

3. Breeding for Kharif grain sorghum

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Introduction

The coordinated sorghum breeding research comprises of basic and strategic research which concentrates on development of pre-breeding material for insect and disease resistance, screening at early generation for trait of interest with multi-disciplinary approach and team work. Applied aspects deal with multi-location yield trials to evaluate finished or nearly finished products mainly at various centers of the All India Coordinated Improvement Project. Following are the details of progress made during this year (2007 to 08).

A. Sorghum breeding research

A. Sorghum breeding research

- Coordinated sorghum breeding research
- Achievements in sorghum breeding at AICSIP centers
- Achievements in sorghum breeding at NRCS
- Publications

Coordinated sorghum breeding research

Grain moulds

- Two hundred and fifteen F_{2.6} and F_{2.7} RILs of a cross 296 B x B 58586 along with four checks were phenotyped at three locations, namely, Akola, Hyderabad and Dharwad for grain mould reaction during 2006 and 2007.
- Combined analysis over 2 years and 3 locations showed that RILs are significantly different. The frequency distribution of the average data over locations and years showed normal distribution for field grade score (FGS).
- Fifteen RILs showed resistance on par with B 58586 over the years and locations. Four lines were statistically on par with resistant checks in all locations and years. These best performing lines are RIL 25, RIL 92, RIL 98 (with 4.3 FGS) and RIL 124 (4.6 FGS) against 4.0 of B 58586, resistant check.
- Twenty four derivatives (F₅) selected for grain mould tolerance during last year from F₄ (from elite x resistant sources) were evaluated at three locations in RCBD for grain mould reaction
- Out of 24 lines evaluated, 19 lines were statistically on par with B 58586. The superior lines for grain mould resistance are GMN 41 with 3.1 FGS, GMN 46 with 3.2, GMN 42 and GMN 55 with 3.3, GMN 58 with 3.4 and GMN 52 and GMN 59 with 3.5 FGS in comparison to B58586 with 3.2 FGS .

Shootfly

- Phenotyping of 432 F_{2.7} RILs from a cross, 27 B x IS 2122, along with checks was carried out at three locations, viz. Hyderabad, Akola and Udaipur for shootfly reaction during kharif 2006 and 2007.
- Twenty two RILs, six over all locations and years and other 16 over two locations and two years showed superior performance for shootfly reaction. On average, the best performing lines for shootfly reaction are SFRIL-128 and SFRIL-206 with 41% DH, SFRIL-374 and SFRIL-404 with 42% and SFRIL-342 with 46% DH against 40% DH of IS 2122.

Drought

- Eighty F₄s from crosses between elite and drought resistance sources were grown in RCBD design with two replications at Udaipur, Kovilpatti and Coimbatore during kharif 2007. Entries SPV 772 x S 35-21, SPV 772 x S 35-29, and SPV 772 x S 35-38 were showing superior performance during drought conditions in flowering and maturity phase

Agronomic traits

- Following crosses were shared among AICSIP centers and evaluated for agronomic superiority (Table A) and 120 superior selections were made over locations.

Table A. List of crosses evaluated for agronomic traits

Contributing center	F2 pedigree	Centers where F2 seed distributed							
		Udaipur	Palem	Surat	Coim	Parbhani	Akola	Dharwad	Deesa
Indore	IS 73210 x SPV 1428	v	v	v	v				
	ICSB 539 x IMS 9B			v		v	v	v	
Coimbatore	CO 25 x SPV 1644	v							
	TNS 30 x SPV 1644		v						
	APK 1 x TNS 30			v					

		Centers where F2 seed distributed					
	APK 1 x RS 673						v
	SPV 1234 x SPV 1644						v
Akola	IS 14332 x GMRP -65	v			v		v
	SVD 9601 x AKMS 14 B	v			v		
	GM 9219 x IS 14384	v					v

Achievements in sorghum breeding at AICSIP centers

- The progress reports on sorghum breeding were received from seven centers. However, we have not received reports from Mauranipur, and Palem.
- Grain mould and shootfly resistant MS lines and R lines are being developed at Akola. Also, six new MS lines are developed which are being used for developing hybrids.
- At Parbhani, 90 nos B and 78 nos R lines were evaluated and superior lines were crossed with PMS 28 B and C 43 to further improve them.
- Indore: Sixteen local germplasm lines are being maintained and evaluated. GGUB 31 had highest grain yield of 170 g. per plant followed by 123 g. per plant of GGUB 52. SV % was lowest in GGUB 52, GGUB 7 and GGUB 30. SF % was lowest in GGUB 8, GGUB 57, V-60-1, GGUB 60, GGUB 20 and GGUB 30.
- At Coimbatore, dual purpose varieties and hybrids are developed and evaluated and high yielding hybrids and varieties were identified.
- Udaipur: Twenty nine crosses in F1s were planted to raise their F2. Selections were made for early, dual purpose plant types with insect/disease resistance from progenies of 16 crosses in F2, 16 crosses in F3, 41 crosses in F4, 6 crosses in F5, 16 crosses in F6, 12 crosses in F7 and 11 crosses in F8 generation.

Achievements in sorghum breeding at NRCS

- Eighty six breeding nursery lines out of 430 were found to show less than 40% deadhearts under late sowing conditions, against those of elite lines, 27B (90% DH), and resistant check, IS 18551 (35% DH).
- 250 S₂s from B line random mating population were evaluated for GM reaction. At harvest maturity, 36 S₂s recorded an average mould rating of 2.6 on 1 - 9 scale where the susceptible check, Bulk Y recorded 8.3 and resistant check, B 58586 recorded 3.3 respectively. Mean performance of the S₂ population was reduced to 6 as against 7.9 of S₁ population.
- Eight hybrids based on A2 cytoplasm were found to be fertile. The hybrid, RS 115A2 x k101 was high yielding (95.7g/plant) and exhibited 17% higher grain yield than check hybrid, CSH 18 (82g/plant). The hybrid was tall (206 cm) and of medium maturity.
- Dual-purpose varieties: (M 11 x B 35)-1-1-2-1 was the highest yielding dual-purpose genotype with a grain yield of 2282 kg/ha and fodder yield of 133 q/ha. It recorded 19% numerical superiority for grain yield and 151% significant superiority for fodder yield over the check, SPV 1616.
- Improvement of 296B for shoot fly tolerance, and rabi cultivar M35-1 for staygreen trait were targeted through marker-assisted backcrossing using donor IS18551 (for shoot fly) and B35 (for staygreen). A total of 6 BC₂F₁s of ((296B x IS18551) x 296B) and 23 BC₂F₁s (((M35-1 x B35) x M35-1) x M35-1) were developed using 296B and M35-1 as recurrent parent.

Publications: During 2007-08, we published 14 articles in international and national journals.

B. Multi-location yield trials

Kharif

Advanced Varietal and Hybrid Trial (Tables 35-37)

- *Zone I (Table 35):* SPH 1596 out yielded the check, CSH 18. SPH 1596 yielded 4357 kg/ha against 3801 kg/ha of the check, CSH 18. None of the varieties were superior to the check, SPV 462.
- *Zone II (Table 36):* SPH 1567 out yielded all the hybrids. SPH 1567 recorded 5260 kg/ha of grain yield against 4961 kg/ha of CSH 16 (check). SPH 1567 recorded high fodder yield as compared to the check, CSH 16. Among the varieties, SPV 1786 recorded 7% higher grain yield compared to CSV 15, the check.
- *Zone III (Table 37):* Two test hybrids were numerically superior to the check, CSH 18. SPH 1596 and SPH 1587 recorded 3451 and 3248 kg/ha of grain yield as against 3001 kg/ha of CSH 18. SPH 1596 and 1587 recorded 15% and 8% increase for grain yield over CSH 18. SPV 1733 was numerically superior to the check, SPV 462.

Initial Varietal Trial (Tables 38-40)

- *Zone I (Table 38):* One variety viz. SPV 1816 was numerically superior for grain yield over the check, SPV 462. SPV 1860 yielded 6483 kg/ha of grain against 6393 kg/ha of SPV 462 (check).

- *Zone II (Table 39):* Two varieties, SPV 1816 and SPV 1808 showed 12% and 6 % superiority over the check, CSV 15. CSV 15 yielded 3820 kg/ha of grain. SPV 1821 out yielded CSV 15 for fodder yield by yielding 15057 kg/ha against 12563 kg/ha.
- *Zone III (Table 40):* None of the varieties out yielded SPV 462, the check.
Fodder yield: Most of the test varieties were superior to the check, SPV 462 for fodder yield. SPV 1821 recorded highest fodder yield of 25873 kg/ha, whereas SPV 462 (check) recorded 19491 kg/ha.

Initial Hybrid Trial (Tables 41 -43)

- *Zone I (Table 41):* Nine hybrids were significantly superior to CSH 18, the check, for grain yield. SPH 1616 (6293 kg/ha) and SPH 1606 (6279 kg/ha) ranked 1st and 2nd for grain yield, where as the check, CSH 18 yielded 4941 kg/ha of grain. SPH 1608 yielded highest fodder of 18589 kg/ha followed by SPH 1603 which yielded 18569 kg/ha against 16475 kg/ha of CSH 18, the check.
- *Zone II (Table 42):* The hybrids, SPH nos 1610, 1611, 1616, and 1615 recorded numerical superiority over the check, CSH16 for grain yield. SPH 1610 gave maximum grain yield of 7153 kg/ha against 6639 kg/ha of CSH 16. Highest fodder yield was recorded in hybrids SPH 1604 (36739 kg/ha) and SPH 1603 (35129 kg/ha) as compared to the check, CSH 16 (24186 kg/ha).
- *Zone III (Table 43):* Three hybrids, SPH nos 1611, 1606, and 1610 were superior to the check, CSH 18 by 17, 6 and 5%. Maximum grain yield of 6317 kg/ha was observed in SPH 1611 as compared to 5397 kg/ha of the check, CSH 18. Highest fodder yield of 25228 kg/ha was recorded in SPH 1608 as against 24534 kg/ha of CSH 18.

Late Kharif season

Advanced Varietal and Hybrid Trial (Table 44): Fodder yield- SPH 1577 had maximum fodder yield of 9089 kg / ha. CSH 18, check has maximum grain yield.

Initial Varietal Trial (Table 45): Seven varieties namely SPV nos. 1813, 1816, 1812, 1818, 1814, 1817, 1897 were superior to the check, SPV 462 by 6.7 to 17%. Highest grain yield of 2980 kg / ha was recorded by SPV 1813 against 2555 kg / ha of the check, SPV 462. SPV 1821 followed by SPV1812 had maximum fodder yield of 9562 kg/ ha and 8681 kg/ha.

Initial Hybrid Trial (Table 46): Three hybrids, SPH Nos. 1609, 1606, and 1616 were numerically superior to the check, CSH 18. SPH 1609 had maximum of 3985 kg /ha of grain yield against 3483 kg/ha of CSH 18, check. Highest fodder yield was recorded by SPH 1603 (10148 kg / ha) followed by SPH 1604 (9807 kg / ha) as compared to the check, CSH 18 (8381 kg/ha).

Looking ahead: Writing 3 journal papers and registration of shootfly and development of grain mould resistance lines in coordinated sorghum breeding research is our target for 2008 -09.

Detailed report: Breeding for Kharif grain sorghum

Introduction: During 2007-08 also, major emphasis in plant breeding was on breeding for resistance to grain mould and shootfly, especially phenotyping of RILs developed for each of these traits. Also, progress was made for drought resistance breeding and interesting results were obtained. Further, work was initiated on developing coloured grain hybrids for evaluation during 2008-09. Significant progress was made in all the 2 areas listed below.

A. Sorghum breeding research

B. Multi-location yield trial

A. Sorghum breeding research

- i) Coordinated sorghum breeding research
- ii) Achievements in sorghum breeding at AICSIP centers
- iii) Achievements in sorghum breeding at NRCS
- iv) Publications

1. Coordinated sorghum breeding research

During kharif and rabi 2007, ten experiments were conducted on grain mould, shootfly, stem borer and drought resistance and agronomic superiority. Details of the experiments and results are given below.

1. Phenotyping of RILs for grain mould resistance
2. Screening F₅s for grain mould resistance
3. Conversion of B derivatives from above experiment to MS lines
4. Phenotyping of RILs for shootfly resistance

5. Screening F_2 s and F_3 s for shootfly resistance
6. Screening F_2 s and F_3 s for stem borer resistance
7. Evaluating F_2 s for agronomic superiority
8. Evaluating F_4 s for drought resistance
9. Developing hybrid seed from shared MS and R lines
10. Developing coloured seed hybrids

Grain moulds

Experiment 1. Phenotyping of RILs (296 B x B 58586) for grain mould reaction and characters associated with GMR. Akola (Drs. R. B. Ghorade & P. N. Mane), Dharwad (Drs. M.Y. Kamatar & Y.D. Narayana) and Hyderabad (Drs. S. Audilakshmi & I. K. Das)

Objectives: To phenotype RILs for grain mould resistance and associated traits

Results: Two hundred and fifteen RILs along with the checks were grown in RCBD with three replications. The checks used were IS 25017, B 58586, C 43, SVD 9601, and 296 B. Data was collected on plant height, days to flowering, days to physiological maturity, days to harvest maturity, field grade score both at physiological maturity and normal maturity, panicle compactness, glume colour and cover, grain hardness at physiological maturity, seed shape and size.

Combined analysis over two years and three locations showed that RILs are significantly different. G×E interaction was predominant. The frequency distribution of the average data over locations and years for RILs showed normal distribution for both field grade scores (FGS) at physiological maturity (PM) and at normal maturity (NM) (Figure 1). The susceptible parent 296 B showed 6.8 FGS at PM and 8.3 FGS at NM. However, resistance source B 58586 showed a score of 2.7 at PM and 4.0 FGS at NM. Though none of the RILs showed superior performance over that of resistance check, B 58586, 15 RILs showed resistance on par with B 58586 over the years and locations. Details are given in Table 1. Four lines were statistically on par with resistant checks in all locations and years. These best performing lines for grain mould resistance are RIL 25, RIL 92, RIL 98 (with 4.3 FGS) and RIL 124 (4.6 FGS) as against 4.0 of B 58586, resistant check. Heritability studies showed that grain mould resistance has low heritability of 33 % at PM and 26 % at NM. Heritability is governed by epistatic gene interaction.

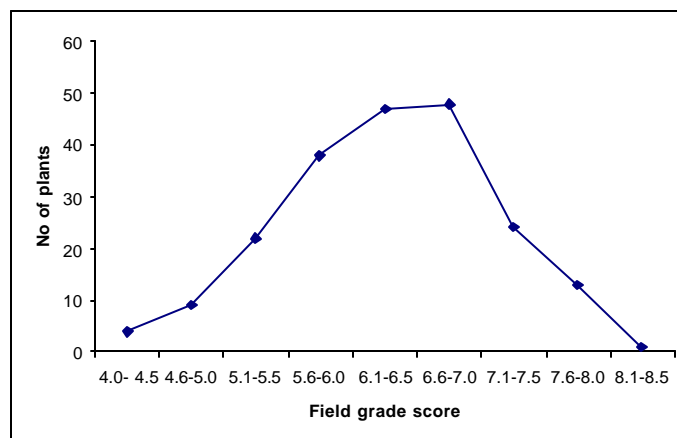


Figure 1: Frequency distribution for average field grade score over 3 locations and 2 years in the RILs from a cross 296 B x B 58586 during kharif 2006 and 2007.

Table 1. Performance of superior RILs for grain mould resistance during kharif 2006 and 07

S. No	RIL.No	FGS at PM ⁺					FGS at NM ⁺					
		Akola 2006	NRCS 2006	Akola 2007	NRCS 2007	AV ⁺⁺	Akola 2006	NRCS 2006	Akola 2007	NRCS 2007	Dharwad 2007	AV ⁺⁺
1	3.0	3.7	1.8		4.8	3.3	4.4*	5.3	3.6*	8.1	4.3*	5.1*
2	RIL20	2.4	3.1	3.6	4.3	3.3	3.6*	5.9	5.4*	6.7*	4.3*	5.2
3	RIL25	1.8	3.0	3.0	3.1	2.7	4.1*	3.8*	3.6*	5.7*	4.3*	4.3*
4	RIL44	3.6	3.7	2.4	4.5	3.6	3.6*	6.3	4.9*	6.1*	4*	5.0*
5	RIL81	3.6	3.2	4.2	3.6	3.6	4.9*	4.3*	5.4*	5.7*	5.3	5.1*
6	RIL83	3.0	2.9	4.2	3.9	3.5	3.6*	4.6	5.4*	6.7*	4*	4.9*
7	RIL84	2.4	5.0	4.8	4.2	4.1	4.9*	7.0	5.4*	5.4*	4*	5.3
8	RIL85	3.6	2.7	3.6	3.2	3.3	4.1*	5.4	5.4*	5.2*	4.3*	4.9*
9	RIL92	3.0	2.4	4.2	3.4	3.2	4.1*	3.1*	4.9*	4.9*	4.3*	4.3*
10	RIL95	5.4	2.5	4.8	3.9	4.2	6.6	3.6*	5.4*	5.7*	4.3*	5.1*
11	RIL98	3.6	2.7	3.0	3.7	3.2	4.9*	3.4*	4.9*	4.5*	4*	4.3*
12	RIL102	3.0	3.7	2.4	3.2	3.1	4.1*	5.9	3.6*	5.7*	3.7*	4.7*
13	RIL115	3.0	4.0	4.2	3.5	3.7	3.6*	6.7	5.4*	6.3*	4.3*	5.3
14	RIL120	2.4	3.7	1.8	5.1	3.2	4.1*	5.3	3.6*	6.3*	3.7*	4.6*
15	RIL124	3.0	2.9	2.4	2.5	2.7	5.4*	4.1*	5.4*	4.7*	3.3*	4.6*
16	RIL161	5.4	2.9	3.6	4.0	4.0	5.4*	4.6	5.9*	6.5*	4*	5.3
17	RIL169	4.8	3.4	4.8	3.8	4.2	5.4*	5.2	5.9*	5.8*	2.7*	5.0*
18	RIL170	2.4	3.0	2.4	3.0	2.7	5.4*	4.6	4.9*	5.0*	4.7	4.8*
19	RIL203	4.2	3.6	3.6	3.6	3.8	4.1*	6.0	4.1*	6.5*	3.7*	4.9*
20	296B	7.2	6.9	5.4	7.6	6.8	8.4	9.0	7.2	9.0	8.0	8.3
21	27B	7.8	5.7	5.4	5.9	6.2	8.4	8.6	6.6	8.4	7.3	7.9
22	B58586	2.4	2.3	3.0	2.9	2.7	4.2	2.8	4.2	5.4	3.3	4.0
23	CD 5%	1.5	1.3	1.9	1.3	0.9	2.1	1.5	1.7	1.4	1.0	1.1

FGS= Field grade score measured on a scale of 19, where 1 is highly resistant and 9 is highly susceptible, + = Field grade score at physiological maturity, + = Field grade score at normal maturity, * = Statistically on par with the resistant check, B58586, ++Average over locations and years

Experiment 2: Evaluation of a set of F₅ selected over AICSIP locations for grain mould resistance (Set I: Kolhapur, NRCS, Hyderabad, Parbhani and Coimbatore, Set II: Surat, Palem and Indore)

Objectives: To identify superior grain mould resistance line

Results: Twenty four lines in Set I and 45 in set II which performed superiorly over years in F₂ to F₄ were evaluated in F₅ along with 2 checks for grain mould resistance and associated traits in RCBD at 3 locations in Set I, namely NRCS, Hyderabad, Parbhani and Coimbatore, and 3 locations for Set II namely Surat, Palem and Indore. Observations recorded were: days to flowering, days to PM, FGS at physiological maturity and normal maturity and plant height. Results are described below.

