Evaluation of New Super-early Pigeonpea Lines for Agronomic Performance and Adaptation in India

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Introduction

Pigeonpea [*Cajanus cajan* (L.) Millspaugh] is a multi-purpose legume crop used mainly for human consumption in the form of processed split dry peas (dal) or fresh as a vegetable. In addition to food, pigeonpea can also be used for a number of other purposes (ie, feed, fodder, fuel, fertilizer).

India is the number one producer and consumer of pigeonpea, but still needs to import around 500,000 tons per year to satisfy the internal demand.

Increasing the area under pigeonpea cultivation could contribute to increased production, but this would only be possible by expanding pigeonpea cultivation to non-traditional areas including wider latitudes, higher altitudes and marginal lands, and to fit in the narrow window of time between harvest and planting of important cereal crops.

Objective

To evaluate newly developed determinate (DT) and non-determinate (NDT) super-early pigeonpea lines for adaptation to several locations in India representing variation for latitude and altitude.

Materials and Methods

A pedigree-based selection method was used to improve earliness (days to 50% flowering)

11 parental lines were crossed in complete diallel fashion

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F_1s were selfed to generate the F_2 generation

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Subsequent selfing and selection for earliness up to the F_5 generation

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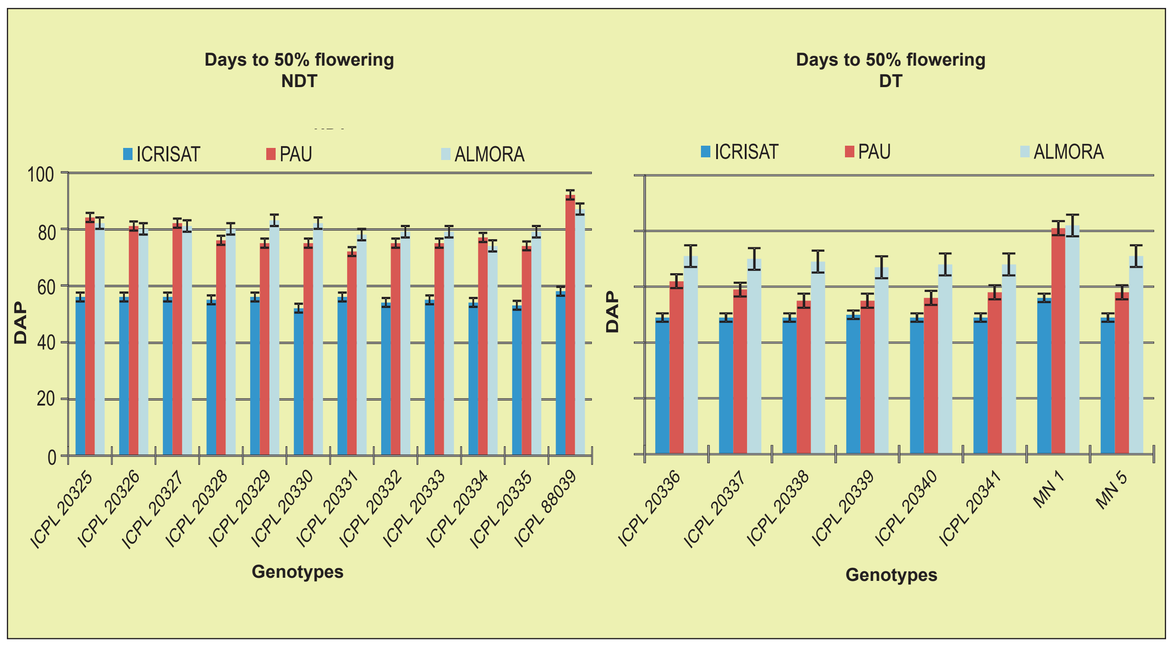
Multilocation testing of advanced lines (11 NDT and 6 DT)

- ICRISAT, Andhra Pradesh (lat. 17°N 30', long. 78°16'E, alt. 545 m)
- PAU, Punjab (lat. 30°56'N, long. 75°52'E, alt. 247 m)
- Almora, Uttaranchal (lat. 29°56'N, long. 79°40E, alt. 1,250 m)

