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Research Article

SVPR 4 – A high yielding superior medium staple cotton variety for summer irrigated/rice fallow tracts of Tamil Nadu

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Abstract
SVPR 4 is a high yielding cotton variety developed by Cotton Research Station, Srivilliputtur. It was released in the year of 2009 for summer irrigated/ Rice fallow tracts of Tamil Nadu. It is a hybrid derivative between MCU 5 and S 4727. SVPR 4 cotton is robust in nature with determinant growth habit and maturing in 150 days. It has recorded a mean seed cotton yield of 1585 kg/ha which is 13.0 % increase over SVPR 2. Its fibre qualities are comparably superior to SVPR 2 with 27.9 mm span length and 22.5 g/tex strength. The cotton SVPR 4 can able to spin 40's counts which is the current demand of the textile Industries. It is moderately resistant to leaf hopper and highly tolerant to drought in summer irrigated season. Hence, SVPR 4 cotton was released as an alternative variety of SVPR 2 for summer irrigated and SVPR 3 for rice fallow tracts of Tamil Nadu.

Key words: Cotton variety, medium staple, rice fallow

Introduction

In Tamil Nadu cotton consumption is increasing day by day, beyond 90 lakhs bales per annum and our production is remains static, *i.e* 5 lakhs bales/annum. The area of cotton is declining from 2.5 lakhs ha to 0.87 lakh ha in the current year 2009 - 2010. Even though many Bt cotton hybrids were released, they could not meet the current requirement of Tamil Nadu. It needs location specific varieties for different situations. In Tamil Nadu, Cotton is being grown in different situations namely, winter irrigated, summer irrigated, rice fallow and winter rainfed season and none of the hybrid was found to adopt in all the seasons. Similarly in summer irrigated /rice fallow conditions, no stable hybrid was found to be suitable for cultivation. The location specific varieties suitable for this situation are SVPR 2 for summer irrigated and SVPR 3 for rice fallow cultivation. Since the recent requirement of textile industries is towards 40's counts the existing varieties could not match the requirements. Hence to overcome the above situation attempts were made to develop a high yielding cotton variety with recent CIRCOT quality norms. It has resulted in the release of SVPR 4 cotton variety.

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Materials and Methods

In the resistance breeding project, long staple cotton variety MCU 5 was taken as base parent and crossed with multiple resistant donor S 4727 during 1997. Pedigree method of selection was followed from F_2 to F_5 generations under unprotected condition for screening against leaf hopper. A superior segregant with resistance to leaf hopper and drought was isolated in F_2 population and was further evaluated upto F_5 generation to reach homozygosity. Based on the consistent performance in station yield trials (Table 1), the cotton culture TSH 9704 was selected for large scale testing and forwarded to multi location trials for testing in three research station of TNAU during summer 2003. The performance of the culture TSH 9704 was evaluated in coordinated varietal trials of AICCIP (South Zone) from 2002 to 2004. Adoptive Research Trials (ART) were also conducted

over 69 locations during 2005 to 2007 under summer irrigated/rice fallow conditions.

Results and Discussion

The culture TSH 9704 was tested at Cotton Research Station, Srivilliputtur from the year 2000 to 2008. The mean of ten yield trials conducted over eight years indicated consistent superiority of the culture over the standard check SVPR 2. It has recorded an average seed cotton yield of 2080 kg/ha as against 1657 kg/ha for SVPR 2, accounting 31.0% increase over check SVPR 2 (Table 1). In All India Co-ordinated Cotton Improvement Project (AICCIP) trials, the culture TSH 9704 was tested in Br. 02 (a) during 2002 and in Br. 03 (a) and Br. 04 (c) 1 during 2003. TSH 9704 has established its superiority over LRA 5166, SVPR 3 (ZC) and local check SVPR 2 by recording 10.1 % increased over SVPR 2 and 17.1 % increased over SVPR 3 respectively (Table 2).

During summer 2003, TSH 9704 was tested in three TNAU research station trials (MLT) in which TSH 9704 registered an average seed cotton yield of 1932 kg/ha over the check SVPR 2 (1677 kg/ha). The yield increase of TSH 9704 was 15.2 % over SVPR 2 (Table 3). In Adaptive Research Trials at 20 locations conducted during summer 2005 revealed that the culture TSH 9704 recorded its superiority over SVPR 2 with an yield increase of 5 % under summer conditions. Similarly in the adaptive research trials at 49 locations, conducted during summer 2006 revealed that the culture TSH 9704 was found to be superior than SVPR 2 with yield increase of 10.1 percent (Table 4).