Set 1: Out of 24 lines evaluated, 19 lines were statistically on par with B 58586 which recorded 3.2 field grade score (FGS). The superior lines for grain mould resistance from set I are GMN 41 with 3.1 FGS, GMN 46 with 3.2 FGS, GMN 42 and GMN 55 with 3.3 FGS, GMN 58 with 3.4 FGS, and GMN 52 and GMN 59 with 3.5 FGS in comparison to B 58586 with 3.2 FGS (Table 2).

Set II: Out of 45 lines, six lines namely GMN nos.108, 109, 122, 126, 132, and 142 were on par with resistant check, B 58586 and scored 1.8 FGS at Surat and Palem. As there was insufficient rainfall at Indore, the lines were not evaluated for grain moulds.

Table 2. Performance of F₅ derivatives for grain mould resistance

S.No.	Entry	Hyderabad	Coimbatore	Parbhani	Average
1	GMN 41	3	3.6	2.7	3.1
2	GMN 42	4	3.6	3	3.3
3	GMN 43	4	9	2.7	4.9
4	GMN 44	3	9	2.7	5.1
5	GMN 45	4	5.4	3	3.8
6	GMN 46	3	3.6	2.7	3.2
7	GMN 47	3	6.6	3.3	4.4
8	GMN 48	3	7.2	3	4.4
9	GMN 49	4	6	2.7	4.1
10	GMN 50	3	5.4	3.3	3.8
11	GMN 51	4	6.6	2.7	4.2
12	GMN 52	3	3.6	4.2	3.5
13	GMN 53	2	7.8	2.7	4.4
14	GMN 54	5	7.2	3.3	4.6
15	GMN 55	3	3.6	3	3.3
16	GMN 56	4	6.6	3	4.3
17	GMN 57	3	6	2.7	4.0
18	GMN 58	3	4.2	3	3.4
19	GMN 59	3	4.2	2.7	3.5
20	GMN 60	4	9	3	5.2
21	GMN 61	3	7.8	3.3	4.7
22	GMN 62	3	7.2	3	4.4
23	GMN 63	4	3.6	2.7	3.3
24	GMN 64	4	3.6	2.7	3.3
25	296 B	9	6.6	8.4	8.0
26	B 58586	4	3.6	2.7	3.2
	CV	20.6	10.4	15.5	30.5
	CD	1.2	1.0	0.8	1.2

F₅S= Field grade score measured on a scale of 1-9, where 1 is highly resistant and 9 is highly susceptible

Experiment 3: Conversion of B derivatives from above grain mould screening programmes to MS lines (NRCS)

Objective: convert B derivatives to MS lines

Results: Fivelines are being test crossed during rabi 2007.

Shootfly and stem borer

Experiment 4: Phenotyping of RILs (27 B x IS 2122) for shootfly reaction and characters associated with SFR.

Drs. C. Aruna, V. R. Bhagwat (Hyderabad), V.Sharma, T. Hussain (Udaipur), R. B.Ghorade and H.G. Kandalkar (Akola)

Objective: To phenotype RILs for shootfly resistance and associated traits

Results: Phenotyping of 432 F₂₋₇ RILs along with checks, IS 18551, IS 2122, DJ 6514 and 27 B from a cross, 27 B x IS 2122 was carried out at three locations, viz. Hyderabad, Akola and Udaipur for shootfly reaction and for shootfly resistance associated traits during kharif 2006 and 2007. The experimental material was grown in RCBD with three replications and one row having 3m length. To increase the pressure of pest, the experiment was grown with fish meal at Hyderabad and experiment was sown late at Udaipur and Akola. Data was recorded in each row for % deadhearts on 14th, 21st and 28th days after germination, on glossiness, seedling vigor and trichome density at various stages of plant growth. The RILs showed large variation for glossiness, seedling vigor and trichome density.

The frequency distribution of RILs for average data over locations and years for % deadheart, DH on 28th day showed normal distribution indicating uniform distribution of markers in the population (Figure 2). 27 B, susceptible parent recorded 74% DH and resistant parent, IS 2122 showed 40 % DH. Twenty two RILs, six over all the locations and years and other 16 over two locations and two years showed superior performance for shootfly reaction. On average, the best performing lines for shootfly reaction are SFRIL-128 and SFRIL- 206 with 41% DH, SFRIL-374 and SFRIL-404 with 42% and SFRIL-342 with 46% DH against 40% DH of IS 2122 (Table 3). Heritability studies showed that shootfly resistance has low heritability (10% broad sense heritability).

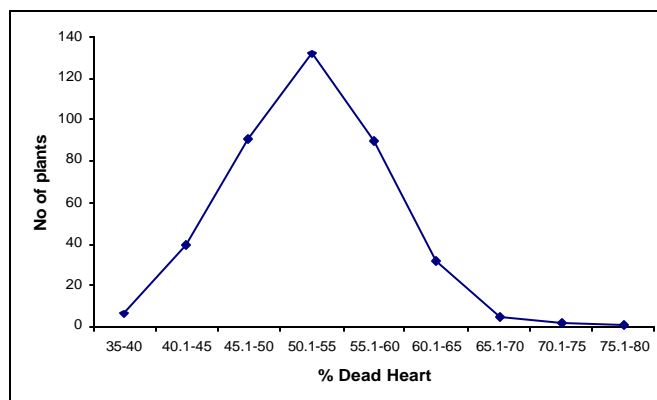


Fig.2: Frequency distribution for % deadheart at 28th day in RILs from a cross, 27 B x IS 2122 over locations during kharif 2006 and 07

Table 3. Performance of superior RILs for shootfly reaction during kharif 2006 and 07

S. No.	Entry No.	Akola 2006	Udaipur 2006	Udaipur 2007	NRCS 2006	NRCS 2007	Average over years and locations
1	SFRIL -35	34.3	41.0	28.0	75.8	47.2	44.0
2	SFRIL -48	31.7	59.0	23.3	68.1	46.3	43.9
3	SFRIL -75	40.5	43.4	24.1	46.7	53.1	41.1
4	SFRIL -128	12.4	77.9	18.6	56.3	42.9	39.8
5	SFRIL -152	27.5	56.9	21.2	69.0	52.1	43.9
6	SFRIL -158	25.8	48.0	14.6	56.3	53.0	38.6
7	SFRIL -159	19.0	60.1	20.1	73.6	45.9	41.9
8	SFRIL -176	37.1	57.8	14.0	73.6	51.8	44.5
9	SFRIL -192	18.8	70.0	17.9	72.4	50.1	43.9
10	SFRIL -199	21.5	69.2	20.8	72.7	52.9	45.6
11	SFRIL -206	20.1	79.8	25.3	38.3	48.2	41.4
12	SFRIL -221	22.2	85.3	18.9	61.7	41.6	43.3
13	SFRIL -227	24.5	81.3	18.4	51.7	60.2	45.9
14	SFRIL -231	17.0	79.4	27.0	47.8	63.3	46.6
15	SFRIL -258	23.9	65.8	17.6	70.0	47.7	43.0
16	SFRIL -259	25.0	84.9	18.5	58.0	47.5	44.5
17	SFRIL -264	26.2	60.8	16.4	69.9	52.1	43.3
18	SFRIL -294	24.3	62.8	21.4	63.3	44.1	41.5
19	SFRIL -324	25.8	70.7	20.7	40.3	68.9	45.2
20	SFRIL -342	40.1	81.7	26.4	34.7	52.8	45.9
21	SFRIL -374	33.2	86.6	23.3	20.0	53.0	42.4
22	SFRIL -404	27.7	75.2	22.5	37.9	50.6	41.7
23	27B	83.4	87.5	46.9	85.4	77.9	73.9
24	IS 2122	32.4	56.9	16.9	51.8	48.8	40.0
25	DJ6514	35.4	91.4	89.8	80.2	86.6	78.6
26	IS 18551	35.6	57.7	20.1	40.7	34.0	35.8
	Mean	33.1	72.2	27.2	69.3	66.8	52.5
	C.V.	27.0	22.1	22.5	19.1	18.3	25.7
	C.D. 5%	17.6	31.3	9.8	12.5	19.6	10.8
	C.D. 1%	23.1	41.2	12.9	16.4	25.7	14.2

Experiment 5: Evaluating F₃s and new set of F₂s crosses for shootfly resistance

Season: kharif 2007 Location: Akola, Udaipur and Hyderabad

Results: Fourteen F₂s and F₃s from crosses of elite lines with shootfly resistance sources were given to PI, entomology for distribution to three centers. Details of the material distributed are given in Table 4. Eighteen selections at Udaipur, 84 selections at Hyderabad and 71 at Akola were made. The respective F₃s and F₄s will be evaluated at Hyderabad in epyphytotic conditions.

Table 4. List of crosses and number of selections made for shootfly resistance during kharif 2007

S. No	Shoot fly resistant F ₃ population	Contributing centers	Seed received (wt in gm)	Seed conditions when received	No of plants selected from centers			
					Hyderabad	Akola	Udaipur	Total
1	PB 12779-2 x SPV 1698	Udaipur	80	good	0	8	NS	8
2	ICSV 272 x CSV 17	Udaipur	90	good	2	11	NS	13
3	IS 18417 x CO 25	Coimbatore	35	40 % ID	0	NS	NS	0
4	IS 18417 x CO 26	Coimbatore	25	70% ID	0	NS	NS	0
5	PSV-56 x SF 94006	Palem	75	20% M	1	7	NS	8
6	PSV-1 x SPV 422	Palem	60	20% M	0	4	NS	4
7	PSV-1 x SPV 462	Palem	65	20% M	0	17	NS	17
8	PSV-57 x SPV 471	Palem	50	70% M	23	NS	NS	23
9	PSV-55 x SFG 94006	Palem	60	35% M	3	4	NS	7
10	M 35-1 x SF 946006	Palem	65	20% M	2	0	NS	2
11	M 35-1 x SF 94001	Palem	35	35% M	0	0	NS	0
12	NTJ 2 x SF 94006	Palem	60	20% M	0	9	NS	9
13	27 B x IS 18551	NRCS	230	good	35	6	9	50
14	IS 2122 x C 43	NRCS	140	good	22	5	9	36
	Total				84	71	18	

ID = Insect damaged seeds, M = Infected with mould, NS = Not supplied

Two advanced generation lines NRCSFR06-1 and NRCSFR06-2 obtained from crosses evaluated during 2003 under group effort experiments performed superiorly for shootfly DH in AICSIP multi-location trials. The details are given in Table 5.

Table 5. Performance of advanced lines for shoot fly resistance

Entry	2006	2007	Average
NRCSFR06-1	45.3	34.7	40.0
NRCSFR06-2	41.2	34.1	37.6
IS 2312	31.5	17.5	24.5
DJ 6514	92.3	91.1	91.5
CD 5%	9.5	23.4	16.4
CV %	14.5	30.7	24.0

Experiment 6: Evaluating new set of F₂ crosses for stem borer resistance

Season: kharif 2007

Location: Warangal, Indore and Surat

Results: Eighteen F₂s and F₃s from crosses of elite lines with stem borer resistance sources were given to PI, entomology for distribution to three centers. Details of the material distributed are given in Table 6. Thirty four selections at Indore, 72 selections at Warangal and at 58 Surat were made. The respective F₃s and F₄s will be evaluated at Hyderabad in ephytotic conditions.

Table 6. List of crosses and number of selections made for stem borer resistance during kharif 2007

SI No	Stemborer resistant F ₂ population	Contributing centers	Seed Received (wt in gm)	Seed conditions when received	No of plants selected			
					Warangal	Indore	Surat	Total
1	PSV- 51 x IS 94014	Palem	65	30% M	6	NS	8	14
2	PSV-58 x SPV 471	Palem	65	15% M	9	NS	8	17
3	PSV-58 x SPV 469	Palem	65	15% M	8	NS	8	16
4	M 35-1 x SPSBR -94017	Palem	60	good	13	NS	6	19
5	PSV-56 x 94014	Palem	50	30% M	4	NS	8	12
6	Palem-2 x SPSBR 94017	Palem	70	15% M	5	NS	6	11
7	NTJ-2 x SPSBR 940145	Palem	65	10% M	5	NS	7	12
8	I-12 x ICSV 93046	NRCS	140	good	22	34	7	63
	Total				72	34	58	164

M= Infected with mould, NS=Not supplied

Agronomic traits

Experiment 7 Evaluating F₂s for cross with new germplasm for agronomic superiority at various centers depending on seed availability

Season: kharif 2007

F₂ seed of ten crosses each were contributed by Coimbatore, Akola and Indore. Following crosses for agronomic improvement were distributed to seven centers (Table 7).

Table 7. List of F₂ crosses evaluated for agronomic traits during kharif 2007

Contributing center	F2 pedigree	Centers where F ₂ seed distributed								
		Udaipur	Palem	Surat	Coim	Parbhani	Akola	NRCS	Dharwad	Deesa
Indore	IS 73210 x SPV 1428	v	v	v	v					
	ICSB 539 x IMS 9B			v		v	v		v	
Coimbatore	CO 25 x SPV 1644	v								
	TNS 30 x SPV 1644		v							
	APK 1 x TNS 30			v						
	APK 1 x RS 673									v
	SPV 1234 x SPV 1644									v
Akola	IS 14332 x GMRP -65		v			v			v	
	SVD 9601 x AKMS 14 B		v			v		v		
	GM 9219 x IS 14384		v					v	v	

Details of selections made at different location:

Coimbatore:

The F₂ segregants of a cross ICSB 539 X IMS 9B contributed by Indore center were raised during kharif 2007, to identify and select promising individual plants with superior agronomic characteristics. Based on visual observations, phenotypically superior plants were identified taking into consideration the priority for the zone I viz., tall plants suitable for dual propose. Total no. of 20 plants with agronomic superiority were selected. The observations recorded on the selected plants are given in Table 8.

Table 8. F₂ Selections for Agronomic Superiority

S.No	Pedigree (Cross combination)	Plant height (cm)	Panicle length (cm)	Single plant yield (g)
1.	ICSB 539 X IMS9B -1	243	21	76
2.	ICSB 539 X IMS9B -2	246	25	85
3.	ICSB 539 X IMS9B -3	242	26	60
4.	ICSB 539 X IMS9B -4	238	26	66
5.	ICSB 539 X IMS9B -5	284	25	54
6.	ICSB 539 X IMS9B -6	298	23	68
7.	ICSB 539 X IMS9B -7	232	28	66
8.	ICSB 539 X IMS9B -8	224	25	48
9.	ICSB 539 X IMS9B -9	218	21	60
10.	ICSB 539 X IMS9B -10	216	24	49
11.	ICSB 539 X IMS9B -11	221	23	74
12.	ICSB 539 X IMS9B -12	232	26	63
13.	ICSB 539 X IMS9B -13	236	25	60
14.	ICSB 539 X IMS9B -14	228	24	49
15.	ICSB 539 X IMS9B -15	221	28	71
16.	ICSB 539 X IMS9B -16	236	25	64
17.	ICSB 539 X IMS9B -17	232	21	73
18.	ICSB 539 X IMS9B -18	240	23	56
19.	ICSB 539 X IMS9B -19	244	26	53
20.	ICSB 539 X IMS9B -20	248	29	65

Dharwad: Following material was grown and appropriate selections were made (Table 9).

Table 9. List of material grown and selections made

Cross	No. of selections	Details of the traits selected for
F2 to F3		
1) ICSB x 539 x IMS-9B	20	P1- Purple, tall plant, big ear head P2- Dwarf plant, tan P3- Purple, dwarf P4- Tall, purple P5- Medium height, purple P6- Purple, tall P7- Purple, tall P8- Tan, tall P9- Dwarf, purple P10- Dwarf, purple P11- Medium, purple P12- Tall, purple P13- Tall, tan P14- Tall, tan P15- Tall, purple P16- Tall, purple P17- Tall, purple P18- Medium, purple P19- Tan, tall P20- Tan, tall
2) IS 14332 x GMRP-65	21	P1- Long head (large ear head) P2- Long ear head P3- Bold grain P4- Bold grain P5- Good size P6- Good grain P7- Good grain P8- Good grain P9- Bold grain P10- White grain P11- Good yield P12- Bold grain P13- Good yield, long head P14- Good yield P15- Grain mould resistant P16- Bold & clear seed P17- Long ear head P18- Good yield P19- Grain mold resistant P20- Clean bold grain P21- Yield
3) GM.9219 x IS 14384	18	P1- Tan, medium height P2- Tan, tall, small grain P3- Purple, medium height P4- Purple, medium height, yield P5- Tan, long ear head P6- Tan, tall P7- Tan, tall, long head P8- Tan, small grain P9- Purple, long ear head P10- Tan, tall P11- Purple, tall, red grain P12- Tan, bold grain P13- Tan, medium height P14- Tan, tall P15- Long ear head, medium height P16- Tan, medium height P17- Tan P18- Tall, tan
F3 to F4		
1) (IS 73210xSPV-1428)xE112	5	Desired heads
2) NR 486 x IS 1357	8	Desired heads

Udaipur:

Two F₂ crosses were evaluated for agronomic superiority. Following selections were made (Table 10)

Table 10. Agronomic superior selections made at Udaipur

Crosses	Comments	No of selections
CO 25 x SPV 1644-1-12	Selections were made with respect to grain yield potential	6
IS 7310 x SPV 1428-1-12	Selected only agronomically good segregants	10

Note: In both crosses heavy disease pressure was observed with poor expression for plant height

Drought

Experiment 8: Selections and advancing of F₄ derivatives selected during 2006 kharif from F₂s of two crosses (elite x drought resistance source) for drought tolerance under natural screening (Kovilpatti, Coimbatore and Udaipur)

Eighty F₄s from crosses between elite and drought resistance sources were grown in RCBD design with 2 replications at Udaipur, Kovilpatti and Coimbatore during kharif 2007. The lines showing superior performance were advanced and selfed and seed is collected. Following are the reports from various centers:

Kovilpatti - Dr. R. Sankarapandian F₄ population (80+7 checks) was sown on 21-5-07 in RBD with two replications under drought conditions at three stages of growth, viz. vegetative phase, flowering phase and maturity phase and controlled conditions. The details are given below.

Trial No. 1 : Vegetative phase: Out of 80 entries, 12 entries were found to be promising for yield and physiological parameters. The entry, SPV 772 x ICSV 272-56 has registered significant grain and straw yield (1.020 kg/plot) and 3.100 kg/plot with 90.5 RWC % (tolerance), moderate Chlorophyll content (31.8 CCI) and lower stomatal conductance (18.1 m.mol.s⁻²). The performance of superior lines is given in Table 11

Table 11. Performance of F₄ derivatives for drought tolerance at vegetative phase during kharif 2007

S. No.	Pedigree	Plot yield (mean)		Physiological parameters (mean)				
		Grain (kg)	Straw (kg)	RWC %	Chlorophyll content (CCI)	Stomatal conductance (m.mol.s ⁻²)	No. of roots / plant	Average root length (cm)
1	SPV 772 x S 35-3	1.21	3.65	62.5	30.9	68.1	16.9	16.2
2	SPV 772 x S 35-5	1.05	3.1	88.6	17.4	39.3	22.8	19
3	SPV 772 x S 35-7	1.13	3.4	82.5	43.9	77.9	15.3	10.3
4	SPV 772 x S 35-28	1.12	3.4	86.5	28.4	36.2	29.4	25.5
5	SPV 772 x S 35-32	1.07	3.05	80	22.4	24.7	19.9	29.8
6	SPV 772 x S 35-39	1.09	3.5	82.5	13.9	24.6	21.6	24.3
7	SPV 772 x ICSV 272-54	1.07	3.1	67.5	36.7	53.8	16.7	17.5
8	SPV 772 x ICSV 272-56	1.02	3.1	90.5	31.8	18.1	19.8	19.3
9	SPV 772 x ICSV 272-64	1.12	3.5	76.5	34.4	36.2	15	13.3
10	SPV 772 x ICSV 272-65	1.41	3.4	73	37.8	86	17.3	17.4
11	S 35 x SU 663-71	1.32	3.6	85.7	15.9	14.9	23.1	26.6
12	Ms 1150/1	1.31	3.6	85.8	30.8	52	22	32.9
13	CSV 17 check	0.75	2.5	81	32.8	60.1	20.6	12.5

Trial No. 2: Flowering phase : Out of 80, 12 entries were found promising for yield and physiological parameters. The entry, SPV 772 x S35-29 has recorded significant grain yield (1.200 kg/plot) and straw yield (3.500 kg/plot) and showed tolerance for RWC % (86.2), moderate Chlorophyll content of 38.2 CCI with lowest stomatal conductance of 18.7 m.mol.s⁻². This entry also has more no. of roots/plant (32.2) Table 12.

