

KR 64 : A high yielding GMS based intra *arboreum* hybrid

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ABSTRACT: A genetic male sterility based intra *arboreum* hybrid KR 64 was developed. It out yielded the local checks for different locations in All India Coordinated Cotton Improvement Project in north zone. Adaptability to change in agronomic conditions, KR 64 gave significantly higher seed cotton yield at Faridkot, Hisar and Sriganaganagar. The row spacing of 67.5 x 60 cm gave significantly higher seed cotton yield over wider spacing whereas 100 per cent RDF gave higher yield (3859 kg/ha). However, KR 64 was found resistant to bacterial leaf blight, comparatively tolerant to Fusarium wilt, root rot and fungal foliar diseases as compared to check hybrids. It has a good yield potential (3766 kg/ha) coupled with early maturity and suitable for cotton raya/wheat cropping system.

Key words : Bacterial leaf blight, earliness, fibre quality, Fusarium wilt, *Gossypium arboreum*, irrigated conditions, north zone, resistance, seed cotton yield

Cotton is the most important commercial crop of India. It plays a significant role in economy of the country. The productivity of India is low as compared to other cotton growing nations of the world. With largest area, India ranks second in production (Anonymous, 2012). The productivity of cotton by and large fluctuates with the changing environments. In order to have consistence in yield performance of a genotype over environments, development of stable genotypes associated with high production potential appears to be obligatory which help to achieve predictable performance through wider adaptability. The diseases and insect pests also adversely affect the seed cotton yield. Hence, there was a need to increase the yield potential by developing high yielding, early maturing and disease resistant hybrids which could contributed to higher productivity under cotton raya/ wheat cropping system.

MATERIALS AND METHODS

Large numbers of crosses were attempted by using genetic male sterile line and germplasm lines. These crosses were evaluated at the Experimental Area, Research and Development Division, Shakti Vardhak Hybrid Seeds Pvt. Ltd., Hisar against released hybrids *viz.*, AAH 1,

CICR 2 and RAJDH 9 in a randomized block design with 3 replications in 2 rows of 6m, keeping rows and plants rows as 67.5 and 60cm, respectively. Yield data were statistical analysed as per Panse and Sukhatme (1987). Resulting hybrid KR 64 was developed by involving GMS 1 x SV55-2 with a view to replace the existing hybrids.

RESULTS AND DISCUSSION

On the basis of high yield potential and stable performance over environments in station trials, KR 64 was sponsored for testing in preliminary *arboreum* hybrid trial (Br 25) under All India Coordinated Cotton Improvement Project. It out yielded zonal and local check hybrids in national trial during 2003-2004 and promoted in combined *arboreum* hybrid trial of north zone. KR 64 has been tested against zonal check AAH 1 and local check hybrids *viz.*, CICR 2, RAJDH 9, Moti and a variety check HD 324 in AICCIP trials from 2003-2004 to 2007-2008. The hybrid recorded highest seed cotton yield 1967 kg/ha in 2003-2004, 2411 kg/ha in 2005-2006, 1758 kg/ha in 2006-2007 and 3075 kg/ha in 2007-2008 and ranked 1st, 3rd, 4th and 2nd, respectively as compared to zonal check hybrid 1765 kg/ha in 2003-2004, 2204 kg/ha in 2005-2006, 1690 kg/ha in 2006-2007 and 2464 kg/ha

Table 1: Performance of KR 64 *vis-a-vis* zonal and local check hybrids under AICCIP trials in north zone

