Hybrid ICPH 2671 Holds Promise for Breaking Yield Plateau in Pigeonpea

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Highlights

ICPH 2671 is a CMS-based medium-duration pigeonpea hybrid developed by ICRISAT, ICAR, and partners under a project supported by ISOPOM, Ministry of Agriculture, Government of India.

The fertility restoration of hybrid ICPH 2671 across environment is high and stable.

In multi-locational trials (3 years, 21 locations), ICPH 2671 recorded 41.6% superiority over control variety Maruti.

In All-India Co-ordinated (IHT & AHT) trials conducted in 2007, the yield of ICPH 2671 was 31% higher in central zone and 62% superior in south zone over control variety Maruti.

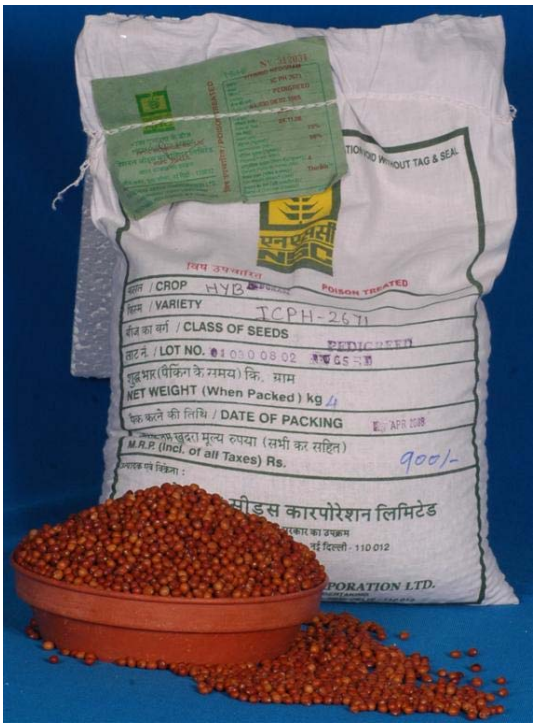
In 29 on-farm trials conducted in 2007, ICPH 2671 demonstrated 28.5% superiority over control Maruti.

The large-scale hybrid (A x R) seed production has also been demonstrated and yields ranging from 2267 to 66 kg ha^{-1} were recorded. A fine tuning of seed production technology to suit different locations will be undertaken shortly.

The *dal* quality of hybrid is acceptable and by most (80%) respondents it was rated as "better than the market sample" in flavor, taste, and cooking time. More such trials are planned shortly.

The cost of seed production of ICPH 2671, as estimated at Indore by Jawaharlal Nehru Krishi Viswavidyalaya, was Rs. 10.57 per kg.

In 2007, about 40,000 kg seed hybrid was produced by ICRISAT and partners. This seed will be used for extensive (8000 -10,000 ha) on-farm validation of performance in different environments and cropping systems in 2008.