Table 12. Performance of F₄ derivatives for drought tolerance at flowering phase during kharif 2007

S. No	Pedigree	Plot yield (mean)		Physiological parameters (mean)				
		Grain (kg)	Straw (kg)	RWC %	Cholorophyll content (CCI)	Stomatal conductance (m.mol.s ⁻²)	No. of roots / plant	Average root length (cm)
1	SPV 772 x S 35-3	1.1	3.2	82.2	42.2	72.2	17.8	29.5
2	SPV 772 x S 35-21	1.1	3.2	87.4	44.2	32.6	20.9	30.8
3	SPV 772 x S 35-27	1.1	3.5	85.6	42.6	27.3	21.3	21.3
4	SPV 772 x S 35-29	1.2	3.5	86.2	38.2	18.7	32.2	22.3
5	SPV 772 x S 35-38	1.12	3.3	92.1	26.6	38.2	26.5	25.4
6	SPV 772 x S 35-45	1.2	3.2	87.6	33.2	32.2	22.6	21.6
7	SPV 772 x ICSV 272-54	1.1	3	67.3	44.2	67.6	19.7	29.4
8	SPV 772 x ICSV 272-65	1.1	3.2	76.5	42	42.2	19.3	29.3
9	S 35 x SU 663-80	1.1	3.4	88.4	22.1	32.7	19.7	29.1
10	C 43-81	1.2	3.2	75.5	27.8	78.9	22.1	25.9
11	CSV 17 check	1.05	2.5	80.3	16.5	58.8	28.3	20.3
12	Ms 1150/1	1.4	3.4	86.3	36.8	65.5	25.5	36.5
13	CSV 17 check	0.85	2.5	84.2	38.6	75.5	21.7	24.4

Trial No. 3: Maturity phase: Out of 80 entries, 9 entries were found promising for yield and physiological parameters (Table 13). The entry, SPV 772 x S35-29 recorded significant grain yield of 1.600 kg/plot and 3.800 kg/plot of straw yield with tolerance for RWC % (88.7), moderate Cholorophyll content of 35.6 CCI and had lowest stomatal conductance of 25.3 m.mol.s⁻² with highest no. of roots/plant (34.4) Table 13

Table 13. Performance of F₄ derivatives for drought tolerance at maturity phase during kharif 2007

S. No.	Pedigree	Plot yield (mean)		Physiological parameters (mean)				
		Grain (kg)	Straw (kg)	RWC %	Cholorophyll content (CCI)	Stomatal conductance (m.mol.s ⁻²)	No. of roots / plant	Average root length (cm)
Trial 3 : Maturity phase								
1	SPV 772 x S 35-5	1.4	3.3	86.2	30.2	45.3	29.4	41.6
2	SPV 772 x S 35-15	1.45	3.4	87.3	35.3	24.4	33.7	39.4
3	SPV 772 x S 35-21	1.55	3.2	86.8	52.2	30.2	27.2	44.5
4	SPV 772 x S 35-29	1.6	3.8	88.7	35.6	25.3	34.4	42.2
5	SPV 772 x S 35-38	1.4	3.7	90.7	28.8	35.5	25.6	46.6
6	SPV 772 x S 35-39	1.7	3.8	87.2	33.7	24.8	28.8	36.2
7	SPV 772 x ICSV 272-64	1.5	3.8	80.5	18.2	138.8	19.5	35.5
8	S 35 x SU 663-71	1.45	3.8	88.3	38.7	30.1	28.5	39.4
9	Ms 1150/1	1.45	4.1	87.5	37.5	50.5	27.7	44.1
10	CSV 17 check	1.05	3.5	86.6	33.2	87.6	22.5	39.9

Trial No. 4 : Control maturity phase: A total no. of 21 entries were found to be promising for yield and physiological parameters. The entry no. 71, SPV 772 x SU 663-71 has recorded highest grain yield of 2.650 kg/plot and 4.400 kg/plot of straw yield with tolerance RWC % (86.8), moderate Cholorophyll content (44.3 CCI), lower stomatal conductance of 36.6 m.mol.s⁻², 32.2 no. of roots / plant and 59.5 cm of average root length (Table 14).

Table 14. Performance of F₄ derivatives for normal conditions at maturity phase during kharif 2007

S. No.	Pedigree	Plot yield (mean)		Physiological parameters (mean)				
		Grain (kg)	Straw (kg)	RWC %	Cholorophyll content (CCI)	Stomatal conductance (m.mol.s ⁻²)	No. of roots / plant	Average root length (cm)
2	SPV 772 x S 35-2	1.7	3.5	78.5	33.8	70.6	22.2	47.4
3	SPV 772 x S 35-3	1.9	4.8	85.5	65.3	62.2	26.6	50.5
5	SPV 772 x S 35-5	2.2	4.5	86.8	70.7	82.6	33.2	55.2
15	SPV 772 x S 35-15	2.2	4.5	86.2	52.6	36.6	35.5	53.2
21	SPV 772 x S 35-21	2.7	4.8	85.9	70.6	37.7	36.3	65.6
24	SPV 772 x S 35-24	2.05	4.2	85.5	45.6	45.5	32.2	55.3
29	SPV 772 x S 35-29	2.8	5.2	86.6	38.8	33.4	38.6	62.3

S. No.	Pedigree	Plot yield (mean)		Physiological parameters (mean)				
		Grain (kg)	Straw (kg)	RWC %	Chlorophyll content (CCI)	Stomatal conductance (m.mol.s ²)	No. of roots / plant	Average root length (cm)
28	SPV 772 x S 35-28	2.3	4.1	72.2	36.6	73.3	25.5	60.5
39	SPV 772 x S 35-39	2.1	4.2	86.1	45.6	32.2	32.2	52.2
38	SPV 772 x S 35-38	2.2	3.9	90.3	35.6	28.8	28.8	62.8
45	SPV 772 x S 35-45	2	3.8	85.5	47.6	30.1	29.3	55.3
49	SPV 772 x S 35-49	1.5	3.7	63.2	26.7	144.6	21.6	65.2
52	SPV 772 x S 35-52	2.5	4.2	81.4	32.2	70.6	24.2	52.2
53	SPV 772 x S 35-53	1.5	4.2	71.1	35.6	82.2	23.5	65.2
59	SPV 772 x S 35-59	1.7	4.1	83.3	18.8	83.6	29.8	55.5
63	SPV 772 x S 35-63	1.65	3.5	81.6	18.8	132.6	21.7	45.2
64	SPV 772 x ICSV 272-64	2.3	4.4	75.5	25.6	141.6	22.5	48.8
71	S 35 x SU 663-71	2.65	4.4	86.8	44.3	36.6	32.2	59.5
73	S 35 x SU 663-73	2.1	3.9	80.1	24.4	30.5	28.4	54.4
83	IS 1501	2.4	4.9	80.1	62.6	72.2	28.8	58.8
87	Ms 1150/1	2.2	4.4	85.5	44.6	57.6	29.9	65.5
82(c)	CSV 17 check	1.2	3.8	83.6	39.6	35.6	26.3	63.3

Conclusion:

1. Entries existed in all three phases of stress and in control: 87 (Ms 1150/1)
2. Entries existed in two phases of stress and in control: 3 (SPV 772 x S 35-3)
5 (SPV 772 x S 35-5)
21 (SPV 772 x S 35-2)
28 (SPV 772 x S 35-28)
29 (SPV 772 x S 35-29)
38 (SPV 772 x S 35-38)
39 (SPV 772 x S 35-39)
64 (SPV 772 x ICSV 272-64)
71 (S 35 x SU 663-71)
3. Entries existed in one phase of stress and in control: 15 (SPV 772 x S35-15)
45 (SPV 772 x S35-45)

The above entries can be utilized in the breeding programme for drought tolerance according to the tolerance to the particular phase of the crop (for early drought, mid-season drought and terminal drought).

Coimbatore - Dr. K. Ganesamurthy: The trial on screening for drought was laid out during kharif 2007 under natural field condition. The trial received a rainfall of 183.9 mm during its vegetative growth period up to flowering. However, the quantum received during its post flowering period was only 15.0 mm up to maturity. Hence, the post flowering period of the trial crop was under severe moisture stress and provided an ideal condition for screening the progenies for post flowering drought resistance. Among the 84 progenies evaluated for drought, 25 progeny rows were found to be tolerant to moisture stress showing stay green attribute and with high chlorophyll content in terms of high spad meter reading. The observations recorded for six important traits on 25 selected progenies are given in Table 15.

Table 15. Screening of F₄ progenies for drought resistance

S.No.	Name of entry	Days to flowering	Plant height (cm)	Panicle length (cm)	No. of leaves /plant	Spad reading	Days to maturity	Single plant grain yield(g)
1.	SPV772 X S35 -9	67	186	22	11	41.5	10.	32.0
2.	SPV772 X S35-22	58	156	23	11	42.0	95	41.8
3.	SPV772 X S35-28	58	180	23	12	24.0	95	64.4
4.	SPV772 X S35-31	58	186	27	10	41.5	95	39.4
5.	SPV772 X S35-33	67	206	23	10	38.5	102	38.8
6.	SPV772 X S35-34	62	194	23	8	46.5	98	54.9
7.	SPV772 X S35-35	62	205	24	12	45.4	98	34.6
8.	SPV772 X S35-37	62	200	26	12	49.3	98	75.8
9.	SPV772 X S35-41	62	163	24	9	37.2	98	51.2
10.	SPV772 X S35-43	66	174	23	11	44.4	102	49.7
11.	SPV772 X S35-48	58	200	23	9	35.5	93	41.7

S.No.	Name of entry	Days to flowering	Plant height (cm)	Panicle length (cm)	No. of leaves /plant	Spad reading	Days to maturity	Single plant grain yield(g)
12.	SPV772 X ICS272 -50	58	203	24	11	29.5	93	41.4
13.	SPV772 X ICS272 -51	62	186	23	11	34.5	99	33.5
14.	SPV772 X ICS272 -52	67	171	24	10	32.5	102	28.7
15.	SPV772 X ICS272 -53	66	189	23	11	28.5	101	31.5
16.	SPV772 X ICS272 -61	62	188	23	12	42.5	98	47.9
17.	SPV772 X ICS272 -63	62	193	22	11	39.0	98	30.9
18.	SPV772 X ICS272 -64	62	179	25	10	31.2	98	44.8
19.	S35 X SV663 -69	59	200	25	11	35.2	95	40.4
20.	S35 X SV663 -71	58	196	22	12	25.4	93	49.7
21.	S35 X SV663 -72	58	196	23	12	49.4	93	53.7
22.	S35 X SV663 -76	62	202	23	11	34.2	98	57.7
23.	S35 X SV663 -77	58	199	24	11	38.0	93	33.9
24.	S35 X SV663 -80	58	197	24	11	41.2	93	55.3
25.	C43 -81	67	190	26	11	32.0	103	32.3
Grand Mean								44.21
SE(d)								3.98
CD								8.22
CV								9.01

Udaipur: Dr. V Sharma: This year total rainfall received at the center was 504.7 mm with better distribution. As such there was no critical drought situation. Hence screening for drought under natural conditions was not possible, however selection of segregants was made for earliness to escape terminal drought coupled with better agronomical background. Details of cross wise selection are as follows (Table 16).

Table 16. Performance of drought material

Cross	Selection criteria	No s
SPV 772 x ICSV 272	Early, dual purpose, compact panicle	13
SPV 772 x S 35	Early, dual purpose segregants	6
S-35 x SU 663	Medium tall, early, dual purpose segregants	6

Experiment 9: Multiplication of hybrid seed for best hybrids from 2005 nursery trial (developed out of pooled MS and R lines)

Location: Seed multiplication of hybrid 206A x KR 199: Hyderabad

BJMS 3 A x SLR 17: Bijapur

Seed of hybrid 206A x KR 199 (developed from parents developed at NRCS and Parbhani) and hybrid BJMS 3 A x SLR 17 (Parents contributed by Bijapur center and NRCS) was multiplied and hybrids will be submitted in IHT of AICSIP trials.

Experiment 10: Development of seed for red colour hybrids

One coloured and two white grain MS lines and two coloured and two white grained R lines were sown and hybrid seed multiplication is being carried out in rabi 2007.

2. Achievements in sorghum breeding at AICSIP centers

Achievements 2007-08

Akola

Resistance Breeding

Grain mould resistance breeding:

Development of male sterile lines: Details of the material developed in this center are given in Table 17.

Table 17. Details of the breeding material at Akola

Generation	Crosses made	Progenies planted	Progenies selected
F9 (B x B)	(SPGM 94008B x Akms 38B)	3	12
	(Akms 14B x SPGM 94008B)	1	3
F₅ (B x B)	(ms 296B x B 58586)	4	8
Total		8	23
F3 (B X R)	SVD 9601 x 70 B	Bulk	30
	GM 9219 x IMS 9 B	Bulk	13
	IMS 9 B x GMPR 65	Bulk	29
	IMS 9 B x IS 14384	Bulk	2
	Ms 296 B x GMPR 65	Bulk	10

Generation	Crosses made	Progenies planted	Progenies selected
	Ms 27 B x IS 14384	Bulk	3
	70 B x GMPR 65	Bulk	9
	SVD 9601 x 296 B	Bulk	20
	SVD 9601 x 14 B	Bulk	26
	IS 14332 x Akms 14 B	Bulk	2
	Ms 27 B x GMPR 65	Bulk	23
	GM 9219 x 70 B	Bulk	36
	IS 14332 x70 B	Bulk	6
	IS 14332 x 27 B	Bulk	4
F ₇ (B x R)	(SPGM 94008B x SPV 1333)	8	7
	(ICS 70B x AKGMR 9)	7	1
	(B 58581x SPV 1025)	1	1
	(B 58581x SPV 881)		
F ₄ (B x R)	(ms 296B x SPV 1548)	11	20
	(MR 836 x B 58586)	3	2
Total		30	31

Development of Restorer lines:

Generation	Crosses made	Progenies planted	Progenies selected
F ₉ (R x R)	(AKENT 8.2 x AKGMR 20)	11	7
	(SPV 1033 x GMPR 4) x (SPV 1039 x ICSV 702 x SPV 678)	6	7
	(AKGMR 9 x PSR 23)	8	4
	(ICSR 76436 x SPV 1447)	13	15
	(NSV 13 x SPV 1033) x (GMPR 4 x 1817 tan)	2	4
	(SU 556 x SPV 775) x (ICSR 89081 x B 58581)	4	3
Total		44	40
F ₈ (R x R)	(GM 9181 x SPGM 94008) x SPV 1333)	22	11
	(GM 9181 x GM 9219)	6	4
	(GM 9181 x ICSR 108.2)	17	6
Total		45	21
F ₆ (R x R)	(GMPR 4 x SPV 1022) x (SPV 1388 x RS 673)	32	6
	(C 43 x IS 3977)	19	9
	(AKR 342 x Ind 12)	30	15
Total		81	30

Shoot-fly resistance breeding programme:

Development of male sterile lines:

Generation	Crosses made	Progenies planted	Progenies selected
F ₇ (B x B)	(ICS 439B x ICS 243B)	9	4
	(ICSB439 x Akms 14B) x 94008 B	11	13
	(2077B x ICSB 422)	1	-
	(Akms 14B x 94008B) x IMS 9B)	6	2
Total		27	19

Development of Restorer lines:

Generation	Crosses made	Progenies planted	Progenies selected
F ₉ (R x R)	(ICSR 108.2 x ICSR 76436)	5	-
	(NSV 13 x CB 1033) x (GMPR 4 x 1817 tan)	-	-
	(AKENT 8.2 x AKGMR 9)	2	1
	(SU 556 x SPV 775)	6	4
	(ICSR 89.81 x B 58581)	5	4
	(CB 1033 x GMPR 4)	1	1
Total		19	10
F ₄ (R x R)	SPV 669 x IS 2205	18	25
	SPV 669 x SPV 504	24	25
Total		42	50

Generation	Crosses made	Progenies planted	Progenies selected
F ₉ (R x R)	(SU 556 x SPV 775) x (ICSR 89081 x B 58581)	4	1
	(SU 556 x SPV 775) x (CB 1033 x GMPR 4)	17	10
	(SU 556 x SPV 775) x (AKGMR 9 x PSR 23)	24	17
	(AKENT 8.2 x GJ 40)	5	2
	(HR 90072 x GJ 40)	8	6
	(SU 556 x SPV 775) x (94008B x SPV 1333)	7	3
	Total	69	39
Generation	Crosses made	Progenies planted	Progenies selected
F ₆ (R x R)	(Kharif Local x SPV 1404)	5	4
	(RS 673 x SPV 1201) x ICSR 104-1	5	2
	(PVK 801 x AKR 150)	3	2
	(SPV 1404 x SVD 9601)	5	1
	(AKR 73 x B 58581) x SPV 881	6	6
	(Kharif Local x AKENT 8.2) x AKGMR 20	6	1
	Total	30	16

Generation	Crosses made	Progenies planted	Progenies selected
F ₇ (B x R)	(ICSB 70 x GJ 40)	33	12
	(ICS 52B x ms 104B) x AKENT 8.2	10	6
	Total	43	18

Generation	Crosses made	Progenies planted	Progenies selected
F ₇ (R x R)	(SP 14199 A3R x C 43)	7	5
	(SP 14199 A3R x HR 90006)	2	-
	(SP 14199 A3R x ICSR 89058)	-	-
	(RS 67 x RM 14)	-	-
	(SP 14075 A2R x RM 14)	2	1
	(SP 14199 A3R x RS 585)	1	1
	(SP 14199 A3R x ICSR 77014)	3	-
	Total	15	7

F ₃ R X R	Crosses made	Progenies planted	Progenies selected
	AKR 422 x ICSR 89058	Bulk	17
	STR 293 x AKR 436	Bulk	60
	STR 293 x ICSR 89058	Bulk	50
	RS 673 x ICSR 89058	Bulk	25
	AKR 426.2 x RS 673	Bulk	22
	AKR 426.2 x AKR 436	Bulk	24
	RS 673 x AKR 422	Bulk	14
	AKR 436 x RS 673	Bulk	50
	AKR 436 x ICSR 89058	Bulk	9
	STR 293 x AKR 426.2	Bulk	33
	STR 293 x RS 673	Bulk	32
	ICSR 89058 x RS 673	Bulk	41
	AKR 426.2 x ICSR 89058	Bulk	78

Newly Generated Material :