Year	Location	Seed cotton yield (kg/ha)					P=0.05	
		Test hybrid KR 64	Zonal check AAH 1	Local checks				
				HD 324	CICR 2	RAJDH 9		Moti
2003-2004	Ludhiana	1481	1173	-	-	-	1150	150
	Faridkot	1783	2275	-	-	-	1095	205
	Hisar	2593	1760	247	-	-	-	333
	Sirsa	2028	1889	-	1083	-	-	458
	Aryanagar (Hisar)	3083	2583	500	-	-	-	225
	Kanpur	833	909	-	-	-	-	237
	Mean	1967(1)	1765(4)	-	-	-	-	-
2005-2006	Ludhiana	936	886	-	-	-	1821	172
	Faridkot	1591	2565	-	-	-	2093	303
	Bhatinda	3519	3395	-	-	-	2519	365
	Hisar	2624	1451	1497	-	-	-	209
	Sirsa	1943	1464	-	1307	-	-	248
	Sriganganagar	3225	3194	-	-	3094	-	419
	Fazilka	2474	1987	-	-	-	1455	532
	Aryanagar (Hisar)	2979	2693	1333	-	-	-	202
Mean	2411(3)	2204(6)	-	-	-	-	-	
2006-2007	Ludhiana	1732	1645	-	-	-	1944	254
	Faridkot	2195	1730	-	-	-	2686	381
	Bhatinda	2284	2772	-	-	-	2772	791
	Hisar	1111	844	658	-	-	-	122
	Sirsa	1764	1507	-	1875	-	-	184
	Sriganganagar	2538	2514	-	-	2012	-	458
	12z	683	815	-	-	-	683	94
	Mean	1758(4)	1690(6)	-	-	-	-	-
2007-2008	Ludhiana	1845	1716	-	-	-	2232	438
	Faridkot	3669	2906	-	-	-	-	277
	Hisar	3766	2243	2963	-	-	-	195
	Sirsa	2675	2675	1770	-	-	-	-
	Sriganganagar	3418	2782	-	-	2444	-	545
	Mean	3075(2)	2464(6)	-	-	-	-	-
	Overall mean	2303	2031	-	-	-	-	-
	Mean location(10)	2457	1911	-	-	-	-	-
	Mean location(7)	2690	-	1281	-	-	-	-
	Mean location(3)	1912	-	-	1422	-	-	-
	Mean location(3)	3060	-	-	-	2517	-	-
Mean location(11)	1866	-	-	-	-	1859	-	
Per cent increase over in zone		13.39	-	-	-	-	-	
Per cent increase over in states HR/RJ/PB		28.57	109.99	34.46	21.57	0.38	-	

Figures in parenthesis represent the ranking of hybrid in the zone

in 2007-2008 ranked 4th, 6th, 6th and 6th, respectively. It out yielded 2303 kg/ha against 2031 kg/ha of zonal check hybrid AAH 1 by 13.39 per cent and local checks (different for different locations) by 34.05 per cent in All India Coordinated Cotton Improvement Project north zone, whereas mean seed cotton yield recorded

2457 kg/ha against 1911 kg/ha of AAH 1 by 28.57 per cent, 2690 kg/ha against 1281 kg/ha of HD 324 by 109.99 per cent, 1912 kg/ha against 1422 kg/ha of CICR 2 by 34.46 per cent, 3060 kg/ha against 2517 kg/ha of RAJDH 9 by 21.57 per cent and 1866 kg/ha against 1859 kg/ha of Moti by 0.38 per cent in Haryana, Rajasthan and Punjab

Table 2. Performance of KR 64 *vis-a-vis* zonal and local check hybrids under AICCIP trials in north zone

Year	Location	Lint yield (kg/ha)						P=0.05
		Test hybrid KR 64	Zonal check AAH 1	Local checks				
				HD 324	CICR 2	RAJDH 9	Moti	
2003-2004	Ludhiana	550	414	-	-	-	446	-
	Faridkot	694	868	-	-	-	455	-
	Hisar	1062	685	150	-	-	-	-
	Sirsa	604	608	-	317	-	-	-
	Aryanagar (Hisar)	1247	993	133	-	-	-	-
	Kanpur	-	-	-	-	-	-	-
	Mean	831(1)	714(6)	-	-	-	-	-
2005-2006	Ludhiana	352	317	-	-	-	658	63
	Faridkot	537	923	-	-	-	735	117
	Bhatinda	1333	1251	-	-	-	903	118
	Hisar	1085	585	623	-	-	-	83
	Sirsa	762	517	-	501	-	-	-
	Sriganganagar	1262	1240	-	-	1235	-	167
	Fazilka	965	769	-	-	-	558	197
	Aryanagar (Hisar)	1202	998	530	-	-	-	-
Mean	937(2)	825(6)	-	-	-	-	-	
2006-2007	Ludhiana	655	572	-	-	-	732	102
	Faridkot	887	623	-	-	-	984	152
	Bhatinda	871	1005	-	-	-	1016	320
	Hisar	468	333	301	-	-	-	-
	Sirsa	745	582	-	741	-	-	-
	Sriganganagar	891	867	-	-	672	-	-
	12z	260	313	-	-	-	265	39
	Mean	683(3)	614(7)	-	-	-	-	-
2007-2008	Ludhiana	709	589	-	-	-	857	162
	Faridkot	1369	995	-	-	-	-	115
	Hisar	1560	774	1252	-	-	-	76
	Sirsa	960	907	704	-	-	-	-
	Sriganganagar	1251	996	-	-	929	-	-
	Mean	1170(2)	852(8)	-	-	-	-	-
	Overall mean	905	751	-	-	-	-	-
	Mean location(10)	970	698	-	-	-	-	-
	Mean location(7)	1083	-	528	-	-	-	-
	Mean location(3)	704	-	-	520	-	-	-
	Mean location(3)	1135	-	-	-	945	-	-
	Mean location(11)	711	-	-	-	-	691	-
	Per cent increase over in zone		20.51	-	-	-	-	-
Per cent increase over in states HR/RJ/PB		38.96	105.11	35.38	20.10	2.89	-	

