CMS-based High-yielding Pigeonpea Hybrids

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Introduction

- Pigeonpea [*Cajanus cajan* (L.) Millsp.] or Red gram is an important pulse crop of India sown every year on 3.9 m ha. The major pigeonpea growing states in India are Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Uttar Pradesh and Uttarakhand.

Why hybrids?

- For the last five decades the productivity of pigeonpea has stagnated at 600–700 kg ha^{-1}. ICRISAT is making efforts to breed high-yielding hybrids to break this yield barrier.

Technology

ICRISAT has developed a stable CMS line, ICPA 2039, derived from a cross between a wild relative of pigeonpea (*C. cajanifolius*) and a cultivar. This trait was transferred in to medium-duration wilt and sterility mosaic resistant lines, and new CMS lines ICPA 2043 and ICPA 2047, were developed.

To identify high yielding hybrids, over 1,200 hybrid combinations were made on CMS lines in the past five years. Among these, hybrids ICPH 2671 and ICPH 2740 were found most promising and were selected for large-scale production and testing.

Important characters

	ICPH 2671	ICPH 2740
Days to 50% flowering:	115-120	125-130
Days to 75% maturity:	165-175	176-189
100-seed mass (g):	11.0-11.5	11.3-11.6
Seed color:	Dark brown	Brown
Yield (t ha^{-1}):	2.5 to 3.0	2.7 to 3.0
Superiority over check:	30-40%	30-40%
Suitability:	Lighter soils	Deep black soils
Special trait:	Resistant to wilt and sterility mosaic diseases	

Seed production

- The seed production of A/B- and R-line, as well as hybrids, should be carried out with a minimum isolation distance of 500 m.
- The seed rate for A-line and hybrid seed production with a spacing of 100 x 30 cm is about 3 kg ha^{-1} (A-line) and 1 kg ha^{-1} (B/R-line).
- For A-line and hybrid seed production, the A- and B/R-lines should be planted in row ratio of 4:1.

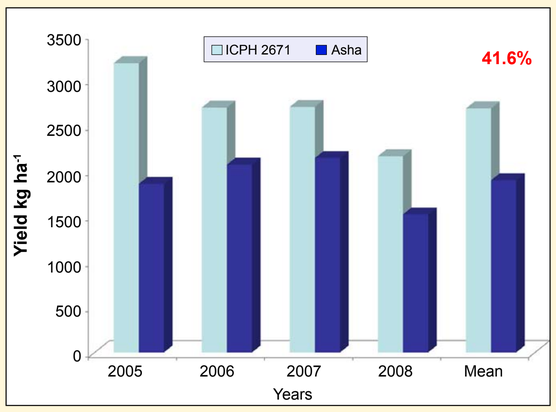
A x R seed production of ICPH 2671.

- The row ratios and spacing of the hybrids and parents **may be changed** to suit the local environment and sowing time. In late season plantings the plants will be relatively short in height and a bigger population will be required to optimize seed yield.

Performance of hybrids in multi-location trials

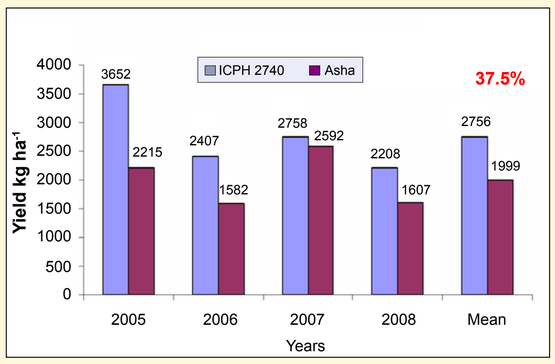
ICPH 2671

This hybrid was evaluated in 35 multi-location trials for four years (2005-2008) in Andhra Pradesh, Jharkhand, Karnataka, Maharashtra and Tamil Nadu and recorded 41.6% superiority over control variety Maruti.



ICPH 2740

This hybrid was evaluated in 33 multi-location trials for four years (2005-2008) in Andhra Pradesh, Karnataka and Maharashtra, and recorded 37.8% superiority over control variety Asha.



On-farm trials

- A total of 923 ICPH 2671 on-farm trials were evaluated in Andhra Pradesh, Jharkhand, Karnataka, Madhya Pradesh and Maharashtra during 2007, 2008 and 2009.
- On-farm trials of ICPH 2740 were planned in larger plots in 2010. However, in a few locations of Gujarat and Maharashtra, good yields were harvested in 2009.
- In 2008, ICPH 2671 was evaluated as an intercrop in 145 locations with different crops and showed 93% superiority over soybean in inter-cropping. (Table 1).

Table 1. ICPH 2671 in on-farm trials in India- 2008.

System	No. of demos.	Area (ha)	Yield (kg ha-1)		% Superiority
			ICPH 2671	Maruti	
Sole	**637**	**211**	**1120**	**913**	**23**
PP+ Maize	**87**	**17**	**829**	**598**	**39**
PP+Soybean	**29**	**12**	**1250**	**648**	**93**
PP+Cotton	**21**	**8**	**730**	**648**	**13**
PP+ Greengram	**8**	**3**	**916**	**779**	**18**
Total/Mean	**782**	**251**	**969**	**717**	**35**

- In 2009, ICPH 2671 was evaluated in 112 on-farm trials at different locations in India. Of these, a farmer in Andhra Pradesh received an award for harvesting a bumper yield of 10,400 kg in an 8 acre plot @ 3,250 kg/ha.
- In 2010, estimated area sown under hybrid pigeonpea is about 3,437 ha in 6 states of India.

On-farm trials at various locations in India, 2007-2009

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