Summary Performance of CMS-Based Pigeonpea Hybrid ICPH 2671

1.	Name of the crop and species	Pigeonpea or Red gram [*Cajanus cajan* (L.) Millsp]
2.	(a) Name of the variety under which tested. (b) Proposal name of variety	ICPH 2671 (Hybrid) ICPH 2671
2.	(a) Parentage with details of its pedigree. (b) Breeding method used. (c) Breeding objective.	Female Parent : ICPA 2043 (ICPA 2039 X ICPL 20176) X ICPL20176 X ICPL20176 X ICPL20176 X ICPL20176 XICPL20176 Male Parent : ICPR 2671 (ICPX 78143 (C 11X ICP 1-6)-WB-WB-WB-WB-W27-B Back crossing for developing female (A/B) parent. The hybrid was developed by crossing ICPA 2043 x ICPR 2671 Pigeonpea is an important crop of India and in spite of breeding several pure line varieties the productivity of the crop has remained stagnant over the past few decades. To break this yield barrier ICRISAT and ICAR along with its partners have developed a hybrid pigeonpea technology and produced a high-yielding hybrid ICPH 2671. This hybrid was tested in several locations in multi-location yield trials and on-farm demonstrations. The yield levels were found to be 30-40% more than check cultivar Maruti. The overall objective of this activity is to develop high-yielding, wilt and sterility mosaic resistant pigeonpea hybrid suitable for 'Maruti' growing areas.
3.	State the varieties which most closely resemble proposed variety in general characteristics.	Maruti
4.	Specific areas of its adoption.	Hybrid ICPH 2671 is adapted in the areas with light vertisols where at present cultivar Maruti is grown as pure crop or as inter crop.
5.	Recommended Ecology	Suitable for rainfed peninsular zone with shallow to medium vertisols.
6.	Description of hybrid. (a) Plant height (b) Range (c) Distinguishing morphological characteristics. (d) Maturity (range in number of days) Seeding/transplanting to flowering, seed to seed (e) Maturity group (early, medium and late – wherever such classification exists) (f) Reaction of major diseases (under field and controlled conditions). (g) Reaction to major pests (under field and controlled conditions including store pests). (h) Agronomic features (e.g. Resistance to lodging, shattering, fertilizer responsiveness, suitability for early or late sown conditions, seed rate etc.).	 221 cm 215 – 226 cm ICPH 2671 has been found **stable for its fertility restoration** at all the places where it was tested for the last three years. This hybrid is of indeterminate growth habit, with spreading branches. The flowers are yellow with dark red dense streaks. The pods are purple in color. Maturity : 180-184 days Seed to flowering: 116-120 days Medium maturity group Hybrid ICPH 2671 has recorded high level **of resistance to major pigeonpea diseases such as wilt (0%) and sterility mosaic** (8%) under severe disease pressure conditions of sick plots. Moderately susceptible to *Helicoverpa armigera* pod borer and it is similar to control Maruti. No lodging is observed in this hybrid. It is also resistant to shattering. This hybrid is suitable for *Kharif* sowings. Seed rate : 4 -6 kg ha^{-1} for intercropping and 8-10 kg ha^{-1} for pure cropping . Plant to plant spacing should be 30-50 cm. Fertilizer: 100 kg DAP ha^{-1}.

	(i) Quality of produce of grain, forage/fibre including nutritive value wherever relevant. (h) Reaction to stresses.	The size of commercial seed varies from 10.8 to 11.2 g/100 seeds and their coat color is dark brown. Dhal protein of hybrid ICPH 2671 is 24.7% and it is similar to that of cultivar Maruti. ICPH 2671 has 30% more root mass than cultivar Maruti with a deep root system which imparts drought tolerance and gives good yield under stress conditions. Experiments at ICRISAT Patancheru also revealed that ICPH 2671 can also tolerate soil salinity better than pure line cultivars.
7.	Description of parents.	Female parent (ICPA 2043) is a medium-duration wilt and sterility mosaic resistant cytoplasmic nuclear male-sterile (CMS) line derived from a wild relative of pigeonpea *C. cajanifolius* by back crossing method. Male parent (ICPR 2671) is a medium-duration wilt and sterility mosaic resistant advanced breeding line.
8.	(a) Yield data in regional / inter regional district trails year wise (levels of fertilizer application, density of plant populations and superiority over local /standard varieties to be indicated. (b) Yield data from national demonstration/large scale demonstrations. (c) Average yield under normal conditions.	ICPH 2671 was evaluated in **multi-location trials** in Maharashtra, Karnataka, and Andhra Pradesh during 2005 - 2007 (21 trials). The results showed that the **hybrid was 41.6% superior to control variety** Maruti (please see enclosed tables 1 - 4). In 2007, ICPH 2671 was evaluated in south and central zones of India under both Advance Hybrid trial (AHT 1) and Initial Hybrid Trial (IHT 1). This hybrid 31% superior in central zone while it is 62% superior in south zone over Maruti check (Table 5 a & b). In the **on-farm trials** conducted by our partners the hybrid ICPH 2671 **was 8.2 (Mahyco) to 85.7 (SFCI) % superior** to control with mean of 28.5% (please see enclosed table 6). Average yield 2860 kg ha^{-1} (table 1) Range: 2694 to 3183 kg ha^{-1} (table 1)
9.	Agency responsible for maintaining breeder seed.	ICRISAT In 2007, we grew seed production plots in a range of environments in Maharashtra and Andhra Pradesh states. The hybrid seed yield varied a lot from 150 kg ha^{-1} to 2200 kg ha^{-1} (Tables 7 a &b).
10.	Information on acceptability of variety by farmers/consumers/ industry.	Farmers, Private and Public Seed industry have taken up demonstrations and seed production program during 2007 and they are confident that ICPH 2671 will be accepted by seed growers, traders and farmers. They are happy with the yield levels in demonstration plots at different locations.
11.	Specific recommendations, if any for seed production.	Seed production of hybrid ICPH 2671 (AxR) and female parent (AxB) ICPA 2043 should be organized in isolation (500m isolation distance) using a row ratio of 4 female and 1 male. Seed on the male-sterile line is set by insects which carry pollen on their bodies. Seed of fertile line (B & R) are produced in isolation with normal practices.
12.	Cost of seed production	The cost of hybrid seed production is Rs.10.57/kg (Source:JNKVV, Indore) Table 8.
13.	Any other pertinent information.	Since pod set on the CMS plants is a result of cross-pollination by insects, its extent depends on the population of insects (particularly honey bee). Therefore, seed production areas should be selected with care and fine tuning of seed production technology with respect to row ratio and staggered sowing of male and female rows needs to be worked out.