Figures in parenthesis represent the ranking of hybrid in the zone

states, respectively under All India Coordinated Cotton Improvement Project trials (Table 1).

Similarly, KR 64 recorded highest lint yield 831 kg/ha in 2003-2004, 937 kg/ha in 2005-2006, 683 kg/ha in 2006-2007 and 1170 kg/ha in 2007-2008 ranked 1st, 2nd, 3rd, and 2nd, respectively against zonal check hybrid 714 kg/

ha in 2003-2004, 825 kg/ha in 2005-2006, 614 kg/ha in 2006-2007 and 852 kg/ha in 2007-2008 ranked 6th, 6th, 7th and 8th, respectively. It out yielded 905 kg/ha against 751 kg/ha of zonal check hybrid AAH 1 by 20.51 per cent and local check hybrids (different for different locations) by 37.75 per cent in north zone, whereas mean

lint yield recorded 970 kg/ha against 698 kg/ha of AAH 1 by 38.96 per cent, 1083 kg/ha against 528 kg/ha of HD 324 by 105.11 per cent, 704 kg/ha against 520 kg/ha of CICR 2 by 35.38 per cent, 1135 kg/ha against 945 kg/ha of RAJDH 9 by 20.10 per cent and 711 kg/ha against 691 kg/ha of Moti by 2.89 per cent in Haryana, Rajasthan and Punjab states, respectively under All India Coordinated Cotton Improvement Project trials (Table 2).

The ginning outturn KR 64 has been shown against local and zonal check (Table 3).

Among GMS based hybrids, KR 64 adjudged superior to check hybrids in national and zonal trials of All India Coordinated Cotton Improvement Project. On the basis of its superiority, it was recommended to agronomical trials (Anonymous, 2008). Adaptability to change in agronomic conditions, Intra *arboreum* hybrid KR 64 gave significantly higher seed cotton yield at all the 3 locations and per cent increase was 9.60, 32.40 and 19.50 at Faridkot, Hisar and Sriganaganagar, respectively over CICR 2. The row spacing of 67.5 x 60cm gave significantly higher seed cotton yield over wider spacing at

Table 3. Ginning outturn of KR 64 *vis-a-vis* zonal and local check hybrids under AICCP trials in Haryana state

Year	Location	Ginning outturn (%)			
		KR 64	AAH 1	HD 324	CICR 2
2003-	Hisar	41.0	39.0	37.1	-
2004	Sirsa	-	-	-	-
	Aryanagar (Hisar)	40.4	38.4	26.6	-
2005-	Hisar	41.4	40.4	41.6	-
2006	Sirsa	39.2	35.3	-	38.4
	Aryanagar (Hisar)	40.3	37.1	39.7	-
2006-	Hisar	42.1	39.4	45.7	-
2007	Sirsa	42.2	38.6	-	39.5
2007-	Hisar	41.4	34.5	42.3	-
2008	Sirsa	35.9	33.9	39.8	-
	Mean location (10)	40.4	37.4	-	-
	Mean location (7)	40.4	-	38.9	-
	Mean location (3)	40.7	-	-	39.2
	Per cent increase over	-	8.82	4.63	3.83
	Farmers fields trials (15)	-	-	-	-
	Farmers fields trials (7)	-	-	-	-
	Per cent increase over	-	-	-	-

Hisar, but at Faridkot and Sriganaganagar all the spacings were at par. Among the fertilizer doses 100 per cent RDF gave higher seed cotton yield

