19.9	-	-

*Disease reaction recorded in disease nursery.

Objective 3 :

Study inheritance of important characters and new variants.

Progress: During this year inheritance studies of open carpel (single recessive gene), decumbent plant type (single recessive gene), and corky stem (one recessive and one dominant gene) mutants were accomplished. Studies on the inheritance of dwarf was initiated. This work will be carried out by a M.Sc. student from Kenya.

Objective 4 :

Screening short-duration lines for photo-insensitivity.

Progress: Screening of short-duration lines, flowering in 52-70 days under natural daylength, showed that within each (0, I, II, III) maturity group, the response to the extended photoperiod in terms of increased number of days to flower differed grossly. Under the extended photoperiod, within each maturity group, the least sensitive lines took about 21 days more to flower while in the most sensitive group the flowering was delayed by about 50-55 days. Photoperiod responses of the selected genotypes will be confirmed in the next year. Short-duration genotypes with least sensitivity to extended photoperiod are likely to be adapted in higher latitude environments.

Objective 5 :

Breeding high protein high yielding lines.

High protein inbred lines performed well with respect to their protein and yield during its second year of testing (Table 2). The data indicated that high protein can be combined with high yield and large seed size. Testing of high protein lines over a range of environments has shown a high level of stability in their protein values. Breeding for developing short-duration high protein lines has started.

Objective 6 :

Breeding for vegetable types in early and medium maturity groups.

Progress: Short-duration, large white seeded lines suitable for vegetable as well as dry seed purposes have been developed. These lines have yielded over 2 t/ha. In medium-duration, indeterminate lines having tolerance/resistance to wilt and SM have been developed. Besides large white seeds, these lines have high yield potential (Table 3).

Table 2. Performance of high protein lines during 1985 and 1986 seasons at Patancheru.

Line	% dhal protein		Yield kg ha-1		Dhal protein yield (kg ha-1)		
	1985	1986*	1985	1986*	1985	1986*	Mean
HPL 40-7	26	29	2105	1434	437	326	382
HPL 40-5	27	29	2096	919	452	211	332
HPL 40-7	27	29	2074	957	440	224	332
BDN 1	23	26	2022	933	373	195	284
Trial mean	26	29	1809	1129	380	257	
SE ±	0.46	0.39	181	269	46.6	59.9	
CV%	3.0	2.0	17	34	17	33	

*Mean of high protein inbred lines
*In 1986 the trial was affected by water-logging.

Table 3. Performance of some white-seeded medium-duration indeterminate lines at Patancheru.

Line	100 seed mass(g)	kg ha-1	% wilt*	% SM*
8520	14	2060	38	12
8504	15	1890	12	0
8508	15	1885	17	17
BDN2 (control)	10	1630	R	S
T15-15 (control)	11	970	S	S
SE ±	0.3	175		
CV%	4	19		

*Data from disease nursery.

6. Publications:

* Sharma, D., Saxena, K.B., Reddy, L.J. and Jain, K.C. Sources of dwarfness in pigeonpeas. Indian Journal of Genetics and Plant Breeding (submitted) (JA 485).

* Saxena, K.B., Faris, D.G., Singh, U. and Kumar, R.V. Relationship between seed size and protein content in high protein selections from crosses between pigeonpea and three Atylosia spp. Plant Food for Human Nutrition (accepted) (JA 499).

* Saxena, K.B., Singh, A.K. and Faris, D.G. The morphogenesis and inheritance of an open carpellary mutant in pigeonpea. J. Heredity (submitted) (JA 612).

* Saxena, K.B., Dundas, I.S., Faris, D.G. and Gupta, S.C. Genetics and histology of corky-stem in pigeonpea. J. Heredity (submitted) (JA 631).

* Saxena, K.B., Sharma, D. and Faris, D.G. Ineffectiveness of wrapped flower in inhibiting cross-fertiization in pigeonpea. Euphytica (accepted) (JA 578).

* Saxena, K.B., Gupta, S.C. and Faris, D.G. Inheritance of a prostrate mutant in pigeonpea. Theoretical and Appllllied Genetics (submitted) (JA 663).