Table 1: Summary performance of hybrid ICPH 2671 and control cultivar Maruti in different locations in 2005,2006, and 2007 seasons

Traits	2005 5 locations	2006 5 locations	2007 11 locations	Mean 21 locations	Superiority over Maruti (%)
Yield (kg ha^{-1})					
Hybrid	3183	2694	2702	2860	**41.6**
Control	1855	2066	2140	2020	
Seed size(g)					
Hybrid	11.2	10.9	10.8	10.96	
Control	10.3	10.4	10.3	10.33	
Maturity (days)					
Hybrid	181	184	180	182	
Control	178	175	174	176	
Flowering (days)					
Hybrid	120	119	116	118	
Control	123	118	115	119	
Plant height (cm)					
Hybrid	226	215	222	221	
Control	199	205	213	206	
Seeds/pod					
Hybrid	3.7	3.8	4.0	3.83	
Control	3.7	3.8	3.7	3.73	

Locations:

2005 (5) : ICRISAT, Patancheru; JK Seeds, Secunderabad; Zuari Seeds, Bangalore; Mahyco, Jalna; TNAU, Coimbatore

2006 (5): ICRISAT,Patancheru; TNAU, Coimbatore; Krishidhan, Jalna; Nimbkar Seeds, Phaltan;Nuziveedu Seeds.

2007 (11):ICRISAT, Patancheru; Bioseeds, Hyderabad; Pioneer, Aurangabad; JK Seeds, Secunderabad; Mahyco, Jalna; Nuziveedu Seeds, Secunderabad; Pravardhan Seeds, Pargi; MSSCL, Akola; Nimbkar seeds, Phaltan, Krishidhan Seeds, Jalna, Nath Seeds, Aurangabad

Table 2. Seed yield (kg ha^{-1}) and other agronomic traits of hybrid ICPH 2671 and control cultivar Maruti at five locations in multilocation trials conducted by ICRISAT in 2005