Besides its high yield TSH 9704 possess higher lint yield (573 kg/ha) than SVPR 2 (504 kg/ha). TSH 9704 is a superior medium staple cotton with an average 2.5 % span length of 27.9 mm, fibre strength of 22.5 g/tex in 1/8 gauge and micronaire value of 4.2. The fibre properties of TSH 9704 match the recent CIRCOT norms and can spin 40s counts (Table5a & b). TSH 9704 is moderately resistant to leaf hopper and tolerant to drought and high night temperature prevailing in summer season. Hence the culture TSH 9704 is suitable for Adaptable Srivilliputtur IPM Module under summer condition (Table 6).

An overall analysis revealed that the cotton culture TSH 9704 was superior over SVPR 2 with an average seed cotton yield of 1583 kg/ha against 1402 kg/ha of SVPR 2. The yield increase of TSH 9704 is 13.0 % over SVPR 2 (Table 7). It has recorded the maximum yield potential of 3772 kg kapas per hectare at LAM Farm, Guntur in the National trial of AICCIP. Based on the above desirable features the cotton culture TSH 9704 was released as SVPR 4 cotton by the Tamil Nadu Agricultural University, Coimbatore during 2009 for the summer irrigated/ rice fallow tracts of Tamil Nadu.

Morphological descriptions of TSH 9704

Two distinguishing morphological features

- Stem is slightly pubescent, pigmented with purple colour when exposed to sunlight, as in MCU5.
- Cream petal with yellow pollen

The other morphological characters are

Plant height	:	100 – 120 cm
Distinguishing morphological characters (as in Crop Production Guide)	:	
Growth habit and plant type	:	Plant is erect, tall with determinate growth habit.
No. of monopodia		1- 2
Leaves and petiole	:	Leaves are broad, palmate lobed, green with purple pigmentation on the leaf petiole.
Stem	:	Stem is slightly pubescent, pigmented with purple colour when exposed to sunlight, as in MCU 5
Petal colour	:	Cream
Anther colour	:	Yellow
Petal spot	:	Absent
Boll	:	Medium, oblong with pointed tip
Epicalyx	:	Bract is pigmented with purple colour when exposed to sunlight
Boll weight	:	3.6 g
No. of locules per boll	:	3 – 4
Seeds	:	Fuzzy
Seed index	:	8.4 g
Lint index	:	4.8 g
Lint Colour	:	White

Table.1 Performance of TSH 9704 at Cotton Research Station, Srivilliputtur (2000-08)

S. No	Name of the Trial	Year	Kapas Yield (Kg/ha)			% increase over SVPR 2	% increase over SVPR 3
			TSH 9704	SVPR 2	SVPR 3		
1.	PRYT	Summer 2000	2056	1900	--	8.2	
2.	PST	Summer 2001	1711	1525	1550	12.2	10.4
3.	MST	Summer 2002	2534	1508	1657	68.0	52.9
4.	MST	Summer 2003	2422	1893	1827	27.9	32.6
5.	MST	Summer 2004	1881	1530	1437	22.9	30.9
6.	AVT	Summer 2005	2081	1630	1580	27.6	31.7
7.	AVT	Winter 2005	2240	1960	1900	14.3	17.9
8.	AVT	Summer 2006	2264	1398	1708	62.0	32.6
9.	AVT	Summer 2007	2000	1410	1355	41.8	47.6
10	AVT	Summer 2008	2509	1811	1805	38.5	39.0
	Over all mean		**2080**	**1657**	**1646**	**31.0**	**31.8**

PRYT- Preliminary Row Yield Trial ; PST - Preliminary Strain Trial
MST - Main Strain Trial ; AVT - Advanced Varietal Trial

Table 2 Performance of TSH 9704 in All India Co-ordinate Cotton Improvement Project trials

S.N	Name of the trial / location	Seed Cotton yield (kg/ha)			
		TSH 9704	Local check (SVPR 2)	Zonal check (LRA 5166)	% increase over local check
	AICCIP – South zone trials (winter 2002 - Br 02 (a))				
1.	Arabhavi	997	1148	989	--
2.	Siruguppa	2344	2533	2293	--
3.	Raichur	1176	738	1136	59.4
4.	Lam - Guntur	3772	2419	3844	55.9
5.	Adilabad *	573	295	555	94.3
6.	Srivilliputtur	2703	1974	1376	36.9
7.	Coimbatore	1203	2270	2016	--
	Mean	**2033**	**1847**	**1942**	**10.1**
AICCIP – Rice fallow cotton trial (Summer 2003)			**Zonal check (SVPR 3)**	% OVER SVPR 3	
1.	Srivilliputtur	2450	459	2222	33.77
2.	Aduthurai	1296	1018	1157	27.30
3.	Karaikal	2240	2460	2260	--
4.	Rahuri	1200	1280	1174	
	Mean	**1995**	**1312**	**1703**	**17.1**

Table.3 MLT.I. Performance of TSH 9704 in Research Stations Trials of TNAU, conducted during summer 2003

