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# Pigeonpea Breeding

Report of Work

1985-86

Project No.: P-102(85)IC

(Development of short-duration Pigeonpea Cultivars and Superior Breeding Lines for  
Grain Production)

Satish C. Gupta, R.K. Kapoor, D.G. Faris, and Laxman Singh



ICRISAT

Legumes Program

Cooperative Research Center, Haryana Agricultural University, Hisar (Haryana)

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**1 June 1985 to 31 May 1986**

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**P-102(65)IC : DEVELOPMENT OF SHORT DURATION CULTIVARS AND SUPERIOR BREEDING LINES FOR GRAIN PRODUCTION**

**OBJECTIVE :** To develop high yielding short duration cultivars with acceptable grain quality suited to use in pure stands or with short duration companion crops.

**A. INTRODUCTION :**

The replicated yield trials and breeding materials reported here were grown at ICRISAT Cooperative Research Station, Hisar. The Hisar station is situated at 29°10'N latitude, 75°46'E longitude and at an altitude of 215.2 m. The monthly mean temperatures and rainfall received during 1985 along with long term (1970-84) mean is presented in table 1.1.

Most of the experiments were sown on 12-17 July 1985. P<sub>2</sub>O<sub>5</sub> @ 20 kg/ha (single super phosphate) was applied in the soil at the time of land preparation. No other nutrients were added. Seeds were not inoculated with *Rhizobium* culture. The crop received 1-2 insecticidal (mostly Endosulphan) spray to control pod borer.

**B. CROSSES :**

During 1985 Harif, 77 crosses were made as per details given below:

**I. AICFIF National Crossing Program :**

During the All India Coordinated Pulses Improvement Project (AICFIF), Harif Pulses Workshop held at TNAU, Coimbatore on 16-19 May 1985, following short duration pigeonpea crosses were allotted to ICRISAT, Hisar.

1.	MS Prabhat	x	ICPL 151
	"	x	H77-216
	"	x	T-21
4.	"	x	ICPL 8309
	"	x	PP (T)83-1

6.	ICPL 151	x	H77-216
7.	"	x	7-21
8.	"	x	ICPL 8309
9.	"	x	PDA(E)83-1

The cross seed of the above listed crosses was supplied to Project Director (Pulses), Patpur.

#### 11. Line x Tester :

Sixteen lines were crossed to 4 testers in line x tester fashion. The lines and testers used and the crosses made are listed below:

Testers (4) : with high stable yields.

ICPL 87 (Determinate)  
 ICPL 151 (Determinate)  
 ICPL 81 (Indeterminate)  
 ICPL 83027 (Indeterminate)

Lines (16) : with different desirable characteristics

ICPL 85012 - High yield  
 ICPL 85029 - High yield  
 ICPL 85031 - Large white seed with high yield  
 ICPL 85022 - Webber tolerant with high yield  
 ICPL 85027 - Earliest maturing indeterminate line  
 ICPL 85005 - Sterility mosaic resistant  
 ICPL 84044 - Sterility mosaic resistant  
 ICPL 84019 - Wilt resistant  
 ICPL 289 - Wilt resistant  
 ICPL 83 - Multiple disease resistant  
 ICPL 316 - Multiple disease resistant

ICPL 83024 - Multiple disease resistant

ICPL 269 - Multiple disease resistant

ICPL 288 - Multiple disease and insect resistant

ICF 822 - Large seeded multiple disease resistant (Diverse Source)

ICF 8494 - Large seeded multiple disease resistant (Diverse source)

All the crosses involving disease resistant parents were made at Falancheru utilizing the parents grown in the disease nurseries.