Generation	Crosses made	Progenies planted	Progenies selected
F₃ (B x B)	(SPA 3B x Akrms 69B)	35	55
	(ms 2219B x Akms 42B)	32	35
	(Akms 28B x Akrms 69B)	29	51
Total		96	141
	lms-9B x 70 B	Bulk	9
	lms-9B x ms-296 B	Bulk	5
	Akms - 14 B x ms 27 B	Bulk	9
	Akms - 14 B x ms 70 B	Bulk	6
	Akms - 14 B x lms 9 B	Bulk	16
	Akms - 14 B x ms 296 B	Bulk	8
	70 B x ms 27 B	Bulk	13
	ms 2219 B x 70 B	Bulk	11
	ms 2219 B x Akms 42 B	Bulk	7
	ms 2219 B x Akms 30 B	Bulk	15
	ms 296 B x Akms 30 B	Bulk	3
	Akms 30 B x 70 B	Bulk	70
	Akms 30 B x Akms 42 B	Bulk	2
F₄ (B x R)	Akms 14B x SPV 504	4	1
	Akms 14B x CS 3541	8	6
	AKR54 x Akms 14B	3	2
	AKENT-1 x Akms 14B	2	-
	AKR 354 CS 3541	1	1
	AKR 73 x AKR 354	2	1
663 x AKENT-82	2	-	
Total		22	11
	Akms 30 B x ICSR -89058	Bulk	15
	Ms 2219 B x ICSR -89058	Bulk	15
	Akms 14 B x ICSR -89058	Bulk	19
	STR 293 x 70 B	Bulk	38
	70 B x ICSR-89058	Bulk	20
	Rs 673 x Akms 30 B	Bulk	24
	Akms 42 B x ICSR -89058	Bulk	7
	Akms 30 B x AKR 436	Bulk	22
	Akms 42 B x AKR 422	Bulk	19
	AKR 422 x Akms 30 B	Bulk	10
	RS-673 x 70 B	Bulk	34
	RS-673 x Akms 42 B	Bulk	10
	Akms 14 B x RS 673	Bulk	16
	Ms 2219 B x AKR 436	Bulk	23
	AKR 426.2 x Akms 30 B	Bulk	50
	AKR 426.2 x 70 B	Bulk	60
	STR 293 x Akms 30 B	Bulk	30
Ms 2219 B x STR 293	Bulk	25	
Ms 2219B x AKR 426.2	Bulk	46	
Ms 296 B x RS-673	Bulk	9	
F₂ (B x B)	Akms 14B x ICS 13B	Bulk	

Development of Restorers

F₄ R X R	Crosses made	Progenies planted	Progenies selected
	SPV 669 x P.Moti	26	15
	SPV 669 x AKSV 13R	34	30
	ICSR 89058 x RS 673	45	18

Grain mould

F₃ B X R	Crosses made	Progenies planted	Progenies selected
	SVD 9601 x 70 B	Bulk	30
	GM 9219 x IMS 9 B	Bulk	13
	IMS 9 B x GMPR 65	Bulk	29
	IMS 9 B x IS 14384	Bulk	2
	Ms 296 B x GMPR 65	Bulk	10
	Ms 27 B x IS 14384	Bulk	3

	70 B x GMPR 65	Bulk	9
	SVD 9601 x 296 B	Bulk	20
	SVD 9601 x 14 B	Bulk	26
	IS 14332 x Akms 14 B	Bulk	2
	Ms 27 B x GMPR 65	Bulk	23
	GM 9219 x 70 B	Bulk	36
	IS 14332 x70 B	Bulk	6
	IS 14332 x 27 B	Bulk	4
	IS 14332 x 296 B	Bulk	2
F 3 R XR	IS 14332 x GMPR 65	Bulk	11
	GM 9219 x IS 14384	Bulk	6
	SVD 9601 x GM 9219	Bulk	22
	SVD 9601 x IS 14332	Bulk	16
	GM 9219 x IS 14332	Bulk	5
	SVD 9601 x GMPR 65	Bulk	56

Following is the programme under conversion breeding:

BC I - 35

BC II - 10

BC III - 06

BCIV - 59

In addition to this, six new male sterile lines have been developed and are being used for development of new experimental hybrids. Further, 168 varietal selections have been made. Similarly 75 new experimental hybrids have been made in kharif 2007.

Parbhani

Identification of new B and R lines: Ninety AB pairs and 78 R lines with special reference to tolerant to grain mould and shoot fly were evaluated and also some of the lines with high brix were evaluated during kharif 2007. Following B and R lines were selected and planted during rabi 2007-08 to assess their performance for adaptability for both the seasons. Similarly, these selected lines were crossed with PMS 28 B and C 43.

Selected B lines: SSABT 1015, 1031B, 6037B, 47512, PBT1013B, 438B, 43909B, SSABT 1022B, ABT 1011B

Selected R lines: ICSR 89053, PRT 1037, RCSR 47766, SSVRT 1020, ICSR 91017 (47809), SSABP 1020R, DRT1037 R, ICSR 91017

Evaluation of F₂ crosses: During kharif 2007, following three F₂ crosses with new germplasm for agronomic superiority received from NRCS were evaluated and desirable single plant selections were made.

ICSB 539 x IMS 9B - 07

IS 14332 x GMRP 5 - 11

SVD 601 x AICMS - 09

Evaluation of F₃ families – Set I: Following 13 F₃ families were evaluated for grain mould resistance under epiphytotic condition and desirable single plant selection was made for further advancement under group efforts trial (Table 18)

Table 18. Crosses and selections made at Parbhani

Sr. No.	Families	No. of selections
1	GMRR9 x B58586	2
2	MR836 x IS25017	3
3	IBP2 x IS25017	2
4	KR791 x IS25017	1
5	KR799 x IS25017	2
6	296B x B58586	4
7	28B x IBP2	5
8	KR799 x B 58586	3
9	PSV 772 x J35	1
10	KR799 x IBP2	2
11	IBP2 x IS25017	2
12	GMRR9 x B58586	2
13	MR836 x B58586	2

Evaluation of F₃ families –Set II: Seventy eight F₃ selected families with special reference to grain mould were evaluated along with PVK 801 and PVK 809 and from following families desirable single plant selections with good quality grain and agronomic base were made (Table 19).

Table 19. Selections made in F₃ for agronomic superiority

Sr. No.	Families	No. of selections
1	SPV 881 x PVK 801	8
2	KR199 x B58586	7
3	PVK 801 x IS25017	6
4	PVK 801 x GMRP94	5
5	PMS 50B x RS29	3
6	GMRP9 x IS25017	6
7	1046B x MS27B	7
8	IB12 x IMS9B	10
9	IMS9B x IS25017	5
10	SRT26B x IS 25017	4
11	GMRP 9 x B58586	3
12	PVK 801 x IS95011	5
13	PVK 809 x B58586	8
14	PVK 801 x KR 799	7

Surat

Dr Jadav: During 2007 group effort experiments were carried out which are reported in section I

Dharwad

Thirty one crosses in different segregating generations (F₂ to F₆) besides crosses from NRCS were evaluated from the progenies of last year selections. List of most promising crosses particularly based on germplasm lines/ land races are given generation wise as follows (Table 20).

Table 20. List of crosses in different segregating generations (F₂ to F₆) evaluated during kharif 2007

S. No.	Cross	Comments	Nb. of selections
A. Crosses in different segregating generations (F₂ to F₆) evaluated			
F₂ Generation			
1.	AKMS-14B x IS 7528	Selected early type segregants	12
2.	SVP-1624 x IS 7528	Good agronomically superior, early segregants	14
3.	SB 7001 x IS 7528	Early dual purpose segregants	20
F₃ Generation			
4.	NR 486 x IS 1357	Selected for drought, disease free, good yield	2
5.	(IS 75210 x SPV-1428)x E-112	Selected dual purpose segregants	2
F₄ Generation			
6.	SPV-772 x S-35	Agronomically good segregants	3
7.	KR-199 x PVK-809	Tall early segregants	2
8.	296B x SRT-18B	Medium tall segregants	2
9.	DNB-2 x IB 3936	Early segregants with desired yield potential	2
10.	SB401 B x SPV-1293	Selected medium tall segregants	2
11.	CSV-15 x AKMS 14B	Agronomically good selection	2
12.	RS-29 x IS 25017	Selected only tall and tan segregants	3
13.	SRT-18B x CSV-15	Tall dual purpose segregants	3
14.	CSV-15 x SRT-18B	Selected only tall dual purpose segregants	2
15.	SB 401B x SPV-1293	Agronomically good segregants	2
16.	SPV-772 x ICSV-272		2
F₅ Generation			
17.	AKMS-14B x C-43	Selected good segregants	3
18.	(CSV-15 x C-43	Selected for SVT and advancement	3
19.	IS-12 x PVK-809	Selected for SVT and advancement	2
20.	C-43 x MR-836	Selected tall early segregants	2
21.	AKMS 14B x CSV-15	Selected for SVT and advancement	2
22.	KR-199 x PVK 809	Selected early with good yield potential	1
23.	CSV-15 x SRT-18B	Selected all with good yield potential	1
24.	I-12 x IS-25017	Selected for SVT and advancement	3
25.	296B x B58586	Selected for SVT advancement	6
F₆ Generation			
26.	MR 836 x B 58586	Selected for SVT and advancement	10

S. No.	Cross	Comments	No. of selections
27.	27B x IS 25017	Selected medium tall segregants	3
28.	IMS-9B x MR-836	Tall dual purpose segregants	2
29.	SRT-18B x MR-836	Selected for SVT and advancement	5
30.	GM-94008 x SRT-18B	Selected for SVT and advancement	6
31.	GMRP9 x B58586	Selected for SVT and advancement	3

Creation of new breeding material: Following 12 F₁ generation material was grown and advanced to F₂ generation for selection in F₂ generation during next year.

- | | | |
|-----------------------------|----------------------------|------------------------------|
| 1. SSV-74 x Kalagonda | 2. DSV -1 x SSV 74 | 3. SB 1085 x IVT 06K (6) III |
| 4. SB 1085 x IVT 06 K (2) I | 5. SB 1085 x IVT (9) I 06K | 6. SB 1085 x IVT (7) I 06K |
| 7. SB 1085 x IVT 06K (2) I | 8. SSVRI 1016 x SSV 74 | 9. DSV-6 x SSV74 |
| 10. 296B x DSV-6 | 11. DSV-6 x IVT 06K (9) I | 12. DSV-6 x IVT 06K (6) III |

Performance of different varieties under multilocation trials (MLVT): The best performing varieties from station trials and AICSIP trials are tested in Multilocation testing to verify their adaptability in different zones of Karnataka. Performance is given in below Table 21.

Table 21. Performance of varieties in multilocation trials- Grain Yield (kg/ha)

S.No.	Entry	Dharwad	Bidar	Hanumanamatti	Bailhongal	Mean
1	SVD-0101	5740	2263	2429	2237	3167
2	SVD-0103	4351	1934	2194	2515	2748
3	SVD-105	7499	3178	2216	2202	3773
4	SVD-0202	3703	617	1042	2039	1850
5	SVD-0701	6259	2346	1546	2332	3120
6	SVD-0702	6222	1564	1722	2067	2893
7	SVD-0703	5148	1787	1759	2191	2721
8	SVD-0709	5796	1934	2057	2235	3005
9	SVD-0710	6481	2675	2318	2182	3414
10	DSV-6	6611	2478	2025	2051	3291
11	CSV-15	6166	2840	2260	2380	3411
12	DSV-2	6740	2798	2478	2253	3567
	CD	9.65	8.4	3.67	NS	
	CV	8.4	13.7	108	15.9	

Testing of Private Sector Hybrids in Karnataka for the year 2007-08: Private company hybrids sold in market are purchased and tested for their performance in order to inform the sorghum growers about their performance as well as for the comparison of public and private sector research efforts. Fifteen private hybrids were tested this year along with CSH 16 and CSH 14 as checks. There were no significant differences between genotypes for grain yield. However significant differences were seen for fodder.

Indore

Germplasm –kharif 20007: 40 germplasm lines were evaluated and the performance is given in Table 22. EB 15 and EP 76 recorded highest per plant yield of 100.5 g. followed by 98 g. of IS 24695

Table 22. Performance of germplasm lines for yield attributes

S.No.	Entries	Grain yield(g/plant)	Plant height(cm)	Time to 50% flowering (d)
1	EP-19	67.5	275.0	74.0
2	EP-13	55.0	285.0	75.5
3	E-105	42.5	302.5	80.5
4	PEC-13	25.0	255.0	73.0
5	Raj-36	49.5	195.0	64.0
6	IS-22482	57.5	215.0	71.0
7	IS-24695	98.0	235.0	71.0
8	IS-22501	96.0	267.5	74.0
9	IS-2814	76.0	215.0	74.0
10	IS-8218	63.0	270.0	74.0
11	IS-6962	70.0	325.0	77.0
12	IS-9705	63.5	275.0	79.0
13	EP-61	52.5	305.0	76.5
14	FG-22	42.0	297.5	73.5

S.No.	Entries	Grain yield(g/plant)	Plant height(cm)	Time to 50% flowering (d)
15	FG-11	55.5	357.5	75.5
16	EG-19	27.5	307.5	75.0
17	E-32	47.5	355.0	80.5
18	EC-8	70.5	365.0	80.0
19	EC-22	75.0	265.0	81.0
20	EP-82	47.0	275.0	78.0
21	Raj-35	39.0	136.0	71.0
22	EP-76	100.5	357.5	79.5
23	EP-102	62.5	302.5	80.0
24	EP-117	44.5	292.5	72.5
25	EA-4	38.5	346.0	79.5
26	POP-52	42.0	305.0	74.0
27	IS-2122	33.0	307.5	76.0
28	IS-1247	29.0	117.5	73.5
29	PEC-28	36.5	307.5	74.0
30	EP-27	31.5	363.5	81.0
31	EP-105	61.0	267.5	79.0
32	EP-47	60.5	367.5	79.0
33	GGUV-19	34.0	372.5	79.0
34	GGUV-20	87.0	337.5	80.0
35	GGUV-27	26.5	270.0	75.5
36	EB-4	35.0	377.5	81.0
37	EB-15	100.5	385.0	80.0
38	IS-9767	51.0	335.0	80.5
39	EP-45	95.0	382.5	82.0
40	EP-89	86.5	287.5	82.0
	SEM	8.8	5.6	1.2
	CD 5%	25.17161	16.0764	3.297355
	CV	2.89362	2.89362	2.89362

Germplasm (Local): Sixteen local germplasm lines are being maintained and evaluated. GGUB 31 had highest grain yield of 170 g. per plant followed by 123 g per plant of GGUB 52. SV % was lowest in GGUB 52, GGUB 7 and GGUB 30. SF % was lowest in GGUB 8, GGUB 57, V-60-1, GGUB 60, GGUB 20 and GGUB 30 (Table 23).

Table 23. Performance of local germplasm for agronomic traits

S.No.	Entries	Grain yield(g/plant)	SB (%)	SF (%)	Time to 50% flowering (d)
1	GGUB-58	46.0	12.5	9.6	107.5
2	GGUB -52	123.0	0.0	2.0	95.0
3	GGUB -7	63.0	0.0	11.6	105.0
4	GGUB -46	37.0	27.6	8.7	97.0
5	GGUB -50	45.5	29.3	11.4	107.5
6	GGUB -8	50.0	1.5	0.0	109.0
7	GGUB -2	85.0	1.0	40.0	100.0
8	GGUB -10	68.5	12.6	27.0	100.0
9	GGUB -31	170.0	13.4	7.8	91.5
10	GGUB -57	11.0	18.5	0.0	108.0
11	V-60-1	56.0	8.6	0.0	85.0
12	GGUB -60	74.0	17.0	0.0	92.5
13	GGUB -68	64.0	11.3	7.0	90.5
14	Paibasa	55.0	3.0	26.0	95.0
15	GGUB -20	45.0	1.5	0.0	82.5
16	GGUB -30	101.5	0.0	0.0	82.5
	SEM	7.0			1.4
	CD 5%	26.35245			5.103489
	CV	14.37659			1.967917

Germplasm (SF/SB)- kharif 2007: Twenty one entries were evaluated and IS 2814 recorded highest grain yield of 92.5 g.per plant followed by 80.5 g.per plant of IS 24695. SB % was lowest in IS 24695. Fourteen entries recorded lowest SF % & 15 entries recorded lowest leaf injury % (Table 24).

Table 24. Performance of SF and SB germplasm for agronomic traits

S.No	Entries	Grain yield(g/plant)	SB (%)	SF (%)	Time to 50% flowering (d)	Leaf injury%
1	EP-19	63.5	9.3	11.5	84.0	27.4
2	EP-13	62.5	18.4	0.0	78.0	16.9
3	E-105	58.5	25.0	0.0	84.0	43.4
4	PEC-13	47.5	25.0	0.0	83.0	33.3
5	Raj-36	35.0	9.1	0.0	91.0	0.0
6	IS22482	35.0	37.9	4.8	96.0	17.9
7	IS24695	80.5	4.8	10.0	91.0	29.8
8	IS22501	68.0	46.1	0.0	91.0	30.3
9	IS2814	92.5	12.2	0.0	91.0	6.1
10	IS8218	60.5	11.3	0.0	91.0	0.0
11	IS6962	62.0	22.9	0.0	97.0	5.0
12	IS9705	53.0	26.7	0.0	96.0	0.0
13	EP-61	56.0	12.8	0.0	81.0	9.5
14	FG-22	26.5	22.8	0.0	81.0	2.4
15	FG-11	39.5	15.4	0.0	87.0	12.9
16	EG-19	22.5	29.2	0.0	86.0	8.8
17	E-32	21.5	16.7	9.5	85.0	0.0
18	EC-8	19.0	24.2	7.1	87.0	0.0
19	EC-22	64.0	19.6	16.2	85.0	10.0
20	EP-82	31.5	26.4	9.2	85.0	0.0
21	Raj-35	34.0	70.0	48.4	82.0	0.0
	SEM	4.6			0.68	
	CD 5%	13.14607			1.930166	
	CV	13.23211			1.095476	

Mould Nursery –kharif 2007: Twenty three elite genotypes selected for mould tolerance and SB tolerance are being maintained. Highest grain yield per plant was recorded for GMRP 87 of 154 g. per plant followed by SRF 252 of 148 g. and 139 g. of GMRP 85. SB % was lowest in SRF 252 and DND 4. DND 4 had lowest SF % of 3 % and 5% for SR 1992 (Table 25).

Table 25. Performance of grain mould nursery for yield and other traits

S.No.	Entries	Grain yield (g/plant)	SB (%)	SF (%)	Plant height(cm)	Time to 50% flowering (d)
1	SR-1992	105	24	5	218	77
2	GMRP-85	139	10	12	224	77
3	GMRP-65	90	38	19	248	80
4	GSSV-312	59	33	40	255	87
5	GSSV-311	128	26	30	289	82
6	AKGMR-35	76	16	32	272	79
7	GMRP-13	95	22	19	207	79
8	GMRP-39	68	6	23	268	76
9	SRF-252	148	4	20	273	73
10	AKGM-34	40	51	32	168	80
11	SRF-2595	112	17	21	278	77
12	DND-4	56	4	3	198	72
13	GMRP-87	154	21	17	259	77
14	GMRP-34	76	13	9	255	80
15	SRF-209	127	9	6	283	73
16	SRF-1749	85	9	13	252	81
17	SRF-204	132	7	8	288	80
18	SRF-1765	55	10	19	207	73
19	MN-9602	115	5	42	267	80
20	AKGMR-32	99	22	56	207	73
21	IS-77064	38	11	24	151	78
22	SR-1676	103	6	17	238	80
23	SRF-245	104	17	24	224	81
	SEM	10.6			3.4	1.1
	CD 5%	31.08267			9.881041	3.285073
	CV	15.71185			1.988578	2.043299

Varietal Trial -II: Sixteen genotypes were tested in the trial including JJ 1041 as check. I- 072 recorded highest yield of 5376 kg / ha followed by 5166 kg / ha of 22-3-3-2-1-12 and 5029 kg / ha of 18-7-3-1-1-15. Highest fodder yield of 16617 kg / ha was recorded by I – 72 followed by 15640 kg / ha of 20-2-2-3-2-11. Days to 50 % flowering ranged from 77 – 82 .1-1-3-5 recorded highest plant height of 341 cm (Table 26).