* Faris, D.G., Saxena, K.B., Mazumdar, S. and Singh, U. Vegetable pigeonpeas: a promising crop for India, ICRISAT Information Bulletin (in press).

* Faris, D.G., Saxena, K.B. and Singh, U. 1986. The promise of high protein pigeonpea. Paper presented at ACIAR Workshop on Grain Legume, Khon-Kaen, Thailand, 1986.

* Singh, U., Jambunathan, R., Saxena, K.B. and Faris, D.G. 1986. Nutritive value of green and mature seed of pigoenpea. Paper presented at ACIAR Workshop on Grain Legume, Khon-Kaen, Thailand.

7. Work plan for next year:

Cleistogamous lines will be tested for their yield and stability. Studies on photo-insensitivity will be continued. Short-duration high protein lines will be developed. Short-duration near photo-insensitive vegetable lines will be developed. Medium-duration white seeded indeterminate vegetable lines will be tested for their adaptation in Gujarat state.

Project No.CO-P-XX(86) Link Project No.P-106(85)IC

Sub-project title: Study of variation for fodder, fuel and grain potential in perennial production system of pigeonpea.

Sub-project scientists: Scientists associated with P-106(85)IC

Collaboration: Directorate of Pulse Research, ICAR, Kanpur
Director, ICAR Research Complex, Shillong.

Period: Start : August 1986
Completion: 1990

Locations: Patancheru, Gwallor, Kanpur and NE Hill region.

Objective and work plan:

To evaluate fodder, fuel and grain productin potential of some perennial pigeonpeas in shifting cultivation system of NE Hill region in non-replicated production plots and in replicated trials at experiment stations.

The trial at Patancheru and Gwalior has been planted. The seed material has been sent to DPR, Kanpur, Director ICAR Research Complex, Shillong, Jt.Directors - Tripura, Manipur and Nagaland.

Project No.CO-P-XX(86) Link Project No.P(106)85 IC

Sub-project title: Evaluation of short-duration pigeonpea for vegetable purposes in the off-season.

Name of collaborative institute:

Gujarat Agricultural University, Sardarkrushinagar
University of Agricultural Sciences, Bangalore

Sub-project scientists: Scientists associated with P-106(85) IC

Period Start: 1987
Completion : 1980

Location: Baroda, Junagadh, Bangalore

Objective and work plan:

Pigeonpeas are grown as a cash crop for green pod sale in Gujarat. The cultivars grown for this purpose are dual type and are of long-duration hence bulk of vegetable pigeonpea production occurs between December and February period. Similar production system of pigeonpea for vegetable purposes exist in Caribbean, both for fresh green peas and canning. In Africa, pigeonpeas are also consumed as green peas and production occurs between December and February from long duration, large podded cultivars.

We now have large podded pigeonpea lines which are of short-duration and relatively insensitive to photoperiod. If they are planted in off-season (February-April) with irrigation and fully protected from pod boring insects the green peas can be made available in off-season and fetch higher price.

Project No. CO-P-XX(86) Link Project Nos. P-106(85) IC
P-107(85)IC

Sub-project title: Adaptation to rice fallows in coastal Andhra Pradesh with APAU and RMP.

Sub-project scientists: Scientists associated with P106(85)IC and collaborators (APAU, RMP)

Period: Start : 1985-86
Completion: To continue

Locations: Patancheru, Rajendranagar, Nunnipalle

Report: To be presented by Pulse Agronomy/RMP.

Project No.CO-P-XX(85) Link Project Nos.P-106(85)IC
P-107(85)IC

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Sub-project title: Photo-thermo sensitivity testing in collaboration with IARI, New Delhi

Sub-project scientists: Scientists associated with P106(85)IC and collaborators (IARI, GRU).

Period: Start : 19
Completion: 1990

Locations: Patancheru, New Delhi

Report: To be presented by Pulse Agronomy

Tr-P-5(86) Link Project P-106(85)IC

Sub-Project Title: Study of varition for pollination behavior.