Location/ Genotype	Grain yield (kg ha^{-1})	Days to flower	Days to mature	Pl. height (cm)	Seeds pod^{-1}	100-seed mass (g)	Plants stand	% superiority over Maruti
ICRISAT, Patancheru								
ICPH 2671	2671	112	180	258	3.7	10.2	38	59
Maruti	1677	114	162	220	3.7	9.4	33	-
SEM±	207.7	1.6	3.5	6.4	0.2	0.3	2.8	-
Mean (n=14)	2142	118	183	252	3.8	9.1	36	-
CV(%)	13.7	1.9	2.7	3.6	5.8	5.0	10.8	-
JK Seeds, Medchal								
ICPH 2671	2996	120	169	208	-	10.5	40	188
Maruti	1041	126	174	200	-	10.0	33	-
SEM±	331.1	2.4	3.8	7.1	-	0.3	2.1	-
Mean (n=14)	2218	130	177	218	-	9.9	31	-
CV(%)	21.1	2.6	3.0	4.6	-	3.8	9.7	-
Zuari Seeds, Bangalore								
ICPH 2671	2571	122	180	200	-	12.0	13	74
Maruti	1476	130	180	160	-	10.2	11	-
SEM±	540.7	1.4	2.5	19.6	-	0.5	3.4	-
Mean (n=14)	2376	133	184	203	-	10.6	11.9	-
CV(%)	32.2	1.5	1.9	13.6	-	7.1	41.0	-
MAHYCO, Jalna								
ICPH 2671	3416	115	180	238	-	12.1	60	34
Maruti	2541	115	177	225	-	9.5	55	-
SEM±	-	-	-	-	-	-	-	-
Mean (n=14)	3260	119	186	230	-	11.0	55	-
CV(%)	7.3	1.8	2.6	7.1	-	5.2	8.4	-
TNAU, Coimbatore								
ICPH 2671	4262	132	195	225	-	11.2	51	68
Maruti	2538	128	195	190	-	12.3	74	-
SEM±	252.7	1.5	0.7	7.5	-	0.1	4.0	-
Mean (n=14)	2064	118	171	182	-	9.6	37	-
CV(%)	17.3	1.8	0.6	5.9	-	1.0	16	-
Mean of five locations								
ICPH 2671	**3183**	**120**	**181**	**226**	**3.7**	**11.2**	**40**	**71.6**
Maruti	**1855**	**123**	**178**	**199**	**3.7**	**10.3**	**41**	

Table 3 . Seed yield (kg ha^{-1}) and other agronomic traits of hybrid ICPH 2671 and control cultivar Maruti at five locations in multilocation trials conducted by ICRISAT in 2006

Location/ Genotype	Grain yield (kg ha^{-1})	Days to flower	Days to mature	Pl. height (cm)	Seeds pod^{-1}	100-seed mass (g)	Plants stand	% superiority over Maruti
ICRISAT, Patancheru								
ICPH 2671	2660	119	179	260	4.1	11.4	52	39
Maruti	1919	116	173	222	4.0	10.8	52	-
SEM±	140.7	0.8	1.2	7.6	0.2	0.4	2.5	-
Mean (n=14)	2631	124	182	251	3.9	11.1	48	-
CV(%)	7.6	0.9	0.9	4.3	6.9	4.6	7.4	-
TNAU, Coimbatore								
ICPH 2671	1823	134	180	208	-	8.9	16	66
Maruti	1100	128	175	206	-	7.7	20	-
SEM±	324.7	1.5	1.9	15.2	-	0.03	4.8	-
Mean (n=14)	1641	133	180	210	-	9.0	21	-
CV(%)	28.0	1.6	1.5	10.2	-	0.4	32.4	-
Krishidhan, Jalna								
ICPH 2671	1948	122	190	155	-	12	29	78
Maruti	1092	126	169	168	-	13	26	-
SEM±	91.8	2.9	1.4	10	-	0.5	1.2	-
Mean (n=14)	1270	128	188	152	-	12.7	26.7	-
CV(%)	10.2	3.2	1.0	9.3	-	5.3	6.4	-
Nimbkar Seeds, Phaltan								
ICPH 2671	3208	97		263	-	11.7	53	43
Maruti	2243	97		272	-	11.1	49	-
SEM±	0.5	1.3		5.2	-	0.3	2.6	-
Mean (n=14)	2666	96		261	-	12.0	51	-
CV(%)	19.1	1.9		2.8	-	4.1	7.2	-
Nuziveedu, Medchal								
ICPH 2671	3830	-	-	-	-	-	-	-4
Maruti	3975	-	-	-	-	-	-	-
SEM±	106.8	-	-	-	-	-	-	-
Mean (n=14)	4449	-	-	-	-	-	-	-
CV(%)	3.4	-	-	-	-	-	-	-
Mean of five locations								
ICPH 2671	**2694**	**119**	**184**	**215**	**3.8**	**10.9**	**40**	**30.4**
Maruti	**2066**	**118**	**175**	**205**	**3.8**	**10.4**	**36**	

Table 4 . Seed yield (kg ha^{-1}) and other agronomic traits of hybrid ICPH 2671 and control cultivar Maruti at 11 locations in multilocation trials conducted by ICRISAT in 2007