Table 26. Performance of varieties for yield and agronomic traits

S.No.	Entries	Grain yield (kg/ha)	Fodder yield (Kg/ha)	Plant height (cm)	Time to 50% flowering (d)
1	(CSV-15Xpai)-7-2-1	11265	18519	278	79
2	(No.9292 1022)-1-5-1-1-1	6327	19290	296	78
3	(GMRP-84 X I-12)-3-1-3-3	4846	22377	280	81
4	(1388 X 673)-20-2-2-1-6-2	5972	18519	290	82
5	(84 X I-12)-5-5-3-2	5617	27778	311	82
6	(84 X I-12)-5-5-3-4	5015	24691	310	81
7	(CSV-15 X Pai)-7-2-1-1-2	5864	19290	280	81
8	(84 X 27 B)-20-1-4-5-1	4090	19290	311	82
9	(27 B (84 X 27B)-3-2-1-1-2	3765	18519	302	81
10	CSV-15	5170	9259	267	80
11	(Kekdi X 1022)-1-3-1-1-2	6991	20062	318	80
12	(84 X 27B)-2-2-1-6-1	4907	21605	312	82
13	(1022(84 x 1022)-4-1-1-2-1	3920	12346	278	78
14	(73210 x 1428) x (1388 x 1041)-1-3-1	7407	28549	306	80
15	JJ-1022	4969	13117	245	75
16	(I-199 X PMS-8B)-14-1	6636	18519	296	77
	SEM	0.36	1.52	12.7	1.1
	CD 5%	3591	15236	41.4	3.5
	CV	53.9	88.0	12.3	3.8

Varietal Trial – I: 16 genotypes were tested in the trial including JJ 1041 as check. I- 072 recorded highest yield of 5376 kg / ha followed by 5166 kg / ha of 22-3-3-2-1-12 and 5029 kg / ha of 18-7-3-1-1-15. Highest fodder yield of 16617 kg / ha was recorded by I – 72 followed by 15640 kg / ha of 20-2-2-3-2-11. Days to 50 % flowering ranged from 77 – 82 .1-1-3-5 recorded highest plant height of 341 cm (Table 27).

Table 27. Performance of varieties for yield and agronomic traits

SNo	Entries	Grain yield(kg/ha)	Fodder yield (Kg/ha)	Plant height(cm)	Time to 50% flowering (d)
1	I-061	4301	11730	273	77.00
2	I-062	4042	10757	283	78.33
3	I-071	4839	13930	279	82.00
4	I-072	5376	16618	289	80.67
5	JJ 1041	4497	11730	281	82.00
6	22-3-3-2-1-12	5166	11730	287	82.00
7	10-1-1-1-1-14	4325	13685	274	82.00
8	18-7-3-1-1-15	5029	11730	284	80.67
9	18-5-3-2-4-10	4570	9775	262	78.67
10	1-1-3-10	4585	10264	317	81.67
11	1-1-3-5	4374	9775	341	82.00
12	1-1-1-1-2-1	1662	5865	193	80.67
13	20-2-2-3-2-11	4814	15640	294	79.33
14	(I-12x IS 25017) 5 - 2-3	3636	12708	281	80.67
15	1-4-1-1-10	3152	6843	165	80.67
16	22-3-2-1-1-11	3006	10264	306	79.33
	SE	0.46	1.72	11.55	1.15
	CD 5%	2186	8219.4	37.7	3.7
	CV	27.7	38.27	7.26	2.47

Elite lines - kharif 2007: Twenty four elite lines were planted. I-034 recorded highest yield of 6172 Kg/ha followed by JJ 1041 (5555 Kg/ha). Highest fodder yield was recorded by SPV 1535 (19290 kg/ha), highest plant height was recorded by SPV 1616 and I-071 of 307 cm. Days to 50 % flowering ranged from 71 to 81 days (Table 28).

Table 28. Performance of elite lines for yield and other attributes

S.No.	Entries	Grain yield(Kg/ha)	Fodder yield (kg/ha)	Plant height(cm)	Time to 50% flowering (d)
1	I-033	4552	15432	273	75
2	SPV1535	4090	19290	287	79
3	I-022	3009	15432	301	79
4	M-10	4105	13117	278	79
5	I-032	5046	15432	299	81
6	I-036	4475	16204	286	78
7	I-038	5247	18518	284	80
8	I-037	2886	9259	300	75
9	I-021	4275	12346	288	76
10	I-040	3318	18518	292	81
11	I-039	4090	18518	267	81
12	I-034	6173	15432	286	80
13	I-061	4012	13117	227	80
14	I-062	5015	15432	257	79
15	No-531	4012	10031	272	77
16	SPV1616	3549	13889	307	76
17	CSV15	2731	15432	272	76
18	No-574	4198	15432	246	80
19	IS26866	3889	18518	283	81
20	No-504	3997	12346	228	79
21	I-071	5015	15432	307	79
22	I-072	4861	16975	265	76
23	JJ1041	5556	16204	291	76
24	I-033	3673	15432	287	71
	SEM	0.22	1.72	9.1	0.68
	CD 5%	2029	8213	26.6	2
	CV	23.13	12.1	4.62	1.24

Segregating populations

F₆ Selections: Fifty eight F₆ progenies of 15 crosses were planted in 5 m. long 4 row plots and 140 selections were made on phenotypic basis. Further selections will be made on the basis of grain yield & quality. Selected entries will be tested in replicated trials with checks (Table 29).

Table 29. List of F₆ Progenies evaluated and no of selections made

S No.	F ₆ Populations	Progenies planted	No of selections done	Remarks
1	CSV 15 X Paibasa guda	7	22	SF / SB
2	CSV 15 X SRF 2102	11	17	Dual, SF / SB
3	GGUB 54 (SPV 1388 X RS 673)	2	14	Dual, Bold, , SF / SB
4	SPV 3133 X SPV 1022	4	4	Dual
5	SPV 1041 X GGUB 48	6	8	Grain Qlty, SF
6	SPV 1041 X GGUB 21	4	16	Grain Qlty, SF
7	GMRP 84 X I 12	7	27	Mould
8	JJ 1022 X Kekdi	3	4	
9	Kwari Sendhwa X JJ 1022	3	6	
10	SRF 206 X JJ 1022	2	5	SF / SB
11	SR 970 X JJ 1022	3	6	SF / SB
12	ENT 12 X SPV 1328	1	2	SF / SB
13	Paibasa X JJ 1022	1		Gr. Qlty
14	JJ 1022 X Paibasa	2	4	Gr. Qlty
15	AKGMR 35 X 27 B	2	5	Mould

F₅ – Selections: Seventy one F₅ progenies of 19 crosses were planted in 5 m.long 4row plots & 147 selections were made on phenotype basis. Further selections will be made on the basis of grain yield & quality .

S. No.	F ₆ Populations	Progenies planted	No of selections done	Remarks
1	IS73210 X SPV 1428 (SPV 1388 X SPV 1041)	13	36	HYV, Dual
2	(IS73210 X SPV 1428) (SPV 1333 X RS 673)	1		
3	Papad (CSV 15 X Paibasa)	2	3	Alternate uses
4	SPV 1041 X GGUB 48	5	10	HYV, Dual
5	SPV 1041 X GGUB 21	2		
6	SPV 1328 X GGUB 27	3	2	HYV, Dual
7	GGUB 54 (SPV 1388 X RS 673)	9	14	HYV, Dual
8	SPV 1022 X GGUB 28	1	3	HYV, Dual
9	SPV 1022 X GGUB 21	1	2	HYV, Dual
10	SPV 1489 X SPV 1472	4	8	HYV, R
11	GMRP 9 X B 58586	1	3	MS
12	SRT 18 X MR 836	5	7	R
13	MR 836 X B 58586	8	18	MS
14	I 12 X PVK 809	2	5	R
15	I 12 X IS 25017	9	26	mid tall, HYV,R
16	296 B X 58586 B	1	5	MS
17	94008 B X 26 B	1	1	MS
18	27 B X IS 25017	1	2	MS
19	2219 B X Rs 29	2	2	

F₄ Selections: Seventy -eight progenies of nine crosses were planted in 5 m. long 4 row plots & 67 selections were made for grain yield & quality. These will be tested in kharif 2008.

S. No	Cross	Progenies planted	No. of selections done	Remarks
1	GGUB 42 X I 12	47	17	Dual,R, seed quality
2	ICSR 89022 X GGUB 50	8	10	Dual, quality
3	IC199 X PVK 809	6	15	Dual,R
4	I 12 X PMS 8	1	2	R
5	30 B2 X GGSV 312	3		MS A2
6	M6 X GGUB 46	2	3	R,A2
7	IMS 9 B XGSSV 312	5	7	MS A1
8	IS 2257 X I 12	3	6	
9	(AKSV 13 X RS 673) X (775 ICSR 104)	3	7	

F₃ selections: Sixty -six selections were made from six crosses. These will be tested in kharif 2008.

S. No.	Cross	Progenies planted	No. of selections done	Remarks
1	717 B X IMS 3 B		6	Utilized in MS programme
2	ICSB 46 X GGUB 52		5	in MS programme
3	ICSB 243 X GGUB 59		-	
4	(73210 X 1428) X I 12		32	R
5	I 12 X (73210 X 1428) X E 112		19	R
6	ICSB 530 X IMS 9 B		4	MS programme

F₂ selections: Five F₂ populations were grown and selections were made for agronomical attributes.

S. No.	Cross	Remarks
1	SPV 1616 X (73210 X 1428) X I 12	R, Dual
2	(SRT 18 X 836) X No. 531	R
3	(I 12 X Is S 25017) X RS 29	R
4	IS 22557X I 12	R
5	(I 12 X IS 25017) X 3-2	R

Coimbatore: Dr. K. Ganesamurthy

Sorghum x Sugarcane intergeneric crosses: The following are the cross combinations effected between sorghum x sugarcane to produce inter generic hybrids.

S.No.	Cross combination (Sorghum x Sugarcane)	No.of earheads crossed
1.	(IS 73210 x SPV 1428) x 94008	10
2.	(IS 73210 x SPV 1428) x CO 775	5
3.	CO (S) 28 x 94008	5
4.	CO (S) 28 x CO 775	1

Sorghum varieties under AICSIP multi location trials: Sorghum breeding group of the center is able to identify and develop the following dual purpose sorghum varieties / hybrids through breeding programme in which elite breeding lines and resistant donors were used.

S. No.	Name of the variety	Pedigree	Status	Special features
1.	TNS 598	APK 1 x TNS 291	Under AICSIP breeding trial IVT during 2007 kharif and also in multilocation trial in TNAU Research Stations.	Medium duration (105-110 days) tall growing dual purpose sorghum. Resistant to shootfly and moderately susceptible to stemborer. High grain (4000 kg /ha) and stover yield (12t/ha).
2.	TNS 599	APK 1 x TNS 291		
3.	TNS 603	BSR 1 x VMS 98001		

Sorghum hybrids under multi location trials

S. No.	Name of hybrid	Cross combination	Status	Special features
1.	TNSH 482	ICSA 51 x TNS 30	Under multi location trials in TNAU Research Stations.	Early (100-105 days), tall growing high yielding (5000 kg /ha) hybrids.
2.	TNSH 483	MS 70A x TNS 30		
3.	TNSH 485	ICSA 464 x ICSV 89106		

Sorghum varieties under advanced trials

S. No.	Name of cultures	Pedigree	Status	Special features
1.	TNS 607	CSV15 x TNS 357	Under university variety Trial	Medium duration dual purpose sorghum with high grain and stover yield and resistant to shootfly
2.	TNS 608	CSV15 x SPV 1536		

Palem: Report not received

Udaipur

Dr.V. Sharma:

Germplasm evaluation: This year 60 germplasm lines and 18 recombinant lines received from ICRISAT were evaluated and most promising germplasm lines were identified for earliness, plant height, yield parameters and grain characteristic. For earliness, IS 1724, IS 3159, and IS 21892 were found most promising. For dual-purpose/ grain yield attributes lines identified were IS 1019, IS 11960, IS 19153 and IS 22239 which were found most promising as these lines were comparatively better for grain yield coupled with good plant height and medium maturity. These lines will be utilized in station breeding programme.

New crosses attempted: To incorporate drought resistance, earliness and insect resistance, disease resistance, fresh 13 crosses were attempted. List of parents and new crosses successfully attempted are given in Table 30.

Table30. List of new crosses/ hybrids attempted during kharif 2007

S. No.	Cross / Hybrid
A. Crosses	
1	CSV 17 x SUR 1255
2	SPV x 1730 x SUR 1221
3	SPV 1774 x IS 25071
4	SPV 1772 x IS 13236
5	SPV 772 x IS 9693
6	SPV 1753 -2 x SPV 772
7	SPV 1730 x SUR 1008
8	SPV 1753 x SUR 1255
9	SPV 1616 x IS 13236
10	CSV 17 x SUR 1032
11	SPV 1753 -3 x IS 25071
12	SPV 881 x SUR 1221
13	SPV 1753 x SUR 1008
B. Hybrids	
1.	AKMS 14A x SU 556
2.	AKMS 14 A x SU 663

Twenty nine crosses in F_{1S} were planted to raise their F₂ (Table 31). Selections were made for early, dual purpose plant types with insect/disease resistance from progenies of 16 crosses in F₂, 16 crosses in F₃, 42 crosses in F₄, 5 crosses in F₅, 16 crosses in F₆, 12 crosses in F₇ and 11 crosses in F₈ generation.

Besides these two crosses in F₂, three crosses in F₄ and eight crosses in F₅ generation received from NRCS, Hyderabad under group activity were also evaluated. Further the center has also contributed two crosses in F₂ viz. pb12779 -2 x SPV 1698, ICSV 272 x CSV 17 (Insect resistance crosses) to PI, breeding, NRCS for multilocation evaluation under group activities.

Most promising crosses identified for earliness and dual purpose in different generations were SPV 772 x SPV 1702, SPV 772 x CSV 17, SPV 881 x SPV 1702, EJ 9 x SPV 1430, EJ 9 x (SU 1x S 300), pb 12779-2 x SPV 1698, ICSV 272 x CSV 17, SPV 881 x ICSV 298, SPV 881 x ICSV 272, SPV 772 x IS 40110, SPV 772 x GJ 39, SPV 772 x ICSV 295, Pb 12779-2 x IS 18580, CSV 15 x Raj 18 and SPV 1474 x SU 663 (Table 32).

Among recombinant lines (R x RF₄) most promising were 43175, 43205, 43209 and RMM 1040 as these lines provided more than 100 g grain yield per plant with good ear head length and medium plant height.

Table 31. List of F1s planted in kharif 2007

S. No.	Cross	S. No.	Cross	S. No.	Cross
1.	EC 1600 x SPV 1685	11.	EC 507866 x SU 1251	21.	SU 1205 x SPV 1686
2.	EC 507856 x SPV 1685	12.	EC 507866 x SPV 1685	22.	SPV 1616 x SU 1013
3.	EC 507856 x SU 1140	13.	EC 507866 x CSV 17	23.	SPV 1686 x CSV 17
4.	EC 507856 x CSV 17	14.	SPV 772 x CSV 17	24.	SPV 1702 x SPV 772
5.	EC 507870 x SU 1080	15.	SPV 772 x SPV 1702	25.	SPV 1600 x SU 1008
6.	EC 507870 x CSV 17	16.	SPV 772 x SPV 1754	26.	SPV 1600 x SPV 881
7.	EC 507870 x HC 308	17.	SPV 772 x SPV 1686	27.	SPV 1753 x SU 1248
8.	EC 507870 x SU 1685	18.	SU 1205 x CSV 17	28.	SPV 1753 x SU 1080
9.	EC 507056 a x SPV 1664	19.	SU 1205 x CSV 15	29.	SPV 1753 x SPV 1526
10.	EC 507656 x CSV 15	20.	SU 1205 x SPV 881		

Table 32: List of crosses in different segregating generations (F₂ to F₈) evaluated during kharif2007 at Udaipur

S. No.	Cross	Selection criteria	Number of selections made
A. Crosses in different segregating generations (F₂ to F₇) evaluated			
F₂ Generation			
1	SPV 772 x SPV 1702	Early, tall, dual purpose and Agronomically good segregants	16
2	SPV 772 x SPV 1698	Early, Tall Dual purpose	13
3	SPV 772 x CSV 17	Early segregants for grain purpose	22
4	SPV 881 x SPV 1702	Early, good grain & dual purpose disease resistant segregants	23

S. No.	Cross	Selection criteria	Number of selections made
5	EJ 9 x SPV 1430	Medium tall, early segregants	21
6	EJ 9 x (SU 1 x S 300)	Early dual purpose segregants	20
7	Pb 12779-2 x SPV 1698	Tall, semi compact panicle & disease resistant segregants	20
9	ICSV 272 x CSV 17	Early dual purpose segregants with semi compact panicle	20
10	HC 300 x (mp 1 x rAJ-2)	Tall with good fodder, loose panicle segregants	5
11	IS 18580 x CSV 17	Tall, good fodder loose panicle with foliar diseases free segregants	4
12	S-35 x CSV 17	Early, dual purpose segregants with semi compact panicle	6
13	SPV 772 x IS 18580	Early dual purpose segregants	7
14	EJ-9 x IS 2312	Rejected due to foliar diseases	-
15	HC 308 x (ICSV 272 x SU 663-1)	Rejected due to poor segregants	-
16	HC 308 x CSV 17	Dual purpose mostly fodder type segregants	4
F₃ Generation			
17	CSV 15 x HC 308	Selected early dual purpose segregants	10
18	CSV 15 x IS 40110	Heavy diseases selected only tan types segregants	2
19	CSV 15 x RSSV -9	Good Agronomically superior, early segregants, semi compact panicle	14
20	CSV 17 x IS 40110	Medium tall segregants, with loose panicle	5
21	CSV 17 x EJ 52	Large red panicle, early tan type sergeants	5
22	SPV 1355 x IS 40110	Early dual purpose agronomically good segregants	10
23	SPV 1355 x IS 2312	Rejected due to Heavy diseases	-
24	SPV 881 x ICSV 298	Compact panicle, Good yield potential, Agronomically superior segregants	21
25	SPV 881 x S - 35	Good dual purpose semi compact high yield potential segregants	13
26	SPV 881 x ICSV 272	Early dual purpose segregants with large semi compact panicles	29
27	SPV 1526 x IS 2312	Selected only early, medium tall compact panicle segregants	11
28	SPV 1472 x IS 2312	Dual purpose good cross selected only tan types, insect resistant but need for disease resistance breeding	7
29	SPV 772 x IS 40110	Early dual purpose medium tall segregants	20
30	GGUB 46 x ISSV 298	Early medium dual purpose, good yield potential segregants	12
31	GGUB 46 x ICSV 272	Dual purpose, semi compact, medium tall early segregants	15
32	IS 14296 x ICSV 298	Due to heavy diseases and poor yield potential selected only few segregants	2
F₄ Generation			
33	SPV 772 x GJ 39	Early selection were made for segregants with drought, disease free, good yield potential and plant height (about 250 cm), loose panicle	10
34	SPV 772 x PSV 15	Selected early dual purpose loose panicle sergeants	8
35	SPV 772 x SU 1	Early dual purpose segregants loose panicle	6
36	SPV 772 x Pb 12779	Medium tall segregants	4
37	SPV 772 x ICSV 295	Dual purpose segregants	12
38	SPV 772 x ICSV 298	Dual type, medium tall, agronomically good segregants	10
39	SPV 772 x S 35	Dual type, early agronomically good segregants	10
40	CSV 15 x ICSV 272	Dual type, semi compact panicle, early agronomically good segregants	14
41	CSV 15 x SPV 772	Dual type, good medium early segregants	8
42	CSV 15 x SU 663	Early dual type, agronomically good segregants	10
43	CSV 15 x ICSV 295	Medium tall bold grain segregants with good agronomical background	11
44	CSV 15 x ICSV 298	Early dual type, Agronomically good segregants.	10
45	CSV 15 x S 35	Selected agronomically good segregants	10
46	SU 663 x GJ 39	Early medium dual type segregants	10
47	S 35 x SU 663	Early dual type, segregants with desired yield potential	8
48	SU 663 x SU 658	Early dual purpose segregants	11
49	ICSV 272 x SU 663	Early dual type segregants with semi compact panicle	11
50	ICSV 272 x ICSV 298	Early medium tall, large panicle, good grain yield potential	11
51	ICSV 298 x S 35	Early dual type, compact and robust panicle very good yield potential	10
52	PB 12779 x SU 658	Early tall dual purpose, semi compact panicle	6
53	PB 12779-2 x CSV 15	Tall dual purpose early segregants	8
54	PB 12779 x SU 556	Medium tall segregants	8
55	PB 12779-2 x IS 18580	Early, medium tall dual type segregants	15
56	PB 12779-2 x IS 18662	Early medium tall selected only good sergeants	4
57	SU 658 x SPV 15 71	Pearly white grain, early dual type segregants	6
58	SU 658 x SU 556	Medium tall, compact ear head, pearly white grain segregants	7
59	SU 658 x SPV 1481	Special grain type, dual purpose, with compact panicle	12
60	SU 658 x IS 18662	Selected only medium tall segregants	4
61	SPV 1571 x CSV 15	Early dual purpose, with cone panicle	9
62	SPV 1571 x SU 556	Medium tall segregants	15
63	SPV 1571 x SPV 1481	Medium tall, early dual purpose, large panicle	6
64	SPV 1571 x Raj 18	Early medium tall dual purpose segregants	8
65	SPV 1571 x IS 18580	Selected only early medium tall, dual purpose segregants	4
66	SU 658 x IS 18580	Early medium compact panicle	8
67	CSV 15 x SU 556	Dual purpose segregants	9
68	CSV 15 x SPV 1481	Early medium tall segregants	4
69	CSV 15 x Raj - 18	Early medium segregants	13
70	CSV 15 x IS 18580	Selected only tall dual purpose segregants	5