Objective, bakcground and progress:

Among pigeonpea genotypes a variation for natural outcrossing has been observed. Under Patancheru conditions cultivar like Prabhat has shovn more out-crossing in comparison to ICP 102, HPL 31 and ICP 8863. The pollination behavior in this crop is not well understood. Therefore, a training project aimed to study this variation and examine the causes for such differences was formulated for a post-doctoral trainee from USA. The trainee failed to join ICRISAT and, therefore, work on this project was not initiated.

Tr-P-6(86) Link Project P-106(85)IC

Title : Inheritance of dwarfs in pigeonpea

Trainee: Githiri S. Mwangi (from Kenya), M.Sc. degree course

Report

Inheritance studies on various pigeonpea dwarfs identified and maintained at ICRISAT will be carried out. In 1986, observations were recorded in F1 and F2 populations of 4 crosses. Random plants were selfed to produce pure F2 and F3 seed. New crosses and backcrosses were also made. In 1987, F1, F2, F3, and backcross generations will be studied.

Tr-P-11 Link Project No.P-106(85)IC

Title: Studies into overcoming some crossability barriers involving pigeonpea and related Atylosia species.

Trainee: Dr. I.S. Dundas (from Australia), Post-doctoral Internship (1984-1986)

Report:

A. platycarpa, a wild relative of pigeonpea, carry genes for several important traits. This species, however, is incompatible when crossed with pigeonpea. To overcome this barrier we attempted bridge crosses using other Atylosia species which can be crossed both to pigeonpea as well as A. platycarpa. Such bridge crosses succeeded in producing shrivelled and inviable seed, caused by the degeneratin of endosperm tissue in the hybrid ovule. An embryo rescue method was developed to raise plantlets using culture medium. The embryos developed into plantlets when nurse-endosperm sacs or young embryos from the maternal parent were placed adjacent to hybrid embryo, and when the cultures were subjected to dark treatment for one week after dissection. These plantlets did not grow to full plants. We hope to pursue the studies further through post-doctoral training program.

GENETIC RESOURCES

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : GR 109(85) IC

2. Project Title : Maintenance and evaluation of Pigeonpea germplasm

3. Project Scientist(s) : P. Remanandan

4. Period covered by report (Month/year) : January 1986 to December 1986

5. Summary of progress report:

A working collection of 735 accessions having frequent demand and 604 accessions with less seed were rejuvenated during 1986/87. We are monitoring the seed viability of germplasm accessions stored under medium term cold storage conditions for over 4 years.

For characterization 920 accessions were grown during 1986/87. These include collections from Trinidad and Tobago, Dominican Republic, Puerto Rico, Barbados, St. Vincent, St. Lucia, Grenada, and India. We have collected all the field data and majority of the postharvest recordings from all these accessions. We have further identified new sources for high number of seeds per pod, a much wanted character in vegetable-type pigeonpea breeding. Preliminary yield evaluation of 16 mid-late and late duration lines and 30 medium duration lines has been carried out at ICRISAT Center to identify germplasm lines with superior agronomic traits. We collected the field data from both these trials and recording of postharvest observations is under progress.

Preliminary screening of germplasm for photoperiod insensitivity continued. Out of 900 lines screened during 1985/86 under 3 different plantings 116 lines showed potential for insensitivity. A set of about 200 lines were tested under extended light and we are in the process of purifying the less sensitive lines.

The computer based Pigeonpea germplasm catalog has been revised, edited and is now under editorial review.

6. Publications:

Remanandan, P. 1986. Genetic variation in pigeonpea germplasm. In Papers presented at ACIAR Workshop "Food Legume Improvement for Asian Farming Systems." 1-5 Sep 1986. Khon Kaen, Thailand. Canberra, Australia: Australian Centre for International Agricultural Research. (CP 280)

7. Work plan for next year:

- Characterization of new accessions and evaluation of elite germplasm.
- Seed viability monitoring, rejuvenation, and storage.
- Preparation for long-term storage.
- Distribution of seeds.