S. No.	Entry	Boll Number	Boll weight (g)	Duration (days)	Cotton Research Station, **Srivilliputtur**	Tamil Nadu Rice Research Institute, **Aduthurai**	Average Seed cotton yield (kg/ha)	% increase over SVPR 2
1.	TSH 9704	35 – 40	3.6	150	2046	1818	1932	15.2
2.	SVPR 2	30 -32	4.0	165	1848	1505	1677	-

Table 4 Performance of TSH 9704 in Adaptive Research Trial conducted during summer 2005 - 2007

2005 - 2006

S.No.	District	Kapas yield (kg/ha)		% increase over
		TSH 9704	SVPR 2	SVPR 2
I	Tanjore	**1544**	**1230**	**25.5**
II	Thiruvarur	**1345**	**1227**	**9.6**
III	Madurai	**1640**	**1584**	**3.5**
IV	Tirunelveli	**1491**	**1433**	**4.0**
V	Virudhunagar	**1213**	**1323**	**-**
VI	Theni	**1188**	**1138**	**4.4**
Overall mean		**1392**	**1330**	**5.0**
TSH 9704 recorded higher yield in 14 locations out of 20 locations evaluated				

2006 - 2007

S.No.	District	Kapas yield (kg/ha)		% increase over
		TSH 9704	SVPR 2	SVPR 2
I	Tanjore	**1642**	**1218**	**34.8**
II	Trichy	**1228**	**913**	**34.5**
III	Nagapattinam	**1535**	**1821**	**-**
IV	Madurai	**1536**	**1352**	**13.6**
V	Tirunelveli	**1468**	**1484**	**--**
VI	Virudhunagar	**1531**	**1408**	**8.7**
	Theni	**1041**	**1113**	**-**
	Dindigul	**1327**	**1021**	**30.0**
	Cuddalore	**1745**	**1605**	**8.7**
	Villupuram	**1545**	**1485**	**4.1**
	Ramanathapuram	**1264**	**1240**	**2.0**
Overall mean		**1455**	**1322**	**10.1**
TSH 9704 recorded higher yield in 41 locations out of 49 locations evaluated				

Table 5 a Fibre and Spinning test of TSH 9704

S. No.	Particulars	CIRCOT, Coimbatore Summer 2005	CIRCOT, Coimbatore ART sample summer 2006	CIRCOT, Mumbai Full scale spinning test 2007-2008	CIRCOT, Coimbatore Summer 2008-09	Average
1.	2.5% span length (mm)	28.7	27.0	26.5	29.3	27.9
2.	Uniformity ratio	49	50	49.0	46.0	48.5
3.	Fineness (Micronaire value)	4.9	4.0	4.1	3.7	4.2
4.	Bundle strength (g/tex)	22.2	22.9	21.7	23.0	22.5
5.	Elongation percent	5.8	5.2	5.4	4.4	5.2
	Strength / length ratio				**0.81**	

Table: 5b Full scale spinning test report of TSH 9704 conducted at CIRCOT, Mumbai (2007-2008)

St. No.	Cd Nc variety	2.5% SL	UR	MIC	M%	Strength (3.2 g/tex)	E%	CSP
072838	TSH 9704	26.5	49	4.1	66	21.7	5.4	**2244 (40s)** 2075 (50s)
072839	SVPR 2	24.5	51	4.1	61	21.2	6.5	2109 (30s) 2052 (40s)
Minimum		24.5	49	4.1	61	21.2	5.4	
Maximum		26.5	51	4.1	66	21.7	6.5	
Average		25.5	50	4.1	64	21.5	6.0	

Standard CSP for 30 s count : 2116
Standard CSP for 40 s count : 2208
Standard CSP for 50 s count : 2300

Table 6. Reaction of TSH 9704 to leafhopper under controlled condition (Summer 2006)

Entry	Leafhopper Injury Index	Reaction
TSH 9704	2.0	MR
SVPR 2	2.0	MR

Table 7. Over all performance of COTTON TSH 9704 in different trials

S.No.	Particulars	No. of trials	Higher yield		Kapas yield		% increase over SVPR 2
			TSH 9704	SVPR 2	TSH 9704	SVPR 2	
1	Station Trial (Cotton Research Station, Srivilliputtur)	10	10	-	2170	1657	31.0
2	TNAU, Research station trials (MLT I)	2	2	-	1932	1677	15.2
3	All India Co-ordinated Cotton Improvement Project trials 2002-2003	10	6	4	1938	1630	19.0
4	Adoptive Research trials Summer 2005	20	14	6	1392	1330	5.0
5.	Adoptive Research trials Summer 2006	49	41	8	1455	1322	10.1
Over all mean		**91**	**73**	**18**	**1583**	**1402**	**13.0**