S. No.	Cross	Selection criteria	Number of selections made
72	CSV 15 x IS 18662	Early tall dual purpose	6
73	SU 556 x SU 1	Early tall dual purpose segregants	7
74	SU 556 x SPV 1481	Medium early agronomically good segregants	8
F₅ Generation			
75	SPV 1514 x Raj 36	Selected only early tall disease free segregants	3
76	SPV 1514 x IS 18580	Selected only agronomically good panicles	4
77	SU 663 x NRCS 328	Selected only early good segregants	5
78	SU 663 x SPV 1518	Selected agronomically good segregants	9
79	SU 663 x Raj 36	Selected early agronomically good segregants	8
F₆ Generation			
80	(SPV 1064 x SU 582) x SU 663	Stabilized lines selection for Station Varietal Trial (SVT) and advancement	3
81	(SPV 1064 x SU 658) x SU 663	Early dual purpose selected for SVT and advancement	6
82	SPV 1518 x SU 663	Good cross selected for SVT and advancement	9
83	SPV 1474 x SU 663	Good cross, tall, early dual purpose segregants for advancement	11
84	SPV 1481 x SU 663	Selected early dual type segregants for advancement	10
85	Pb 12779 x SU 663	Selected early dual purpose segregants for advancement	4
86	SPV 1481 x Pb 12779-2	Selected tall agronomically good segregants for advancement	7
87	SPV 1474 x Pb 12779-2	Provided good insect resistance segregants for advancement	7
88	SU 556 x Pb 12779-2	Selected Early dual purpose segregants for advancement	6
89	SPV 1481 x IS 2122	Early good segregants for advancement	11
90	SPV 1474 x IS 2122	Diseases free, insect resistance, ear head local type, good for fodder	7
91	SU 556 x IS 2122	Selected for SVT, SPT and advancement	9
92	SPV 1481 x IS 18580	Good cross selected for SVT & forage purpose only	4
93	SPV 1474 x IS 18580	Early dual purpose, selected for SVT and advancement	6
94	SPV 1518 x IS 18580	Selected for SVT, SPT and advancement	7
95	SU 556 x IS 18580	Medium tall, selected only tan types segregants	4
F₇ Generation: (Stabilized lines were selected for evaluation in station varietal trials (SVT) and advancement)			others for
96	SPV 1134 X SPV 1329	Selected for SVT and advancement	3
97	SPV 1134 x SPV 1201	Selection for SVT	4
98	SPV 1134 x ICSV 298	Selection for SVT	7
99	SPV 1134 x GM 973445	Selected for SVT and advancement	7
100	SPV 1333 x SPV 1201	Selected for SVT and advancement	3
101	SPV 1333 x ICSV 298	Selected for SVT and advancement	3
102	SPV 1333 x GM 973445	Selected for SVT and advancement	3
103	ICSV 298 x SPV 1329	Selected for SVT and advancement	4
104	ICSV 298 x SPV 1201	Selected for SVT and advancement	7
105	ICSV 298 x GM 973445	Selected bold grain segregants	4
106	SPV 1329 x SPV 1201	Tall dual purpose segregants	8
107	SPV 1329 x ICSV 272	Tall dual purpose segregants	7
F₈ Generation			
108	SU 663 x IS 77029	Selected for SVT and advancement	12
109	SPV 1022 x ICSV 272	Selected for SVT and advancement	5
B. Crosses evaluated in F₅ received from NRCS, Hyderabad under group activities pertaining to dual purpose x drought combination			
This year total rainfall received at the center was 504.7 mm with better distribution. As such there was no critical drought situation. Hence screening for drought under natural condition was not possible, however selection of segregants was made for earliness to escape terminal drought coupled with better agronomical background. Details of cross wise selection are as follows.			
110	CSV 15 X SPV 1474	Tall dual purpose segregants for advancement	16
111	CSV 15 X CSV 17	Early, dual purpose with medium plant height segregants	9
112	C 526 x SPV 1474	Early, dual purpose segregants	6
113	HC 171 X SPV 1474	Tall type, good for forage attributes could be used for single cut forage	5
114	CO 526 x INDORE 12-4	Early, dual purpose segregants	7
115	GJ 38 X INDORE 12	Medium early, dual purpose segregants	5
116	GJ 38 X SPV 1474	Dual purpose type, medium maturing and good plant height (selected for R line)	6
117	PALEM 2 X INDORE 12	Poor cross with respect to grain yield but good attributes for dual purpose	3
124	IS 7310 x SPV 1428 1-12	Selected only agronomically good segregants	10

Station varietal trial: In this trial, 24 test entries developed by Udaipur center were evaluated against three checks viz. CSV 15, Pratap Jowar 1430, and SPV 1616. Entries SU 1270, SU 1271, SU 1259 and SU 1273 provided better grain yield than all the checks. SU 1270 provided 9 to 30 per cent more grain yield than checks, SPV 1616 (9 %), CSV 15 (16 %) and Pratap Jowar 1430 (30 %). SU 1271 provided 8 to 28 per cent more grain yield than checks, SPV 1616 (8 %), CSV 15 (15 %) and Pratap Jowar 1430 (28 %). SU 1259 provided 7 to 27 per cent more grain yield than checks, SPV 1616 (7 %), CSV 15 (13 %) and Pratap Jowar 1430 (27 %). Likewise SU 1273 provided 7 to 25 per cent more grain yield than checks, SPV 1616 (7 %), CSV 15 (12 %) and Pratap Jowar 1430 (25 %). Among these, SU 1271 also provided 15 to 25 per cent more dry fodder yield than checks, Pratap Jowar 1430 (15 %), SPV 1616 (17 %) and CSV 15 (25 %). The

promising entries will be contributed in coordinated grain, dual purpose / forage trials for their evaluation at National level during kharif 2008-09.

Regional varietal trial: The trial was planned for Bhilwara and ATC Chittorgarh beside Udaipur. The trial at Bhilwara could not be planted. In this trial three test entries were evaluated against two checks viz. CSV 15 and Pratap Jowar 1430. At Udaipur, SPV 1685 provided maximum grain yield with reasonably good dry fodder yield, while SPV 1664 provided maximum dry fodder yields.

Station parental trial (SPT): Twenty-two restorer lines developed at our center along with two checks viz., SU 556 and AKR 150 were evaluated in two sets of trials (SPT I and SPT II). Promising restorer lines were identified for utilization as 'R' lines. List of R lines along with observations were recorded for different characters (Table 33 and 34).

Maintenance of A B lines: AKMS 14A & AKMS 14B, were also planted for their maintenance.

Table 33: Station Parental Trial – I kharif 2007.

S.No.	SU No.	Pedigree	Days to 50% flowering	Days to maturity	Plant height (cm)	Grain yield/plant (g)	Rank
1.	SUR 1008	(IRAT 204 x SPV 1072-1)	54	91	160	88	6
2.	SUR 1013	(ICSV 298 x SPV 1329.2)	60	93	230	92	5
3.	SUR 1032	(SPV 1290 x SU 582-5)	53	89	163	64	12
4.	SUR 1033	(IS 23401 x Pb 12779-2-2)	60	93	162	84	7
5.	SUR 1219	(SU 556 x IS 18580)	56	92	170	70	11
6.	SUR 1221	(SPV 1209 x Pb 12779.2)	57	92	250	136	1
7.	SUR 1248	(SU 658 x SU 556)	61	95	290	48	13
8.	SUR 1249	(SU 663 x NRCS 328)	62	95	170	116	2
9.	SUR 1255	(GJ 38 x CSV 17-2)	64	91	230	80	10
10.	SUR 1256	(GJ 38 x CSV 17-3)	59	93	112	28	14
11.	SUR 1257	(GJ 741 x Indore 12)	59	94	193	100	4
12.	SUR 1258	(SU 663 x IS 10551)	53	89	190	82	8
13.	SU 556	Check	54	89	180	106	3
14.	AKR 150	Check	54	89	165	82	9

Table 34: Station Parental Trial - II kharif 2007

S.No.	SU No.	Pedigree	Days to 50% flowering	Days to maturity	Plant height (cm)	Grain yield g/plant	Rank
1.	SUR 1307	(SU 663 x Raj 36)	53	88	150	106	2
2.	SUR 1308	(SU 556 x PB 12779-1)	63	94	140	86	6
3.	SUR 1309	(SU 556 x PB 12779-2)	64	95	150	96	4
4.	SUR 1310	(SU 556 x IS 2122-1)	61	94	225	106	2
5.	SUR 1311	(SU 556 x IS 2122-2)	59	92	245	108	1
6.	SUR 1312	(SPV 1134 x GM 973445)	59	93	250	102	3
7.	SUR 1313	(SPV 1333 x SPV 1201-1)	61	93	245	102	3
8.	SUR 1314	(SPV 1333 x SPV 1201-2)	61	93	167	78	8
9.	SUR 1315	(SPV 772 x ICSV 272-1)	59	92	200	84	7
10.	SUR 1316	(SPV 772 x ICSV 272-2)	53	88	195	50	9
11.	AKR 150	Check	58	92	155	88	5
12.	SU 556	Check	59	94	190	78	8

Breeder seed production and maintenance of nucleus seed:

(A) As per the indent, breeder seed production programme of SU 556 /SPV 1430 (Pratap Jowar 1430) and CSV 15 was under taken successfully at RCA, Udaipur.

(B) Nucleus seed of varieties viz. CSV 10, CSV 17, Pratap Jowar 1430 (SU 556), AKR150, AKMS 14A & B, SPV 96, SPV 245, Rajasthan Chari-1 & Rajasthan Chari-2 was also undertaken successfully. (C) Seed multiplication of 25 promising entries developed by our center was taken in off-season nursery at Warangal, (AP) during rabi 2007-08.

Mouranipur: Report not received.

3. Achievements in sorghum breeding at NRCS

During 2007 kharif, we worked for genetic diversification for biotic stresses, yield improvement and basic studies on genetics of high sugar content in sweet sorghum (reported under sweet sorghum section). We developed shootfly (SF) and grain mould (GM) tolerant material, and high yielding hybrids and varieties. Detailed achievements are given below.

Genetic diversification for Biotic stresses

Shootfly resistance (Drs. Aruna, Padmaja & Bhagwat): Eighty six breeding nursery lines out of 430 (F_4 and F_6 derivatives of the crosses between elite x resistant source) were found to show less than 40% deadhearts at 28 days after emergence under late sowing conditions, against that of elite lines, 27B and 296 B (90% and 84% deadhearts respectively), and that of resistant check, IS 18551 (35% DH). Also, 432 RILs population of the cross 27B x IS 2122 was evaluated for SF deadhearts and traits associated with resistance. Frequency distribution showed normal distribution for the traits associated with SF resistance. Twenty RILs were found promising with less than 50% deadheart percentage (37.9 to 48.6% DH), where as the resistant check, (IS 18551) showed 34% and the susceptible check, (DJ 6514) showed 87% of SF incidence. The resistant parent used in the RIL population, IS 2122 recorded 48% DH while the other parent, 27B showed 78% DH. In the line improvement of 27B for SF resistance programme, six derivatives, one in BC_1F_3 , four in BC_1F_4 and one in BC_3F_2 recorded less than 50% DH, where as the parent, 27B showed 83% deadhearts.

Grain mould resistance (Drs. Audilakshmi, IK Das, Nageshwara Rao): Phenotyping of 218 RILs (213 RILs + 2 parents + 3 checks) for GM resistance and traits associated with resistance was carried out. Data on glume colour, glume cover, panicle shape and days to flowering was recorded. The glume cover varied from 50 to 90% and glume colour ranged from straw to black. The frequency distribution of FGS in the population followed a normal distribution. Over two years, superior RILs 25, 92, 124, 139,158, 170 and 209 for grain mould resistance were identified showing FGS 1.5-1.7 at physiological maturity and 2.2-3.0 at harvest maturity as compared to the checks: resistant B58586 showing FGS 1.45 at PM and 2.27 at HM and susceptible 296 B recording FGS 4.03 at PM and 5.00 at HM. 250 S₂s from B line random mating population were evaluated for GM reaction and 110 entries recorded resistant reaction when observed at physiological maturity stage. At harvest maturity, 36 S₂s recorded an average mould rating of 2.6 on 1 - 9 scale where the susceptible check, Bulk Y recorded 8.3 and resistant checks, IS 14332 and B 58586 recorded 3.2 and 3.33 respectively. Mean performance of the S₂ population was reduced to 6 as against 7.9 of S₁ population.

Genetic enhancement for yield and associated traits

Development of superior R lines: Development of A₁ restorers (Drs. Aruna and Audilakshmi) Evaluation of 65 new R (restorers) lines for agronomic traits showed that the R lines, CB 84, and CB 439 were superior with significant improvement in grain and fodder yields and brix over C 43. Six R lines were found to be significantly superior to C 43 (450g/plant) for green fodder yield. CB 439, with fodder yield of 750 g/plant was the best R line. Twenty five R lines showed significant superiority over C 43 (12.1%) for brix. CB 443 and CB 328 showed highest brix of 18%. Nine R lines recorded significantly higher grain yield over C 43 (77 g/plant). CB 84 (125 g/plant) was the best among all the lines for grain yield. Initiated crossing among elite R x R lines from different sources to diversify the genetic base of restorers and 20 F₁s were produced by crossing diverse restorers.

Development of A Restorers (Dr. SL Kaul): The promising fertile lines developed on A₂ cytoplasm which were in advanced generation (F_6) were again crossed with unrelated A₂ CMS lines, and F₁ crosses were raised and advanced to F₂. These F₂'s were evaluated in large population (approximately 1000 plants/ each line) for agronomic superiority and GM reaction. One hundred and nine promising and fertile plants in high agronomic back ground were selected. The grain yield ranged from 78g to 104g/plant in these crosses. The tolerance to GM was higher as GM score ranged from 4 to 5 compared 7 to 8 in checks, (RS 627, RS 673, I 12) in the scale of 1 to 10 where 1 is highly resistant and 10 is highly susceptible.

Development of superior MS lines (Drs. Audilakshmi and Aruna): Fifty superior MS lines from last year's results were re-evaluated along with the checks in RCBD for grain yield, cane yield and other agronomical traits. These 50 MS lines ranged from 56 to 69 days for days to flowering, varied from 103 -223 cm for plant height and 26 to 36 cm for panicle length. Forty two MS lines showed grain yield on par and six B lines were significantly superior to 296 B for grain yield. MS lines showing significantly superior grain yield are BX 3175 (85.5 g/plant), BX 3219 (80.2), CB 175 (80.8g/plant), BX 3059 (65.6), BX 280 (67.2 g/plant), CB 176 (67.2 g/plant). Thirty lines were on par with RSSV 9 for % brix and six MS lines showed brix of 17.1 to 19.1 % against 19.6 % of RSSV 9. Superior MS lines for high brix were BX 3021(17.7 %), BX 514(19.1%), BX 3215(18.2%), CB 166(17.1%), CB 202 (17.5%) and CB 386 (19.1%). Only one MS line, CB 201 (496 g/plant) was statistically on par with RSSV 9 (504 %) for cane yield. One hundred and twenty five MS lines along with the check were advanced from BC₂ to BC₃. Six superior entries were BC 25x26 (27 B x 200 B), BC 47x48 (422B x LR 92 -21), BC 61 x 62 (NR 486 x 422 B), BC 111x 112 (27 B x C 43), BC 147 x 148 (463 B x NR 27) and

BC 234 x 235 (27 B x IS 19150) x 27 B}. Initiated B x B crosses for development of improved B lines and developed 20 F₁'s between good combiners and SF/GM resistant lines.

Developing superior varieties and hybrids (Drs. Umakanth, SL Kaul, Aruna and Audilakshmi): We have developed seven superior hybrids and 11 varieties for grain and stover yield.

Hybrids based on new R lines: In the hybrid trial, 25 hybrids based on 16 new R lines were evaluated. Three hybrids, 153A x R87, 2295A x R436, and 257A x R84 recorded 14.9, 14.1 and 9.04% increase in yields over the check, CSH 23 (3992 kg/ha).

Hybrids based on new MS lines: Twenty five hybrids based on seven MS lines and one check, CSH 23 were evaluated in RCBD for grain yield and other agronomic traits. Three hybrids namely 229 A x R 432, 151 A x R 426 and 249 A x R 424 showed 14, 11 and 7 % increase over the check, CSH 23 (3882 kg/ha) for grain yield. The hybrid, 151 A x R 426 was earlier than CSH 23 by 4 days. Another four hybrids were numerically on par with the check, CSH 23 for grain yield. The high yielding hybrid, 229 A x R 432 was very tall (303 cm).

Developing A₂ hybrids: Thirty A₂ hybrids based on six CMS of A₂ cytoplasm along with four checks (CSH14, CSH16, CSH18, and CSH 23) were evaluated in RBD in three replications for fertility reaction and agronomic characters. Eight hybrids were found to be fertile. The hybrid, RS 115A₂x K101 was high yielding (95.7g/plant) and exhibited 17% higher grain yield than check hybrid, CSH 18 (82g/plant). The hybrid was tall (206 cm) and of medium maturity. The mid – tall hybrids RS74A₂x K105, RS115A₂x K105, RS1096A₂x K150 and RS 1182A₂x K150, were also high yielding and registered 15 -27% increase in grain yield.

Dual-purpose varieties: (M 11 x B 35)-1-1-2-1 was the highest yielding dual-purpose genotype with a grain yield of 2282 kg/ha and fodder yield of 133 q/ha. It recorded 19% numerical superiority for grain yield and 151% significant superiority for fodder yield over the check, SPV 1616 (1914 kg/ha grain and 53 q/ha fodder). The next best progenies which registered a numerical superiority of 11-17% over SPV 1616 for grain yield were viz., (Palem 2 x SPV 1474)-7-1-1-1, (M 11x B 35)-1-1-2-2, (SPV 1022 x CSV 17)-1-1-3-1, (GJ 38 x SPV 1474)-7-1-1-1, (GJ 38 x Indore 12)-2-1-2-1, (GJ 38 x Indore 12)-2-1-3-1, and (HC 260 x B 35)-2-2-1-5. (M 11x B 35)-1-1-2-2 and (HC 260 x B 35)-2-2-1-5 recorded significant superiority of 140% and 120% over the check, SPV 1616.