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

2. Project Title : Collection of germplasm of pigeonpea and related Cajaninae

3. Project scientist(s) : P. Remanandan

4. Period covered by report : January 1986 to December 1986

5. Summary of progress report:

The world pigeonpea germplasm collection has grown to 10 818 from 48 countries and the collection of closely related wild taxa increased to 240 accessions of 46 species belonging to 6 genera. A collection expedition carried out in Guyana, Jamaica, and Venezuela resulted in securing 112 representative landraces of pigeonpea during Feb-Mar 1986. Out of this 94 have been cleared by the NBPGR. Majority of these have been harvested from PEQIA. These are medium-late to late-maturing lines with impressive vegetable-type characteristics. Other samples cleared and harvested are 10 samples of pigeonpea from Brazil, and 3 received from U.K. Thirty one wild species samples received from Indonesia are now growing in the PEQIA nethouse.

Collection from Indian states during 1986 include 43 pigeonpea and 6 wild species samples from Madhya Pradesh, Maharashtra, and Uttar Pradesh.

6. Publications:

Rao, N.K., van der Maesen, L.J.G., and Remanandan, P. 1985. Breaking seed dormancy in Atylosia species. Seed Research 13(2):47-50. (JA 389)

van der Maesen, L.J.G. 1985. Cajanus DC. and Atylosia W.&A. (Leguminosae). A revision of all taxa closely related to the pigeonpea, with notes on other related genera within the subtribe Cajaninae. Agricultural University Wageningen Paper 85-4. (JA 391)

van der Maesen, L.J.G., Remanandan, P., Kameswara Rao, N., and Pundir, R.P.S. 1985. Occurrence of Cajaninae in the Indian subcontinent, Burma and Thailand. Journal, Bombay Natural History Society 82:489-500. (JA 396)

7. Work plan:

Priority areas of collection include South/Central America, southern Philippines, Indonesia, Burma, and India. Collection in India will be carried out jointly with NBPGR/ICAR.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

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

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

3. Project Scientist(s): R.P.S. Pundir

4. Period covered by report: January to December 1986

5. Summary of progress report:

During 1985/86 chickpea crop season, we grew 1937 and 1814 accessions for preliminary evaluation at Patancheru and Hisar respectively. It was possible to evaluate 624 (Patancheru) and 720 (Hisar) accessions only at the two locations. Later, due to soil salinity problem at Hisar, evaluation work was transferred to Gwalior. At ICRISAT Center, 3200 lines were also sown for rejuvenation. While evaluating 356 Ethiopian accessions in replicated tests, we identified 25 that out yielded the check cultivars. Of these ICC 12518, 12567, 12579, 12609, and 12694 were significantly superior. Two replicated tests: (i) Ethiopian kabuli chickpeas and (ii) relationship of various seed sizes and protein, were lost due to fusarium wilt and soil salinity. From mutagen treated lines, we identified one more line, that has green tipped flower vexillum in contrast to the usual over all pink color, a character that can be used as a maker gene. In order to generate new sources of resistance, we made 8 crosses aiming to introgress gray mold resistance from desi chickpea to kabuli types. Successful progenies will be supplied to pathologists for further screening and subsequent utilization. Of the 428 lines tested by the pathologist against wilt and dry root rot, 22 lines were found promising. During 1986, we supplied 2603 seed samples to ICRISAT scientists (Pathology: 1807, Entomology: 514, Breeding: 191, Biochemistry: 58 and Others 33), 1400 to Indian institutions and 1704 abroad. We transferred seeds of all accessions in aluminium cans to our new medium term cold storage facility. We analysed and summarized the germplasm evaluation data, and these, together with passport data on all accessions have been compiled for publication in the ICRISAT chickpea germplasm catalog.

6. Publications:

Pundir, R.P.S., Reddy, K.N., and Mengesha, M.H. ICRISAT germplasm catalog. (under editorial review)

7. Work plan for next year:

- During 1986/87 crop season, we have sovn 1150 accessions for preliminary evaluation, and 876 accessions for seed increase. Four replicated evaluation tests also have been sovn. Two chickpea genotypes: ICC 12237 (triple disease resistance) and ICC 12951 (polycarpy) have been treated with EMS mutagen to produce better types.

- Transferring germplasm seeds to long term facility.

- Monitoring viability of seeds stored in the medium term cold room.