Location/ Genotype	Grain yield (kg ha^{-1})	Days to		Pl. height (cm)	Seeds pod^{-1}	100-seed mass (g)	Plants stand	% superiority over
		flower	mature					Maruti
ICRISAT, Patancheru								
ICPH 2671	2373	122	183	250	3.8	10.6	40	23
Maruti	1931	116	175	228	3.7	9.9	38	-
SEM±	191.8	0.6	1.0	2.5	0.1	0.2	2.8	-
Mean (n=8)	2233	123	184	244	3.8	10.3	33.8	-
CV(%)	12.1	0.6	0.8	1.4	4.3	2.5	11.8	-
Bioseeds, Hyderabad								
ICPH 2671	1862	131	188	290	-	12.2	10	-7
Maruti	1999	118	174	257	-	12.5	17	-
SEM±	309.9	1.1	2.0	15.8	-	0.7	2.6	-
Mean (n=8)	2029	132	187	281	-	11.8	13	-
CV(%)	21.6	1.2	1.5	7.9	-	8.7	29.7	-
Pioneer, Aurangabad								
ICPH 2671	5375	120	176	240	-	10.5	22.5	38
Maruti	3893	120	170	225	-	9.7	27	-
SEM±	267.8	1.4	1.0	5.7	-	0.4	0.9	-
Mean (n=8)	4956	126	178	238	-	10.7	21.6	-
CV(%)	7.6	1.6	0.8	3.4	-	5.0	5.7	-
JK Seeds, Medchal								
ICPH 2671	2030	118	175	202	-	10.5	20	14
Maruti	1774	118	176	198	-	10.5	23	-
SEM±	367.1	0.6	1.3	4.1	-	0.5	3.5	-
Mean (n=8)	1968	123	177	207	-	10.3	19	-
CV(%)	26.4	0.7	1.0	2.8	-	6.3	26	-
MAHYCO, Jalna								
ICPH 2671	2038	114	184	188	4.3	10.3	50	19
Maruti	1713	116	178	188	3.4	9.3	57	-
SEM±	206.8	2.8	4.7	5.2	0.2	0.3	2.5	-
Mean (n=8)	1640	118	182	199	3.9	10.2	52	-
CV(%)	17.8	3.4	3.6	2.6	7.5	3.8	6.9	-
Nuziveedu, Medchal								
ICPH 2671	2936	86	141	202	-	11	13	25
Maruti	2350	86	140	192	-	10	12	-
SEM±	604	0.4	1.0	6.0	-	0.3	1.8	-
Mean (n=8)	3237	89	143	201	-	10.6	13	-
CV(%)	26.4	0.6	1.0	4.3	-	4.2	18.9	-

Pravardhan Seeds, Pargi								
ICPH 2671	2253	125	170	122	-	11.3	32	70
Maruti	1328	130	160	117	-	9.9	30	-
SEM±	493.5	0.0	1.8	6.1	-	0.3	6.0	-
Mean (n=8)	2472	127	179	138	-	11.5	26	-
CV(%)	28.2	0.0	1.4	6.2	-	3.5	32.5	-
MSSCL, Akola								
ICPH 2671	2489	142	198	184	-	9.8	16	60
Maruti	1557	146	202	172	-	9.1	15	-
SEM±	288.8	1.4	2.0	7.8	-	0.3	0.7	-
Mean (n=8)	1936	144	198	181	-	9.2	14.9	-
CV(%)	21.1	1.4	1.4	6.1	-	4.2	6.2	-
Nimbkar Seeds, Phaltan								
ICPH 2671	3439	86	192	276	-	12	33.5	28
Maruti	2694	82	178	277	-	12	36.5	-
SEM±	281.1	0.7	0.7	2.3	-	0.5	5.9	-
Mean (n=8)	3289	89	177	256	-	12.1	37.1	-
CV(%)	12.1	1.1	0.6	1.2	-	6.2	22.4	-
Krishidhan Seeds, Jalna								
ICPH 2671	1633	120	196	236	-	11.5	30	11
Maruti	1467	124	188	236	-	11.2	37	-
SEM±	94.6	0.7	2.7	4.6	-	0.6	4.6	-
Mean (n=8)	1571	126	196	233	-	10.9	36	-
CV(%)	8.5	0.8	2.0	2.8	-	7.1	17.8	-
Nath Seeds, Aurangabad								
ICPH 2671	3292	116	173	252	4.0	9.4	33	16
Maruti	2834	114	170	258	4.0	9.7	44.5	-
SEM±	344.3	1.8	1.7	11.9	0.2	0.5	3.2	-
Mean (n=8)	2656	123	173	263	3.4	10.0	40	-
CV(%)	18.3	2.0	1.4	6.4	9.5	7.1	11.5	-
Mean of 11 locations								
ICPH 2671	**2702**	**116**	**180**	**222**	**4.0**	**10.8**	**27**	**26.3**
Maruti	**2140**	**115**	**174**	**213**	**3.7**	**10.3**	**31**	