Crosses Made :

Sil.No.	Cross No.	Crosses
1.	850001	ICPL 85012 x ICPL 87
2.	850002	ICPL 85029 x "
3.	850003	ICPL 85031 x "
4.	850004	ICPL 83022 x "
5.	850005	ICPL 85037 x "
6.	850006	ICPL 85012 x ICPL 151
7.	850007	ICPL 83029 x "
8.	850008	ICPL 85031 x "
9.	850009	ICPL 83022 x "
10.	850010	ICPL 85037 x "
11.	850011	ICPL 85012 x ICPL 81
12.	850012	ICPL 83029 x "
13.	850013	ICPL 85031 x "
14.	850014	ICPL 83022 x "
15.	850015	ICPL 85037 x "
16.	850016	ICPL 85012 x ICPL 83027
17.	850017	ICPL 83029 x "
18.	850018	ICPL 85031 x "
19.	850019	ICPL 83022 x "
20.	850020	ICPL 85037 x "
21.	850021	ICPL 85005 x ICPL 87
22.	850022	ICPL 84044 x "
23.	850023	ICPL 84019 x "
24.	850024	ICPL 289 x "
25.	850025	ICPL 83 x "
26.	850026	ICPL 316 x "
27.	850027	ICPL 83024 x "
28.	850028	ICPL 269 x "

29.	850029	ICPL 288	x	"
30.	850030	ICP 8862	x	"
31.	850031	ICP 8094	x	"
32.	850032	ICPL 85005	x	ICPL 151
33.	850033	ICPL 84044	x	"
34.	850034	ICFL 84019	x	"
35.	850035	ICFL 289	x	"
36.	850036	ICFL 83	x	"
37.	850037	ICFL 316	x	"
38.	850038	ICFL 83024	x	"
39.	850039	ICFL 269	x	"
40.	850040	ICFL 288	x	"
41.	850041	ICP 8862	x	"
42.	850042	ICP 8094	x	"
43.	850043	ICPL 85005	x	ICPL 81
44.	850044	ICFL 84044	x	"
45.	850045	ICFL 84019	x	"
46.	850046	ICFL 289	x	"
47.	850047	ICFL 83	x	"
48.	850048	ICFL 316	x	"
49.	850049	ICFL 83024	x	"
50.	850050	ICFL 269	x	"
51.	850051	ICFL 288	x	"
52.	850052	ICP 8862	x	"
53.	850053	ICP 8094	x	"
54.	850054	ICPL 85005	x	ICPL 83027
55.	850055	ICFL 84044	x	"
56.	850056	ICFL 84019	x	"
57.	850057	ICFL 289	x	"
58.	850058	ICFL 83	x	"
59.	850059	ICFL 316	x	"
60.	850060	ICFL 83024	x	"
61.	850061	ICFL 269	x	"
62.	850062	ICFL 288	x	"
63.	850063	ICP 8862	x	"
64.	850064	ICP 8094	x	"

III. To incorporate dwarfness from new source in promising extra early maturing lines :

1.	850065	ICPL 316	x	D <sub>1</sub> dwarf
2.	850066	ICFL 85037	x	" <sub>6</sub>

IV. To increase seed size of high yielding indeterminate lines :

1.	850067	ICPL 85052	x	ICPL 83024
2.	850068	ICPL 85052	x	ICPL 85031



## C. BREEDING MATERIALS

### 1. BULK POPULATIONS :

#### F1:

All the 121 F1's made during 1984 were advanced in unreplicated 4 m long one row plots flanked with parents. Rows were spaced 50 cm apart. Seed from each F1 row was bulk harvested for growing F2 populations next year.

#### F2 :

Twenty-five F2 populations (including one multiple cross from HAU) were ~~sown~~<sup>grown</sup> in 2 to 40 row plots depending upon the availability of the seed. The populations were sown on 12 July 1985. The selections practiced in these populations is summarized in table 1.2. From these populations 147 determinate (DT) and 271 indeterminate (NDT) plants were selected for evaluation as single plant progenies (SFP) with close check next year. Six promising looking variable populations (ICPX 830012, 830014, 830023, 830024, 830025 and multiple cross) were selected for growing in large plots next year for practising further individual plant selections.

#### F3:

Two F3 populations (ICPX 820002 and 820009) were grown in large plots for practising individual plant selections. From these 63 DT plants were selected for evaluation as SPPs with close check next year.

#### F4:

Three DT and 2 NDT F4 populations were grown in unreplicated large plots for making single plant selections. The populations grown and plants selected is summarized in table 1.3. In all 123 DT and 50 NDT plants were selected for evaluating as SPP's next year.