- Genetic studies.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

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

2. Project Title : Collection of Cicer germplasm

3. Project Scientist : R.P.S. Pundir

4. Period covered by report : January to December 1986

5. Summary of progress report:

During March 1986, we led and participated in a chickpea germplasm collecting expedition to Madhya Pradesh, India, the state producing largest amount of chickpea in India. This was our joint venture with the JNKVV College of Agriculture, Indore (Madhya Pradesh) and the NBPGR (New Delhi). This region exhibits a lot of variability in chickpea. We collected 274 accessions. The major chickpea types observed were typical desi chickpea 'PEELA CHANA', desi large seeded 'DABBO', double podded 'DO GHANTI', tuberculated seed type 'KATILA', near kabuli type 'GULABI', and kabuli. During the mission we sav considerable losses to chickpea crop mainly due to soilborne diseases, and sometime frost and lodging caused by excessive vegetative growth.

During the year, 512 new accessions were added to the gene bank originating from India (357), Bangladesh (131), USA (15), and Italy (9). This number also included 75 wilt resistant selections made by our pathologists. With these, the chickpea germplasm accession number conserved in the ICRISAT gene bank reached to 14 875. Passport information of new accessions have been computerized. The observations recorded during collecting trip have been compiled to prepare a GRU departmental progress report. Germplasm collecting progress was reviewed and new priorities were determined as listed below in our Work Plan.

6. Publications:

1. Pundir, R.P.S., and Rajagopalan, C.K. Collection of chickpea germplasm in Tamil Nadu. ICN 15 (1986) - in press.

2. Pundir, R.P.S., Reddy, K.N., and Mengesha, M.H. ICRISAT chickpea germplasm catalog. (under editorial review)

7. Work plan for next year:

Our efforts would continue to provide better representation of all chickpea growing regions in the gene bank. We are exploring possibilities to collect chickpea germplasm from Syria, Burma, Morocco, and Malavi. We also have plans to collect chickpea germplasm from the remaining parts of Madhya Pradesh in collaboration with NBPGR.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

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

2. Project Title : Maintenance of wild Cicer species and interspecific hybridization

3. Project Scientist : R.P.S. Pundir

4. Period covered by report : January to December 1986

5. Summary of progress report:

Twenty two accessions of the 8 annual wild Cicer species were grown in solarized plot along with an input of extended day light. Satisfactory plant growth and seed increase of all the accessions were obtained by using this method. Cicer microphyllum, one of the perennial species, was also grown in extended day light. This produced some flowers but there was no pod setting. We transferred these plants to our growth chamber to provide conditions close to their natural habitat. Few flowers were produced, two of them developed into normal pods and seeds. This indicates that perennial species can be grown and maintained at Center under controlled environment. We are trying to further refine our work in creating the most ideal condition for maintaining and rejuvenating perennial wild relatives of chickpea.

ICRISAT pathologists screened all the accessions of 8 annual wild species against ascochyta blight and gray mold, and they found tolerance to ascochyta blight in C. bijugum, C. judaicum and C. pinnatifidum. Tolerance to gray mold was observed in C. bijugum, C. echinospermum, C. judaicum, and C. reticulatum.

We supplied wild species seeds to many research workers.

6. Publications: Nil

7. Work plan for next year:

- Maintaining seeds of wild species for distribution and utilization.
- Exploring ways to maintain and make use of perennial species. Continue efforts in interspecific crosses.

Project No.: GR-116(85) IC-A

Project Title: Multilocation evaluation of Pigeonpea germplasm

Name of the collaborative Institute: National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR)

Name of scientists responsible for the project:

(a) Collaborative Institute: Mr. T.A. Thomas (NBPGR)
Dr. S.K. Chaudhari (Pusa, Bihar)

(b) ICRISAT: P. Remanandan, M.H. Mengesha, D. Sharma

Duration

(a) Date of start: June, 1986

(b) Date of completion:

Objectives:

ICRISAT/NBPGR/ICAR collaborative program to evaluate the ICRISAT mandate crops at or near the area of original habitat or area of adaptation. A set of 479 early maturing accessions at Issapur, Delhi, 353 mid-late maturing accessions at Akola, 393 mid-late maturing accessions at Gwalior during kharif and 353 mid-late maturing accessions for Rabi at Dholi, Bihar have been selected and planted during 1986.