Table 4. Adaptability to change in agronomic conditions under AICCP trial 2008-2009

Treatments	Faridkot			Hisar			Gananagar		
	Seed cotton yield (kg/ha)	Bolls/plant	Boll weight (g)	Seed cotton yield (kg/ha)	Bolls/plant	Boll weight (g)	Seed cotton yield (kg/ha)	Bolls/plant	Boll weight (g)
Arboreum hybrid									
KR 64	3868	73	2.85	2860	51	2.60	3989	146	2.55
CICR 2	3529	63	2.53	2160	34	3.00	3338	137	2.37
P=0.05	313	8.5	0.21	500	4.6	NS	529	8.39	0.17
Row spacing (cm)									
67.5 x 60	3931	63	2.66	2990	41	3.00	4137	143	2.47
67.5 x 75	3466	73	2.73	-	-	-	-	-	-
100 x 45	-	-	-	2030	44	2.80	-	-	-
108 x 45	-	-	-	-	-	-	4004	147	2.59
108 x 60	-	-	-	-	-	-	3826	148	2.60
P=0.05	NS	7.2	0.06	520	2.4	NS	NS	NS	NS
Fertilizer levels (%)									
75 RDF	3536	68	2.62	2130	43	2.50	3627	141	2.50
100 RDF	3859	66	2.71	2670	43	3.00	4091	147	2.57
125 RDF	3700	70	2.75	2730	41	3.10	4249	149	2.59
P=0.05	NS	NS	0.06	410	NS	0.40	306	4.85	NS
Per cent increase over check	9.60	-	-	32.40	-	-	19.50	-	-

Table 5. Reaction to insect pests of KR 64 *vis-à-vis* zonal and local check hybrids under AICCIP trials

Year	Location	Jassid			Whitefly/3leaves			Bollworm infestation (%)					
								Locule basis			Boll basis		
		KR 64	AAH 1	LC	KR 64	AAH 1	LC	KR 64	AAH 1	LC	KR 64	AAH 1	LC
2005-2006	All north zone	T	T	T	-	-	-	-	-	-	-	-	-
2006-	Faridkot	0.70	0.50	0.70	0.80	0.90	0.80	7.45	9.72	13.34	-	-	-
2007	Ludhiana	1.30	1.20	2.30	7.20	5.00	7.00	17.40	24.30	27.50	-	-	-
	Sriganganagar	-	-	-	-	-	-	13.86	20.66	18.95	-	-	-
	Mean	1.00	0.85	1.50	4.00	2.95	3.90	12.90	18.20	19.90	-	-	-
2007-	Faridkot	0.30	0.30	0.30	4.00	4.80	4.00	-	-	-	-	-	-
2008	Hisar	0.50	0.40	0.80	1.70	2.60	3.90	6.20	7.30	7.60	14.70	18.10	16.00
	Sirsa	0.20	0.20	0.20	0.70	0.40	0.20	8.30	2.40	2.80	00.70	0.40	00.20
	Sriganganagar	-	-	-	-	-	-	12.50	11.42	9.57	26.71	31.18	15.15
	Mean	0.33	0.30	0.43	2.13	2.60	2.70	9.00	7.00	6.70	14.04	16.56	10.45
	Overall mean	0.66	0.58	0.96	3.05	2.77	3.30	10.95	12.60	13.30	14.04	16.56	10.45

3859 kg/ha at Faridkot whereas, 125 per cent RDF gave higher seed cotton yield 2730 kg/ha and 4249 kg/ha at Hisar and Sriganganagar, respectively. However difference in yield was non significant at Faridkot. It is suitable for cotton-raya/ wheat cropping system due to its earliness

and normal as well late planting under irrigated conditions of Haryana and Rajasthan (Table 4).