Brown midrib genotypes: Four promising genotypes, numerically superior to the check, SPV 1616 for grain yield were (Palem 2 x IS 21889)-2-1-2-1 (40%), (Palem 2 x IS 21891)-1-1-1-1 (27%), (COS 28 x IS 21891)-7-2-3-1 (20%) and (CSV 15 x IS 21891)-1-1-3-1 (11%). Variety (COS 28 x IS 21891)-7-2-3-1 recorded a significant superiority of 74% for fodder yield over the check. The promising genotypes which exhibited significant superiority for fodder yield over the check, SPV 1616 were (PC 5 x IS 21888)-8-1-2-1 (87%), (PC 5 x IS 21888)-5-1-1-1 (65%) and (SPV 462 x IS 21891)-3-1-2-1 (59%).

Two varieties out of 13 showed significant superiority for grain yield over SPV 1616. BN14 and BN166 recorded 124g/plant and 111 g/plant against 97 g/plant of SPV 1616.

Genetic improvement of multi-cut sorghum (Dr. V Bhat): A total of 30 hybrids were evaluated in augmented design (2 rows of 4m each) for green fodder yield and associated traits. None of the hybrids exceeded the check HC 308 for green fodder yield. The top five hybrids recorded a green fodder yield of 430 to 570 g per plant when cut at 70 days after planting.

A total of 20 genotypes were evaluated in RCBD with three replications with two rows of 4m each per replication. Data were recorded at 70 days after sowing. None of the genotypes exceeded the check SSG 59-3 and HC 308 for plant height. PCD 9 recorded a leaf:stem ratio of 0.43 while NSSA 1005A₂ x RSSV-4 showed the ratio at 0.36, both being superior to check, SSG 59-3. Highest green fodder yield was recorded in PL-9 (871.33g) compared to control HC 308 (802.44g). The advanced progeny of the NSS 1005A₂ X RSSV-4 cross also showed more fodder yield than the multi-cut checks, SSG 59-3 and CSH 20MF.

Marker-assisted selection for sorghum improvement (Dr. R Madhusudhana):

Mapping populations for genetic linkage map and QTL identification

- a) Shoot fly:
 - 296B (susceptible) x IS 18551(resistant) population: 350 F₇ RILs are maintained.
 - 27B (susceptible) x IS 2122 (resistant) population: 434 F₇ RILs are available.

- b) Grain mould: 296B (susceptible) x B58586 (resistant) population : 223 F₇ RILs are available
- c) Terminal drought and other rabi traits: M35-1 x B35 population - A recombinant inbred population with 500 F₇ generation is available.

Marker-assisted improvement of elite sorghum parents Under this programme, improvement of popular kharif seed parent 296B for shoot fly tolerance, and rabi cultivar M35-1 for staygreen trait were targeted through marker-assisted backcrossing using donor IS18551 (for shoot fly) and B35 (for staygreen). A total of six BC₂F₁s of ((296B x IS18551) x 296B) and 23 BC₂F₁s (((M35-1 x B35) x M35-1) x M35-1) were developed using 296B and M35-1 as recurrent parent. The material will be advanced to BC₃F₁s and BC₂F₂s and foreground and background selection will be done to identify the backcross progenies similar to the recurrent parents with introgressed genomic segment from the donor parents.

4. Publications

NRCS

- Aruna, C. and Audilakshmi, S. 2008. A strategy to identify potential germplasm for improving yield attributes using diversity analysis in sorghum. *Plant Genetic Resources*. Accepted. (MS 23-07).
- Elangovan M., Prabhakar, and D. Chandra Sekara Reddy, 2006. Variability in post rainy (*abi*) collections of sorghum [*Sorghum bicolor* L. Moench] from India. *J. Res. ANGRAU*: 34(2) 85-90.
- Elangovan M., Prabhakar, and D. Chandra Sekhara Reddy, 2006, Characterization and evaluation of sorghum germplasm from Maharashtra, India, *PKV Res. J.* 30 (1):1-5
- Jhansi Rani, K. Rana, B.S., Swarnalata Kaul, Rao, S.S. and Ganesh, M. 2007. Genetic analysis of certain morpho-physiological characters in rabi sorghum. *Indian Journal of Genetics and Plant Breeding*. Accepted.
- Madhusudhana, R., Padmaja, P.G., Satish, K., Murai Mohan, S., Srinivas, G. and Nagaraja Reddy, R. 2007. Heterosis for shoot fly (*Atherigona soccata* (Rondani)) resistance in sorghum. *Indian Journal of Genetics and Plant Breeding*. Accepted.
- Prabhakar, SS Rao. IK Das and MS Raut, 2006. New early maturing elite lines with drought tolerance. *Jowar Samachar*, Vol. 2, No.1:4-6

Coimbatore

- Karthikeyan, M., Sandoskumar, R., Radhajayalakshmi, R., Mathiyazhagan, S., Khabbaz, S.E., Ganesamurthy, K., Selvi, B., and R. Velazhahan, 2007. Effect of formulated Zimmu (*Allium cepa* L. x *Allium Sativum* L.) extract in the management of grain mould of sorghum. *J. sci Food Agric*: 87 : 2495- 2501.
- Deepalakshmi, A.J. and K. Ganesamurthy. 2007. Studies on genetic variability and character Association in kharif sorghum (*Sorghum bicolor* (L) Moench.). *Indian J. Agric. Res.*, 41(3) :177-182.

Akola

- H. G. Kandalkar and U. B. Men (2007) : Reaction of some sorghum elite lines and some Nursery lines against shootfly and stem borer. *PKV Res Journal* 31 (2): 309-312.
- H. G. Kandalkar U. B. Men and P.A. Kahate (2007) : Development of Some Advancces sorghum cultivars and Genotypes for resistance to shoot pests . *PKV, Res J* 31 (2) : 315-316.
- Bansode S.M., Naik R.M., Mehetre S.S Dalvi U.S. and Dethe A.M. 2007. Diversity analysis of commercial sugarcane varieties based on RAPD Markers *International Journal of Tropical Agriculture*, 25(1-2): 231-235.
- Patil S.P., Manjare M.R., Kamdi S.R., Dethe A.M. and Ingale M.N. 2007. Stability analysis in sorghum (*Sorghum bicolor* L. Moench). *International Journal of Plant Sciences*, 2(2): 70-75.
- R. B. Ghorade and Dipali V. Ghive (2007) : Heterosis studies in Sorghum , *Asian Journal of Bioscience*, Vol2 (1): pp 200.
- U. V. Patil, R. B. Ghorade, A.B. Bagade and P. N. Mane (2008) .*Annals of Plant Physiology* (Accepted for publication)

Udaipur

- Singh, P. Sumeriya, H.K., Sharma, V. and Chhipa, K.G. 2007. Study on the effect of integrated nutrient management on promising forage sorghum genotypes SU 1080: In International symposium on organic farming and renewable sources of energy for sustainable agriculture. Organized by PROM society, MPUAT and MLSU, Udaipur. Held on November 19-21, 2007 pp 122.

B. Multi-location AICSIP trials

Kharif

During 2005 kharif, three trials were conducted viz. Advanced Varietal and Hybrid Trial (AVHT), Initial Varietal Trial (IVT), and Initial Hybrid Trial (IHT).

Advanced Varietal and Hybrid Trial (AVHT)

(Tables 35 to 37): In this combined trial of varieties and hybrids, 11 varieties and four hybrids, nine varieties and five hybrids, and 10 varieties and five hybrids and 13 varieties were evaluated along with the checks in Zone I, Zone II, and Zone III respectively.

Zone I (Table 35)

Days to flowering- In this zone, varieties flowered between 56 and 73 days. Among test hybrids, the flowering ranged from 59 to 72 days. None of the test varieties or hybrids were earlier than the checks, CSV 17 (56 days) and CSH 23 (59 days).

Plant height- The plant height ranged from 136 to 265 cm, SPV 1774 being the tallest.

Grain yield- SPH 1596 out yielded the check, CSH 18. SPH 1596 yielded 4357 kg/ha against 3801 kg/ha of the check, CSH 18. None of the varieties were superior to the check, SPV 462.

Fodder yield- SPV 1774 recorded maximum fodder yield of 18410 kg/ha as compared to 18164 kg/ha of SPV 462(check). Among hybrids, CSH 18 recorded highest fodder yield of 16430 kg/ha and test hybrid, SPH 1596 recorded 16342 kg/ha.

Grain size CSH 16 was the most bold grain type recording 30 g/1000 grain as test weight followed by SPV 1775 showing 28 g/1000 grain.

Remark s- SPH 1596 was superior to CSH 18 by 15% for grain yield and on par for fodder yield. None of the varieties were superior for grain yield to the check, SPV 462. SPV 1774 recorded highest fodder yield of 18410 kg/ha.

Table 35. Performance of advanced varietal & hybrid trial (AVHT) -Zone I during kharif 2007

S. No.	Entry	Location	Grain yield kg/ha	R	% \pm over check	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
					CSH 18						
1	SPH 1596	MAHODAYA HYBRID	4357	1	14.6	16342	12	66	106	196	28.6
2	CSH 18		3801	2	0.0	16430	11	72	110	202	24.7
3	CSH 16	NRCS	3780	3	-0.6	16262	13	65	104	186	30.3
4	CSH 23	NRCS	3413	4	-10.2	14697	14	59	100	171	27.9
5	SPV 462		4498	1	0.0	18164	4	71	109	218	27.0
6	SPV 1746	Dharwad	3891	2	-13.5	17654	6	73	111	194	23.6
7	SPV 1733	SR 666-1	3869	3	-14.0	16955	8	72	110	201	25.6
8	CSV 15	NRCS	3788	4	-15.8	17593	7	71	109	222	25.3
9	SPV 1616	NRCS	3566	5	-20.7	18165	3	71	110	241	29.1
10	Local Check		3633	6	-19.2	16440	10	68	108	246	23.5
11	SPV 1742	NRCS Elan	3340	7	-25.7	16709	9	72	111	174	26.3
12	SPV 1600	Dharwad	3084	8	-31.4	18213	2	72	110	243	25.3
13	SPV 1774	UDAIPUR	3070	9	-31.7	18410	1	70	107	265	27.3
14	SPV 1775	UDAIPUR	3002	10	-33.3	18130	5	71	108	256	28.1
15	CSV 17		2341	11	-48.0	11368	15	56	97	136	23.8
	LOC. MEAN		3562			16769		69	107	210	26.4
	C.D. (5%)		1167			3235		4	5	35	4.2
	C.D. (1%)		1619			4364		5	7	47	5.7
	C.V. (%)		15.27			11.54		3.52	2.86	10.02	9.50

Zone II (Table 36)

Days to flowering- In this trial, flowering ranged from 63 to 78 days. The varieties which were earlier to CSV 15 were SPV 1774, SPV 1786, and SPV 1616. Among hybrids, SPH 1567 took 75 days to flower as against 71 days of CSH 16, check.

Plant height- Plant heights in this trial varied from 145 to 276 cm, tallest being SPV 1774.

Grain yield- SPH 1567 out yielded all the hybrids, and in varieties, SPV 462 (check) out yielded all the varieties. SPH 1567 recorded 5260 kg/ha of grain yield against 4961 kg/ha of CSH 16 (check). Among the varieties, SPV 1786 recorded 7% higher grain yield compared to CSV 15, the check.

Fodder yield- Variety SPV 1774 yielded highest fodder of 14332 kg/ha. SPH 1567 yielded 12478 kg/ha of fodder as against 10613 kg/ha of CSH 16.

Grain size CSH 23 and CSH 16 showed maximum grain weight of 27 g/1000 grain. The variety SPV 1774 recorded 26 g/ 1000 grain against 25g of CSV 15 (check).

Remarks- SPH 1567 recorded high grain and fodder yields as compared to the check, CSH 16. SPH 1567 recorded 5260 kg/ha of grain and 12478 kg/ha of fodder yield as against 4961 kg/ha of grain and 10613 kg/ha of fodder of CSH 16.

Zone III (Table 37)

Table 37: Days to flowering- Among the hybrids and varieties tested, flowering ranged from 62 to 79 days, the earliest being the check, CSV 17.

Plant height- Test varieties varied for plant height from 141 to 257 cm.

Grain yield- Two test hybrids were numerically superior to the check, CSH 18. SPH 1596 and SPH 1587 recorded 3451 and 3248 kg/ha of grain yield as against 3001 kg/ha of CSH 18. SPV 1733 was numerically superior to the check, SPV 462.

Fodder yield- SPV 1774 was highest yielder of fodder (20420 kg/ ha) as against 17835 kg/ha of CSH 18. Among the hybrids, the check hybrid, CSH 18 yielded maximum fodder followed by SPH 1596 (16830 kg/ha).

Remarks- SPH 1596 and 1587 recorded 15% and 8 % increase for grain yield over CSH 18. SPV 1733 was numerically superior to the check, SPV 462.

Initial Varietal Trial

(Tables 38-40): In this trial, 16 test entries and four checks were evaluated in each zone. Zone wise results are described below.

Zone I (Table 38)

Days to flowering- The varieties ranged for flowering from 53 to 72 days.

Plant height- Plant height varied from 113 to 188 cm.

Grain yield- One variety viz. SPV 1816 was numerically superior for grain yield over the check, SPV 462. SPV 1860 yielded 6483 kg/ha of grain against 6393 kg/ha of SPV 462 (check).

Fodder yield- SPV 1820 recorded highest fodder yield of 19142 kg/ha followed by SPV 1821 with 19107 kg/ha as against 15410 kg/ha of SPV 462, the check.

Grain size SPV 1810 showed maximum grain weight of 30 g/1000 grain as against 26 g of SPV 462.

Remarks- The variety SPV 1816 which topped for grain yield recorded less fodder yield as compared to SPV 462.

Zone II (Table 39)

Days to flowering- The test varieties showed large variation for flowering (73 and 84 days).

Plant height- The varieties showed plant heights ranging from 144 to 318 cm.

Grain yield- Two varieties SPV 1816 and SPV 1808 showed 12% and 6 % superiority over the check, CSV 15. CSV 15 yielded 3820 kg/ha of grain yield.

Fodder yield- SPV 1821 out yielded CSV 15 for fodder yield by yielding 15057 kg/ha against 12563 kg/ha.

Grain size SPV 1815 was having highest grain size of 33 gm/1000 grain.

Remarks- SPV 1808 was the dual purpose variety which showed higher grain and fodder yields.

Table 36. Performance of advanced varietal & hybrid trial (AVHT) – Zone II during kharif 2007

S. No	Entry	Location	Grain yield kg/ha	R	% ± over check	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
					CSH 16						
1	SPH 1567	Parbhani	5260	1	6.0	12478	4	75	112	206	23.4
2	CSH 16	NRCS	4961	2	0.0	10613	1 2	71	110	195	26.8
3	CSH 23	NRCS	4751	3	-4.2	9468	1 4	66	106	177	27.3
4	CSH 18	CSH 18	4718	5	-4.9	11910	8	75	111	209	23.8
5	CSH 16	NRCS	4423	7	-10.8	9955	1 3	70	110	190	27.0
					CSV 15						
6	SPV 462	SPV 462	4749	4	19.3	12276	5	76	111	228	25.4
7	SPV 1616	NRCS	4491	6	12.8	13014	3	75	112	248	26.8
8	SPV 1786	Akola	4241	8	6.5	12183	6	75	112	234	23.0
9	CSV 15	NRCS	3981	9	0.0	11390	9	76	112	223	25.0
10	SPV 1746	DSV 6	3959	10	-0.6	12020	7	78	114	202	23.6
11	Local ch#	Local check	3907	11	-1.9	11313	1 0	77	114	216	26.3
12	SPV 1774	Udaipur	3863	12	-3.0	14322	1	74	111	276	26.1
13	CSV 17	CSV 17	3845	13	-3.4	7898	1 5	63	103	145	23.9
14	SPV 1600	SPV 1600	3546	14	-10.9	13792	2	77	114	251	24.7
15	SPV 1742	NRCS Elan	3362	15	-15.5	10765	1 1	77	114	178	24.5
	L. MEAN		4270			11560		74	111	212	25.2
	C.D. (5%)		763			3028		3	2	16	3.3
	C.D. (1%)		1010			4030		4	3	21	4.4
	C.V. (%)		18			16.87		4.25	2.21	8.79	11.46

Table 37. Performance of advanced varietal & hybrid trial (AVHT) – Zone III during kharif 2007

S. N	Entry	Location	Grain yield kg/ha	R	% ± over check	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
1	SPH 1596	MAHODAYA HYBRID	3451	1	15.0	16830	13	72	109	186	27.1
2	SPH 1587	Kaveri Seeds	3248	2	8.2	16625	14	72	110	202	28.7
3	SPH 1342	CSH 23	3228	3	7.6	13722	18	67	103	182	26.7
4	CSH 18	Indore	3001	4	0.0	17659	8	79	115	203	27.4
5	CSH 16	NRCS	2911	5	-3.0	14776	16	72	108	179	29.1
6	CSH 16	NRCS	2857	6	-4.8	15482	15	70	109	194	26.6
7	Local Check		2832	1	5.9	17267	10	76	115	239	34.9
8	CSV 17	UDAIPUR	2822	2	5.6	11915	19	61	96	141	23.3
9	SPV 1733	Surat	2749	3	2.8	17835	7	78	111	203	27.3
10	SPV 462	Coimbatore	2673	4	0.0	16876	12	75	109	208	28.6
11	SPV 1600	Dharwad	2653	5	-0.7	19983	2	76	111	224	28.3
12	SPV 1746	Dharwad	2624	6	-1.8	17356	9	78	115	211	28.2
13	SPV 1616	NRCS	2585	7	-3.3	18463	6	77	109	223	26.6
14	SPV 1786	Akola	2526	8	-5.5	17161	11	78	112	222	25.2
15	CSV 15		2476	9	-7.4	19376	4	78	110	227	27.4
16	SPV 1742	NRCS, Elan	2290	10	-14.3	14338	17	78	112	175	27.3
17	SPV 1730	Surat	2268	11	-15.2	19203	5	77	111	257	27.5
18	SPV 1775	Udaipur	2252	12	-15.8	19554	3	77	114	231	30.9
19	SPV 1774	Udaipur	2071	13	-22.5	20420	1	79	115	251	28.5
	LOC. MEAN		2711			17097		75	110	208	27.9
	C.D. (5%)		650			5480		4	6	25	1.8
	C.D. (1%)		863			7298		6	9	34	2.4
	C.V. (%)		19.03			18.92		4.18	4.40	10.59	3.60

Table 38. Performance of Initial varietal trial (IVT) - Zone I during kharif 2007