Source of funds:

Progress so far:

All the plantings have been done in time and the trials established well. Recording of data on 17 important morphoagronomic characters is under progress. The trial at Issapur has been harvested and the data are being compiled.

Remarks:

COLLABORATIVE PROJECTS

Projec' No.: GR-116(85) IC-B

Project Title: Multilocation evaluation of Pigeonpea germplasm

Name of the collaborative Institute: National Dryland Farming Research Station (NDFRS), Katumani, Kenya

Name of scientists responsible for the project:

(a) Collaborative Institute: Dr. A. Shakoor, Mr. Paul Omanga

(b) ICRISAT: P. Remanandan, M.H. Mengesha

Duration

(a) Date of start: Octoer, 1986
(b) Date of completion:

Objectives:

A regional pigeonpea germplasm evaluation program in collaboration with the Ministry of Agriculture, Govt. of Kenya has been initiated in Kenya starting October, 1986 to evaluate the germplasm at or near the area of original habitat or area of adaptation. A set of 500 germplasm accessions consisting of vegetable type germplasm collected from Kenya, the Caribbean islands and India has been constituted and planted at two locations (Katumani and Kiboko) during 1986. Promising lines will be selected, multiplied and a working collection will be constituted for further evaluations.

Source of funds:

Progress so far:

The trials at two locations are well established and recording of data on important morphoagronomic characters is under progress. Over 200 accessions reached podding stage in late March 87. Several genotypes with desirable agronomic traits appearing well adapted to the region have been identified. They are being selfed for further elaborate tests in the next season.

Remarks:

Majority of accessions is expected to reach podding stage by early May 87. Joint evaluation needs to be carried out from 1 to 30 May 1987.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : GR-117(86) IC

2. Project Title : Multilocation evaluation of chickpea germplasm

3. Project Scientist : R.P.S. Pundir

4. Period covered by report : January to December 1986

5. Summary of progress report:

We have evaluated almost all accessions at Patancheru at least one time. At Hisar, 720 accessions were evaluated during 1985/86 totalling 4323 lines up to now. Subsequently, due to soil salinity problem at Hisar, we have transferred chickpea germplasm evaluation work to Gwalior.

During 1986/87 season, we sowed 1033 chickpeas at Debre Zeit, Ethiopia in collaboration with Plant Genetic Resources Center, Addis Ababa, Ethiopia and the Agricultural Research Center (ARC, Debre Zeit) of Agricultural University of Alemaya. We visited the experiment 10-13 December, 1986. The crop was satisfactory and national Ethiopian scientists as well as ICARDA chickpea breeder were highly supportive and they were able to identify 18 promising lines. These accessions can be further tested in replicated trials and utilized in the national research program.

Under our collaborative efforts with NBPGR, a set of 1320 long-duration chickpeas have been sown at New Delhi, Jodhpur, and Gwalior, and another similar set of short-duration at Patancheru, and Akola. This joint work has been highly appreciated by our collaborating scientists in NBPGR and agricultural universities. These experiments were visited jointly by GRU scientists and collaborating national scientists in India during crop season. At New Delhi, chickpea crop was poor because of unsuitable soil type whereas at Jodhpur, crop was good initially, but was later damaged by fusarium wilt and stunt virus. Surprisingly, chickpea did not nodulate at Jodhpur. Chickpea crops at Akola and Gwalior were very good and we expect to obtain meaningful evaluation data.

6. Publications: Nil

7. Work plan for next year:

Germplasm observations on regional and multilocation evaluations will be summarized and shared. Data will be compiled in catalog form and distributed to chickpea research workers. In future years, efforts will continue with new sets of germplasm accessions. Scientists from nearby stations will be invited to visit germplasm growouts and select material for utilization at their end. The regional chickpea germplasm evaluation in Ethiopia will be continued with the use of promising lines and new short-duration accessions as suggested by our cooperators.