#### DT Population Trial :

Four F3 and five F4 DT populations were yield tested along with Check, ICPL 151 in a replicated yield trial sown on 4 July, 1985. The test was laid out in RBD with 4 replications. Plot size consisted of 4 meter long 12 rows spaced 45 cm apart. Populations tested and single plant selections made is summarized in table 1.4. Due to water logging the test was abandoned but 137 DT and 10 NDT plants were selected from these populations for evaluating them as SPP's next year. One population bulk (ICPX 810098) was selected for growing next year in a large plot for making single plant selections.

### NDT Population Trial :

Two F3 and seven F4 NDT populations were yield tested along with Check, UPAS 120 in a replicated yield trial sown on 4 July, 1985 in RBD with 4 replications. Trial details were same as for DT population trial. Populations tested and selections made is summarized in table 1.5.

The trial was washed out due to prolonged water logging at seedling stage. From these populations 145 NDT plants were selected for evaluating them as SPPs next year. One population bulk (ICPX B20011) was selected for growing next year in a large plot for making single plant selections.

#### B5 EPDT (MS) and B5 EPNDT (MS) Composites:

##### B5 EPDT (MS) Composite:

About one hundred seed from each of the following were mixed to constitute the 1985 Early Pigeonpea Determinate (Male Sterile) Composite.

- (a) MS Prabhat (DT)
- (b) All the early maturing DT ICPLs
- (c) B3EH015; 016
- (d) B4EH001, 002, 004, 017, 020, 021 and 022

Seed from all the male sterile determinate plants was harvested and bulked for growing next year. In addition, 20 fertile good looking DT plants were selected for evaluating next year as SPP's.

##### B5 EPNDT (MS) Composite:

One hundred seed from each of the following were mixed to constitute the 1985 Early Pigeonpea Indeterminate (Male Sterile) Composite:

- a) MS Prabhat (NDT) and MS T-21 (NDT)
- b) All the early maturing NDT ICPLs
- c) B3EH 001, 002, 003, 004, 005, 006, 007, 008, 009, 010, 011, 012, 013, 014, 017, 018 and 019.
- d) B4EH003, 005, 006, 007, 008, 009, 010, 011, 012, 013, 014, 015, 016, 018 and 019.

Seed from all the male sterile indeterminate plants was harvested and bulked for growing next year. In addition, 18 fertile good looking plants were selected for evaluating next year as SPP's.

## 2. SINGLE PLANT PROGENY EVALUATIONS :

During 1985 kharif, 1220 (582 determinate and 638 indeterminate single plant progenies (SPP's) of different generations (F3 to F9) of 126 crosses were evaluated in unreplicated 9 meter long one row plots. Rows were spaced 50 cm apart. Sowing was done on 12 July. Every fifth plot was planted with Checks. ICPL 4 and ICPL 151 were used alternatively as Checks for determinate progenies and UPAS 120 and H77-216 for indeterminate progenies. Selections made in the single plant progenies is summarized in table 1.6. A total of 1933 (908 determinate and 1025 indeterminate) promising looking individual plants were selected for evaluation as SPP's next year. Ninety-four (47 DT and 47 NDT) promising and uniform progeny bulks were selected for replicated yield testing next year. In addition, 155 (69 DT and 86 NDT) progenies were selected for retesting as progeny bulks with close check.

### Composite 1 :

Eleven (5 DT and 6 NDT) SPP's derived from Composite 1 were evaluated in unreplicated 9 m long one row plot with close check. From these eight progenies were selected for retesting as progeny bulks next year. In addition, 46 (19 DT and 27 NDT) plants were selected for evaluation as SPP's next year (table 1.6).

### Florida Bulks:

Thirty-one (20 DT and 11 NDT) SPP's derived from five bulks received from Florida, USA, were evaluated in unreplicated 9 m long one row plot with close check. From these promising looking 40 plants were selected for evaluation as SPP's next year (table 1.6). In addition, five progenies were selected for retesting as progeny bulks and 3 determinate promising and uniform progenies were selected for replicated yield testing next year.

## D. REPLICATED YIELD TESTS :

### 1. All India Coordinated Pulses Improvement Project (AICPIP) Tests :

In the AICPIP Kharif Pulses Workshop held at Coimbatore (16-19 May 1985), one of the short duration pigeonpea line ICPL 151 was identified as promising for release in North Plains West and Central Zones. It was given a nickname " JAGRITI ".

















