Table 5a. Grain yield (kg ha^{-1}) of pigeonpea hybrid ICPH 2671 in Central zone in All India Coordinated trials 2007

Genotype	SDAU, SK Nagar	MPKV, Rahuri	ZARS, Khargone	Mean	% superiority over
Advance Hybrid Trial (AHT)					
ICPH 2671	2937	2590	3029	2852	-
Maruti (C)	2169	2660	2180	2336	22
Asha (C)	1833	2833	1764	2143	33
BSMR 736 (C)	2534	3611	2176	2773	3
Co 6 (C)	2944	3254	2125	2774	3
Initial Hybrid Trial (IHT)					
ICPH 2671	2934	2368	1527	2276	-
Maruti (C)	1493	2872	354	1573	45
Asha (C)	1931	2268	1550	1916	19
BSMR 736 (C)	1760	1604	1533	1632	39
Co 6 (C)	2546	2299	1081	1975	15
Mean of AHT & IHT					
ICPH 2671	2936	2479	2278	2564	-
Maruti (C)	1831	2766	1267	1955	31
Asha (C)	1882	2551	1855	1996	28
BSMR 736 (C)	2147	2608	1649	2135	20
Co 6 (C)	2745	2777	1603	2375	8

Table 5b. Grain yield (kg ha^{-1}) of pigeonpea hybrid ICPH 2671 in south zone in All India Coordinated trials 2007

Genotype	Coimbatore	Warangal	Patancheru	Mean	% superiority over
Advance Hybrid Trial (AHT)					
ICPH 2671	1028	3583	1770	2127	-
Maruti (C)	823	1549	1707	1360	56
Asha (C)	1240	2134	1803	1726	23
BSMR 736 (C)	1276	1968	2174	1806	18
Initial Hybrid Trial (IHT)					
ICPH 2671	1161	3620	3194	2658	-
Maruti (C)	1229	1608	1923	1587	68
Asha (C)	522	2425	2213	1720	55
BSMR 736 (C)	1090	2075	2430	1865	43
Co 6 (C)	1011	1520	1954	1495	78
Mean of AHT & IHT					
ICPH 2671	1095	3602	2482	2393	-
Maruti (C)	1026	1579	1815	1474	62
Asha (C)	881	2280	2008	1723	39
BSMR 736 (C)	1183	2022	2302	1836	30

Table 6. On-farm demonstrations of ICPH 2671 at various locations in India, 2007

S.No.	Location	Number of trials	ICPH 2671		Maruti		% increase over Maruti
			Area (ha)	kg ha^{-1}	Area (ha)	kg ha^{-1}	
	Pure Crop:						
1	Pradham Bio-tech, Karnataka	1	0.2	1200	0.2	700	71.40
2	SFCI,BV Nagar, Nandyal	1	1.2	2500	0.4	1875	33.33
3	SFCI,Jawalgera, Raichur	1	0.5	650	0.5	350	85.70
4	Mahyco, Maharastra	13	0.4 each	1820	0.4 each	1588	14.61
5	Mahyco, Karnataka	6	0.4 each	1700	0.4 each	1570	8.28
6	Mahyco. Andhra Pradesh	5	0.4 each	2020	0.4 each	1710	18.12
7	Mahyco, Madhya Pradesh	2	0.4 each	2588	0.4 each	1925	34.40
		Mean		1783		1388	28.45

Table 7a. Record of hybrid ICPH 2671 (AxR) seed production in high-yielding locations during 2007