For reaction to major diseases hybrid KR 64 was found resistant to bacterial leaf blight disease and comparatively tolerant to Fusarium wilt, fungal foliar leaf spot diseases and root rot

Table 6. Fibre quality characters of KR 64 *vis-à-vis* zonal and local check hybrids under AICCIP trials

Year	Location	2.5 per cent span length (mm)			Micronaire value			Strength (g/tex)		
		KR 64	AAH 1	LC	KR 64	AAH 1	LC	KR 64	AAH 1	LC
2003-	Ludhiana	19.3	21.3	19.0	6.8	6.7	-	15.9	17.9	16.9
2004	Hisar	17.7	19.2	17.5	-	7.0	-	16.0	17.8	14.7
	Mean	18.5	20.2	18.2	6.8	6.8	-	16.6	17.8	15.8
2005-	Ludhiana	-	-	20.2	-	-	6.0	-	-	14.1
2006	Faridkot	18.6	19.2	19.2	7.0	7.0	6.8	13.3	13.6	15.9
	Hisar	17.6	19.4	18.1	8.4	7.2	8.2	14.4	15.1	14.8
	Sirsa	18.1	21.5	19.0	8.1	8.1	8.2	15.1	16.8	15.9
	Sriganganagar	17.9	20.8	20.4	8.0	7.5	7.4	14.4	17.2	17.7
	Fazilka	18.3	19.4	19.3	6.8	6.8	6.8	19.5	19.9	21.1
	Aryanagar(Hisar)	17.7	19.9	17.7	7.7	6.8	8.4	14.6	17.8	14.5
	Mean	18.0	20.0	19.1	7.7	7.2	7.4	15.2	16.7	16.3
2006-	Ludhiana	19.5	20.1	21.6	7.0	7.0	7.0	15.3	16.4	17.8
2007	Faridkot	16.4	17.7	17.1	7.0	7.0	7.0	10.3	11.7	12.0
	Bhatinda	18.3	18.6	19.4	7.0	7.0	7.0	13.9	14.1	13.7
	Hisar	18.0	19.2	18.8	7.0	7.0	7.0	13.8	14.1	13.7
	Sirsa	19.7	19.0	17.8	6.9	7.0	6.9	16.5	17.2	17.8
	Sriganganagar	-	20.1	21.4	-	6.8	6.7	-	14.6	17.4
	Mean	18.4	17.9	19.4	7.0	7.0	6.9	14.0	14.7	15.4
2007-	Ludhiana	19.6	21.2	21.8	7.0	7.0	7.0	16.6	17.5	16.9
2008	Faridkot	19.2	20.6	-	7.0	7.0	-	17.4	17.0	-
	Hisar	16.6	19.2	18.6	7.3	6.6	7.2	14.9	16.2	15.7
	Sirsa	19.1	20.7	17.1	7.0	7.0	7.0	17.2	17.2	14.5
	Sriganganagar	18.3	19.5	19.0	7.0	6.7	6.5	15.0	15.4	16.9
	Mean	18.6	20.2	19.1	7.1	6.9	6.9	16.2	16.7	16.0
	Overall mean	18.4	19.4	18.8	7.2	7.0	7.1	15.3	16.3	15.7

as compared to check hybrids. Insect pest reaction showed tolerant to jassid and bollworm and per cent infestation was less than local check hybrids (Table 5).

KR 64 has a plant height ranging from 180-200cm. Plant is erect and spreading with narrow lobed digitate leaves, white coloured petals with dark red spots at the base and yellow coloured pollen. Boll size is medium with 3-4 locules, ovate shape, pitted surface and pointed tips. Boll weight varied from 2.4 to 3.0g. It takes 50-60 days from seeding to flowering and 150-160 days from seeding to maturity. Ginning outturn is 40.4 per cent with fuzzy seed and white fibre colour. Fibre properties were *at par* with check hybrids compiled over years. It has short 2.5 per cent span length (16.4-19.7mm), micronaire (6.8-8.4 μ /inch) and fibre strength (13.3-19.5g/tax) (Table 6).

In view of its high yield potential 3766 kg/ha coupled with stable performance, early maturity, insect pest disease tolerant and *at par* fibre quality with its desirable features, State Seed Sub-Committee, Haryana recommended for release and notification to the Central Seed Sub Committee, Ministry of Agriculture and

Cooperation, Government of India, New Delhi on 15.07.2011 vide Proceeding No.2296-2305/TAS Dated 06.09.2011 and notified by the Ministry of Agriculture and Cooperation, New Delhi on 01.02.2013 vide Gazette of India No. 290.

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REFERENCES

- Anonymous, 2008.** "Annual Report". All India Coordinated Cotton Improvement Project. CICR, Coimbatore.
- Anonymous, 2012.** "Annual Report". All India Coordinated Cotton Improvement Project. CICR, Coimbatore.
- Panse, V.G. and Sukhatme, P.V. 1987.** Statistical Methods for Agricultural Workers ICAR Publication, New Delhi.

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