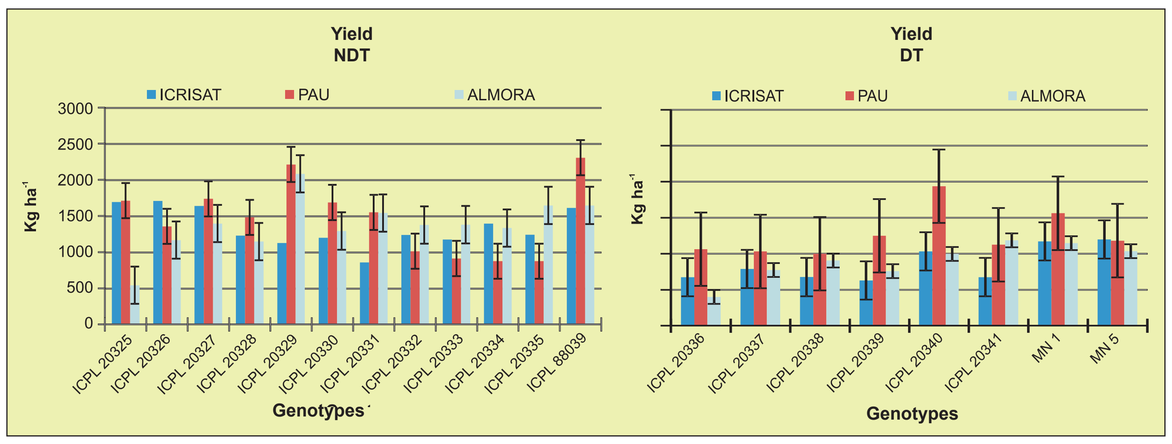
ICPL 88039 was used as NDT check.

MN 1 and MN 5 were used as DT checks.

The data collected included days to 50% flowering, 75% maturity, yield and yield components (only days to 50% flowering and yield are presented in the figures).



Days to 50 % flowering of non-determinate and determinate pigeonpea lines evaluated at ICRISAT, Andhra Pradesh (lat. 17°N 30', long. 78°16'E, alt. 545 m), PAU, Punjab (lat. 30°56'N, long. 75°52'E, alt. 247 m) and Almora, Uttaranchal (lat. 29°56'N, long. 79°40E, alt. 1,250 m)



Yield (kg ha^{-1}) of non-determinate and determinate pigeonpea lines evaluated at ICRISAT, Andhra Pradesh (lat. 17°N 30', long. 78°16'E, alt. 545 m), PAU, Punjab (lat. 30°56'N, long. 75°52'E, alt. 247 m) and Almora, Uttaranchal (lat. 29°56'N, long. 79°40E, alt. 1,250 m)

Results and discussion

- The pedigree-based selection method was effective to improve earliness.
- DT and NDT lines that flowered as early as 45-50 days (ICRISAT) were developed.
- The newly developed lines flower and mature at wider latitudes (tested at 30°N vs 17°N) and altitudes (tested at 247, 545 and 1,250 m a.s.l.).

Super-early pigeonpea lines at flowering stage (ICRISAT, Andhra Pradesh, India)

- Most of the newly developed NDT lines flowered significantly earlier (one to three weeks earlier) than the check variety ICPL 88039.
- The newly developed DT lines flowered in parallel with MN 5 (earliest check) but significantly earlier than MN 1.
- The yield of the NDT lines (1,318 kg ha^{-1} in average) was significantly higher than the yield of the DT lines (856 kg ha^{-1} in average).
- Several of the new NDT lines had yields equivalent to the check variety with the advantage of flowering significantly earlier.
- ICPL 20329 (NDT type) had excellent yield (more than 2,000 kg ha^{-1}) at two locations (PAU and Almora).
- Within the DT lines, ICPL 20340 showed promising yield at PAU (1,938 kg ha^{-1}).

Super-early pigeonpea non-determinate (left) and determinate (right) lines at podding stage (ICRISAT, Andhra Pradesh, India)

Several of the newly developed super-early pigeonpea DT and NDT lines represent options for the cereal-legume cropping system and could also allow expansion of the traditional pigeonpea growing areas to wider latitudes and altitudes. Further testing is necessary to confirm performance over time.

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