SNo.	State	District	Location	Area (ha)	Seed yield (kg)	Productivity kg ha^{-1}
1	Andhra Pradesh	Ranga Reddy	Shadnagar	1.6	1400	875
2	Andhra Pradesh	Nandyal	Gadivemula, Nandyal	1.6	1000	625
3	Andhra Pradesh	Kurnool	Alamur, Nandyal	1.6	1000	625
4	Andhra Pradesh	Kurnool	MK Puram, Nandyal	1.2	1000	833
5	Andhra Pradesh	Warangal	Manapur, Ghanapur	1.2	1275	1063
6	Andhra Pradesh	Nandyal	Yallur	1	1000	1000
7	Andhra Pradesh	Medak	ICRISAT, Patancheru	0.4	500	1250
8	Andhra Pradesh	Ranga Reddy	Medchal	0.4	500	1250
9	Andhra Pradesh	West Godavari	Eluru-1	1.2	750	625
10	Andhra Pradesh	West Godavari	Eluru-2	1.2	750	625
11	Andhra Pradesh	West Godavari	Eluru-3	1.6	1146	716
12	Andhra Pradesh	Nizambad	Renjal	0.4	700	1750
13	Andhra Pradesh	Ranga Reddy	Manoharabad	0.68	856	1258
14	Madhya Pradesh	Indore	Indore	0.15	340	2267
15	Gujarat	Ahmedabad	Ahmedabad	0.8	850	1063

Table 7b. Record of hybrid ICPH 2671 (AxR) seed production in low-yielding locations during 2007

SNo.	State	District	Location	Area (ha)	Seed yield (kg)	Productivity kg ha^{-1}
1	Andhra Pradesh	Anantapur	Gooty	1.2	200	167
2	Andhra Pradesh	Mahbubnagar	CS Nagar	1.4	190	136
3	Andhra Pradesh	Mahbubnagar	Dharmavaram	1.6	350	219
4	Andhra Pradesh	Kurnool	Peddatekur	1.2	290	242
5	Andhra Pradesh	Nandyal	Loc-1	0.6	80	133
6	Andhra Pradesh	Nandyal	Loc-2	0.8	200	250
7	Andhra Pradesh	Nandyal	Loc-3	0.6	100	167
8	Andhra Pradesh	Hyderabad	Veerannaguda	4.4	1650	375
9	Andhra Pradesh	Ranga Reddy	Pargi	9.4	2500	266
10	Karnataka	Raichur	Jawalgera	5.6	435	78
11	Karnataka	Raichur	Jawalgera	4	630	158
12	Karnataka	Raichur	Jawalgera	3.2	210	66
13	Karnataka	Raichur	Jawalgera	6.4	800	125
14	Karnataka	Raichur	Jawalgera	3.2	900	113
15	Karnataka	Raichur	Jawalgera	2.8	470	168
16	Karnataka	Yadgir	Loc-1	5.2	1300	250
17	Karnataka	Yadgir	Loc-2	5.2	2600	500
18	Maharashtra	Parbhani	MAU	0.5	250	500
19	Maharashtra	Akola	-	15.1	3825	253
20	Maharashtra	Jalna	-	20	7400	370
21	Phaltan	Phaltan	Phaltan	5.2	1000	192

Table 8**: Estimated cost (Rs/kg) of hybrid ICPH 2671 seed production at JNKVV , College of Agriculture, Indore in 2007-08**

A) Gross expenditure	**Labor used**	**Cost (Rs/ha)**
Field preparation		2000
Inputs (Fertilizer, seed treatments)		3205
Seed cost (estimated)		900
Sowing	40	3740
Weeding & Interculture	58	5423
Rouguing	20	1870
Spraying (3 insecticide sprays)	22	2057
Harvesting by picking	45	4208
Threshing	32	2992
Total	**217**	**26395**

B) Returns (Rs/ha)

Hybrid seed (estimated)	1400 kg/ha	
Pollen parent value in Rs (@ 1400/q)	800 kg/ha	11200
Value of pigeonpea stubbles (bulk sale)		400
Total		11600

C) Cost of Hybrid seed

Cost of producing (1400 kg) hybrid	26395-11600 =
Cost of one kg seed	14795/1400 = **Rs.10.57/kg**

Date of sowing : 27 June 2007
Field: medium black soil
Female: male row ratio = 4:2
Spacing : 75 x 30 cm