S N	Entry	Location	Grain yield kg/ha	R	% \pm over check	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
					SPV 462						
1	SPV 1816	Coimbatore	6483	1	1.4	13403	19	66	103	225	26.8
2	SPV 462		6393	2	0.0	15410	13	67	104	227	26.1
3	SPV 1817	Coimbatore	6168	3	-3.5	18438	4	64	101	237	27.0
4	SPV 1818	Parbhani	6029	4	-5.7	15673	9	68	105	262	25.6
5	SPV 1820	Indore	6015	5	-5.9	19142	1	69	106	270	27.3
6	SPV 1811	Akola	5968	6	-6.6	16719	5	67	105	235	26.8
7	SPV 1807	Surat	5297	12	-17.1	15193	14	65	102	242	25.7
8	SPV 1808	Udaipur	5117	13	-20.0	15516	11	68	104	254	24.6
9	SPV 1809	Udaipur	5681	9	-11.1	16016	6	68	105	253	26.5
10	SPV 1810	Akola	3432	18	-46.3	15981	7	72	109	259	29.4
11	SPV 1812	Akola	5680	10	-11.2	14467	18	67	103	242	25.1
12	SPV 1813	Dharwad	4751	14	-25.7	14717	15	69	106	224	30.1
13	SPV 1814	Dharwad	5300	11	-17.1	14487	17	69	106	171	29.5
14	SPV 1815	Dharwad	4434	15	-30.6	15571	10	69	106	170	29.6
15	CSV 15		5843	7	-8.6	15420	12	68	104	249	25.4
16	CSV 17		3147	19	-50.8	11179	20	53	95	162	27.8
17	Local ch#		5806	8	-9.2	14527	16	66	103	243	25.9
18	SPV 1827	Parbhani	4274	17	-33.1	15948	8	67	104	250	28.0
19	SPV 1819	Indore	4430	16	-30.7	18619	3	72	107	280	27.0
20	SPV 1821	NRCS Elan	1548	20	-75.8	19107	2	60	98	322	27.9
	LOC. MEAN		5090			15777		67	104	239	27.1
	C.D. (5%)		542			3097		2	4	46	7.0
	C.D. (1%)		725			4233		3	6	63	9.5
	C.V. (%)		6.44			9.38		1.59	1.95	9.18	12.27

Table 39: Performance of initial varietal trial (IVT) – Zone II during kharif 2007

S. N	Entry	Location	Grain yield kg/ha	R	% \pm over check	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
					CSV 15						
1	SPV1816	Coimbatore	4290	1	12.304	12149	15	77	116	245	29.5
2	SPV1808	Udaipur	4064	2	6.3874	14137	5	76	115	242	27.0
3	SPV 462	SPV 462	4038	3	5.7068	12580	12	76	115	237	27.3
4	SPV1813	Dharwad	3924	4	2.7225	12200	14	79	117	225	29.6
5	SPV1812	Akola	3920	5	2.6178	13947	6	76	115	238	28.7
6	CSV 15	CSV 15	3820	6	0	12565	13	76	116	237	28.0
7	SPV1819	Indore	3796	7	-0.6283	14880	2	84	122	256	29.2
8	SPV 1817	Coimbatore	3668	8	-3.9791	13456	8	75	112	255	25.8
9	SPV1811	Akola	3644	9	-4.6073	13271	9	75	114	253	26.7
10	SPV1818	Parbhani	3584	10	-6.178	14152	4	77	117	263	27.8
11	SPV1807	Surat	3506	11	-8.2199	13191	10	73	112	260	27.2
12	SPV1814	Dharwad	3444	12	-9.8429	9754	18	79	118	146	32.4
13	Local ch#	Local check	3396	13	-11.099	11484	17	82	121	242	25.8
14	SPV1815	Dharwad	3348	14	-12.356	9692	19	79	118	144	32.7
15	SPV1820	Indore	3295	15	-13.743	13789	7	78	117	236	30.2
16	CSV 17	CSV 17	3294	16	-13.77	7969	20	61	101	152	25.3
17	SPV1809	Udaipur	3126	17	-18.168	12639	11	77	116	254	26.9
18	SPV1827	Parbhani	3081	18	-19.346	12069	16	80	120	243	29.7
19	SPV1810	Akola	2988	19	-21.78	14264	3	82	119	267	29.6
20	SPV1821	NRCS Elan	2456	20	-35.707	15057	1	74	112	318	31.2
	LOC. MEAN		3550					77	116	235	28.5
	C.D. (5%)		640					4	4	17	3.4
	C.D. (1%)		850					5	5	23	4.6
	C.V. (%)		14.14					4.13	3.03	6.42	7.03

Zone III (Table 40)

Days to flowering- Large variation for flowering was observed which ranged from 70 to 82 days.

Plant height- Maximum plant height of 339 cm was observed in SPV 1821.

Grain yield- None of the varieties out yielded SPV 462, check.
Fodder yield- Most of the test varieties were superior over the check, SPV 462 for fodder yield. SPV 1821 recorded highest fodder yield of 25873 kg/ha, whereas SPV 462 (check) recorded 19491 kg/ha.
Grain size Maximum grain size of 30 gm/ 1000 grain was recorded by SPV 1818.
Remarks- Varieties recording high fodder had less grain yield.

Initial Hybrid Trial

(Tables 41-43): In this trial, 16 hybrids and four checks were evaluated in RCBD for grain and fodder yields and other agronomic traits.

Zone I

(Table 41)

Days to flowering- Flowering in hybrids ranged from 51 to 67 days. CSH 18, the check matured in 104 days.
Plant height- Plant height among hybrids tested varied from 173 to 278 cm.
Grain yield- Nine hybrids were significantly superior to CSH 18, the check, for grain yield. SPH 1616 (6293 kg/ha) and SPH 1606 (6279 kg/ha) ranked 1st and 2nd for grain yield, where as the check, CSH 18 yielded 4941 kg/ha of grain yield.
Fodder yield- SPH 1608 yielded highest fodder of 18589 kg/ha followed by SPH 1603 which yielded 18569 kg/ha against 16475 kg/ha of CSH 18, the check.
Grain size Maximum grain size of 36 g/ 1000 grain was recorded by SPH 1608 against 25 g/1000 grain of CSH 18.
Remarks- SPH 1604 and SPH 1610 showed both high grain and fodder yields.

Zone II (Table 42)

Days to flowering The flowering in hybrids ranged from 59 to 73 days. SPH 1602 was earliest and took only 59 days.
Plant height- Plant height varied from 170 to 277 cm.
Grain yield- The hybrids, SPH nos 1610, 1611, 1616, and 1615 recorded numerical superiority over the check, CSH16 for grain yield. SPH 1610 yielded maximum grain yield of 7153 kg/ha against 6639 kg/ha of CSH 16.
Fodder yield- Highest fodder yield was recorded in hybrids SPH 1604 (36739 kg/ha) and SPH 1603 (35129 kg/ha) as compared to the check, CSH 16 (24186 kg/ha).
Grain size Maximum grain size of 33 gm/1000 grain was observed in SPH 1608 against 29 g/1000 grain of the check, CSH 16.
Remarks- SPH 1610 and SPH 1615 showed high grain and fodder yields.

Zone III (Table 43)

Days to flowering Flowering in this hybrid trial ranged from 56 to 73 days. SPH 1602 took 56 days to flower.
Plant height- The maximum plant height of 328 cm was recorded by SPH 1604.
Grain yield- Three hybrids, SPH nos 1611, 1606, and 1610 were superior to the check, CSH 18 by 17, 6 and 5%. Maximum grain yield of 6317 kg/ha was observed in SPH 1611 as compared to 5397 kg/ha of the check, CSH 18.
Fodder yield- Highest fodder yield of 25228 kg/ha was recorded in SPH 1608 as against 24534 kg/ha of CSH 18.
Grain size Maximum grain size of 35 g/ 1000 grain was recorded by SPH 1608 against 28 g/1000 grain of CSH 18.
Remarks- High grain yielding hybrids were low fodder yielding except for SPH 1610. SPH 1610 has both high grain and fodder yields.

Table40: Performance of initial varietal trial (IVT) –Zone III during kharif 2007

S. N	Entry	Location	Grain yield kg/ha	R	% ± over check	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
					SPV 462						
1	CSV 15	CSV 15	3537	1	0.7	20847	5	74	105	250	27.7
2	CSV 17	CSV 17	3530	2	0.5	12194	20	55	92	148	24.5
3	SPV 462	SPV 462	3514	3	0.0	19491	14	73	104	238	28.3
4	SPV 1812	Akola	3429	4	-2.4	20038	10	72	102	253	26.8
5	SPV 1808	Udaipur	3370	5	-4.1	20992	4	72	107	260	26.7
6	Local ch#	Local check	3351	6	-4.6	19382	15	71	102	245	34.2
7	SPV 1816	Coimbatore	3324	7	-5.4	19190	16	73	106	232	28.2
8	SPV 1811	Akola	3199	8	-9.0	19604	13	72	103	265	27.6
9	SPV 1817	Coimbatore	3158	9	-10.1	17948	18	72	104	268	26.8
10	SPV 1814	Dharwad	3054	10	-13.1	18062	17	77	108	163	28.9

S. N	Entry	Location	Grain yield kg/ha	R	% ± over check	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
11	SPV 1807	Surat	3010	11	-14.3	20152	8	70	107	274	29.8
12	SPV 1818	Parbhani	2985	12	-15.1	19624	12	73	106	282	30.3
13	SPV 1809	Udaipur	2978	13	-15.3	20349	6	76	107	253	29.1
14	SPV 1813	Dharwad	2921	14	-16.9	20118	9	74	108	234	29.5
15	SPV 1815	Dharwad	2909	15	-17.2	17802	19	77	110	160	28.0
16	SPV 1819	Indore	2775	16	-21.0	19860	11	77	109	249	26.7
17	SPV 1827	Parbhani	2445	17	-30.4	20268	7	76	109	263	29.4
18	SPV 1820	Indore	2379	18	-32.3	21730	3	80	112	243	28.3
19	SPV 1810	Akola	2174	19	-38.1	24380	2	82	113	273	25.6
20	SPV 1821	NRCS Elan	1936	20	-44.9	25873	1	71	115	339	25.4
	L. MEAN		2999					73	106	245	28.1
	C.D. (5%)		758					4	6	32	3.6
	C.D. (1%)		1009					5	8	42	4.8
	C.V. (%)		17.86					3.89	3.85	9.19	8.67

Table 41: Performance of initial hybrid trial (IHT) – Zone I during kharif 2007

S. No	Entry	Location	Grain yield kg/ha	R	% ± over check	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
					CSH 18						
1	SPH 1616	Emergent Genetics	6293	1	27.4	15533	11	65	102	209	31.2
2	SPH 1606	Krishidhan Seeds	6279	2	27.1	16039	8	65	102	188	28.0
3	SPH 1604	Ganga Kaveri	6097	3	23.4	18233	3	66	103	278	25.6
4	SPH 1609	G Tech Seed Exports	5962	4	20.7	16376	6	66	102	202	28.1
5	SPH 1611	Srirama Agritech	5878	5	19.0	14815	15	62	99	184	27.3
6	SPH 1615	Kaveri Seeds	5739	6	16.2	15078	13	66	103	201	27.6
7	SPH 1610	JK Seeds	5728	7	15.9	16754	4	63	100	216	30.2
8	SPH 1603	Ganga Kaveri	5580	8	12.9	18569	2	65	101	275	28.6
9	SPH 1617	Pradham Biotech	5504	9	11.4	16189	7	64	102	210	24.6
10	CSH 16	CHECK	5359	10	85	15638	10	63	100	190	27.1
11	SPH 1614	Parbhani	5203	11	5.3	15280	12	66	102	215	26.5
12	SPH 1605	Akola	4983	12	0.9	14525	16	63	100	222	23.3
13	CSH 18	CHECK	4941	13	0.0	16474	5	67	104	227	25.3
14	Local check#	Local check	4825	14	-2.3	15048	14	67	103	225	24.4
15	CSH 23	CHECK	4668	15	-5.5	13844	19	58	98	189	28.5
16	SPH 1613	Parbhani	4638	16	-6.1	16029	9	65	103	215	26.7
17	SPH 1612	Advanta	4575	17	-7.4	14467	17	67	102	173	24.0
18	SPH 1607	Nuziveedu Seeds	4309	18	-12.8	14322	18	59	98	189	29.1
19	SPH 1608	Mahyco	3864	19	-21.8	18589	1	61	97	213	36.2
20	SPH 1602	Udaipur	2874	20	-60.6	10651	20	51	95	175	27.2
	LOC. MEAN		5165			15623		63	101	210	27.5
	C.D. (5%)		455			3345		3	5	22	5.3
	C.D. (1%)		610			4572		4	6	30	7.3
	C.V. (%)		5.33			10.23		2.39	2.23	4.96	9.29

Table 42: Performance of initial hybrid trial (IHT) – Zone II during kharif 2007

S. No	Entry	Location	Grain yield kg/ha	R	% ± over check	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
					CSH 16						
1	SPH 1610	JK Seeds	7153	1	7.7	28715	4	69	110	220	31.2
2	Local check#	Local check	6948	2	4.7	22114	19	72	113	210	27.2
3	SPH 1611	Srirama Agritech	6843	3	3.1	23550	17	69	109	192	27.4
4	SPH 1616	Emergent Genetics	6785	4	2.2	28661	5	69	110	209	29.8
5	SPH 1615	Kaveri Seeds	6741	5	1.5	24535	14	71	111	193	28.8
6	CSH 16	CHECK	6639	6	0.0	24186	15	69	109	188	29.2
7	SPH 1608	Mahyco	6596	7	-0.6	30492	3	67	107	207	33.3
8	SPH 1607	Nuziveedu Seeds	6585	8	-0.8	23123	18	63	103	186	25.9
9	CSH 23	CHECK	6514	9	-1.9	23820	16	64	105	181	27.6
10	SPH 1617	Pradham Biotech	6237	10	-6.1	25297	13	68	109	193	25.7
11	SPH 1606	Krishidhan Seeds	6085	11	-8.3	27309	7	71	111	196	26.1
12	SPH 1609	G Tech Seed Exp.	6035	12	-9.1	27249	8	72	112	196	25.8
13	SPH 1605	Akola	5990	13	-9.8	27658	6	68	109	200	23.9
14	SPH 1614	Parbhani	5897	14	-11.2	26691	9	72	112	204	27.7
15	CSH 18	CHECK	5885	15	-11.4	26306	10	71	111	218	24.5
16	SPH 1612	Advanta	5839	16	-12.1	25922	11	72	112	170	28.1
17	SPH 1603	Ganga Kaveri	5830	17	-12.2	35129	2	71	111	266	25.7
18	SPH 1613	Parbhani	5703	18	-14.1	25423	12	73	114	199	26.1
19	SPH 1602	Udaipur	5635	19	-15.1	18847	20	59	102	174	26.1
20	SPH 1604	Ganga Kaveri	5297	20	-20.2	36739	1	71	112	277	22.8
	LOC. MEAN		6262			26588		69	110	204	27.1
	C.D. (5%)		1131			2037		2	3	12	3.4
	C.D. (1%)		1496			2711		3	4	16	4.5
	C.V. (%)		17.06			10.05		3.40	2.61	6.24	8.88

Table 43. Performance of initial hybrid trial (IHT) – Zone III during kharif 2007

S. No	Entry	Location	Grain yield kg/ha	R	% ± over check	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
					CSH 18						
1	SPH 1611	Srirama Agritech	6317	1	17.0	19902	14	68	101	231	29.9
2	SPH 1606	Krishidhan Seeds	5721	2	6.0	19447	15	70	103	227	29.4
3	SPH 1610	JK Seeds	5709	3	5.8	22726	5	65	100	264	35.6
4	CSH 23	CHECK	5556	4	2.9	20514	12	63	95	211	24.4
5	SPH 1607	Nuziveedu Seeds	5497	5	1.9	18354	17	64	95	222	22.8
6	SPH 1615	Kaveri Seeds	5481	6	1.6	21748	8	68	104	235	28.1
7	CSH 18	CHECK	5397	7	0.0	24534	3	73	105	267	30.0
8	SPH 1613	Parbhani	5287	8	-2.0	24232	4	68	103	249	25.7
9	SPH 1605	Akola	5144	9	-4.7	16887	19	64	99	243	22.8
10	CSH 16	CHECK	5071	10	-6.0	18438	16	65	97	218	30.4
11	SPH 1614	Parbhani	5003	11	-7.3	22156	7	66	101	245	24.2
12	SPH 1617	Pradham Biotech	4991	12	-7.5	19941	13	66	97	236	23.6
13	SPH 1612	Advanta	4806	13	-11.0	17710	18	72	99	186	24.8
14	SPH 1608	Mahyco	4772	14	-11.6	25228	1	67	102	251	35.3
15	SPH 1616	Emergent Genetics	4696	15	-13.0	21176	10	68	102	250	36.0
16	SPH 1602	Udaipur	4582	16	-15.1	13731	20	56	85	206	22.0
17	Local check#	Local check	4488	17	-16.8	20853	11	71	105	237	37.2
18	SPH 1609	G Tech seed Exports	4466	18	-17.3	21744	9	72	104	238	28.7
19	SPH 1604	Ganga Kaveri	3599	19	-33.3	22659	6	69	105	328	26.9
20	SPH 1603	Ganga Kaveri	3534	20	-34.5	24856	2	68	103	314	31.3
	LOC. MEAN		5006			20842		67		243	28.5
	C.D. (5%)		1283			24363		6		39	6.6
	C.D. (1%)		1753			33301		8		53	8.9
	C.V. (%)		12.24			24.21		4.43		7.60	14.05

Late Kharif

During 2007 late kharif, three trials were conducted viz. Advanced Varietal and Hybrid Trial (AVHT), Initial Varietal Trial (IVT), and Initial Hybrid Trial (IHT).

Advanced Varietal and Hybrid Trial (Table 44): In this combined trial of varieties and hybrids, one hybrid and six checks were evaluated for grain and fodder yields and other agronomic traits.

Days to flowering- It ranged from 58 to 70 days in the genotypes evaluated.

Plant height- The range of plant height in varieties and hybrids is 127 to 228 cm.

Grain yield- CSH 18, check has maximum grain yield.

Fodder yield- SPH 1577 had maximum fodder yield of 9089 kg / ha.

Grain size SPH 1577 has highest grain size of 36 g / 1000 grain.

Remarks- The test hybrid, SPH 1577 had high fodder yield and grain size.

Table 44. Performance of varieties and hybrids in advanced varietal & hybrid trial (AVHT) - late kharif 2007

S. No	Entry	Location	Grain yield kg/ha	R	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
1	CSH18	Indore	3669	1	8342	4	71	117	205	25.9
2	CSH16	NRCS	3540	2	7397	5	65	110	189	34.4
3	Local check	Local check	3523	3	8426	3	70	115	228	41.5
4	SPH1577		3418	4	9089	1	68	113	177	35.5
5	SPV462	Coimbatore	2786	5	6575	7	70	115	202	27.7
6	SPV1616	NRCS	2702	6	8847	2	67	111	222	27.1
7	CSV17	Udaipur	2347	7	6885	6	58	103	127	25.8
8	LOC. MEAN		3141		7937		67	112	193	31.1
9	C.D. (5%)		474		3506		3	4	29	12.9
10	C.D. (1%)		718		5312		4	6	40	19.5
11	C.V. (%)		62		18.1		1.56	2.14	8.39	16.9

Initial Varietal Trial (Table 45): The trial has 16 varieties along with 4 checks which were evaluated for grain and fodder yields and agronomic characters.

Days to flowering- The variation for flowering was from 63 to 73 days.

Plant height- The varieties varied for plant height from 146 to 262 cm.

Grain yield- Seven varieties namely SPV Nos. 1813, 1816, 1812, 1818, 1814, 1817, 1897 were superior to the check, SPV 462 by 6.7 to 17%. Highest grain yield of 2980 kg / ha was recorded by SPV 1813 against 2555 kg / ha of the check, SPV 462.

Fodder yield- SPV 1821 followed by SPV1812 had maximum fodder yield of 9562 kg/ ha and 8681 kg/ha.

Grain size SPV 813 recorded grain weight of 34 g / 1000 grain.

Remarks- Varieties SPV 1816 and 1812 were superior for both grain and stover yields.

Table 45. Performance of varieties in initial varietal trial (IVT) - late kharif 2007

S. No	Entry	Location	Grain yield kg/ha	R	% ± over check SPV 462	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
1	Localch#	Local check	3019	1	18.2	7501	14	70	115	246	34.4
2	SPV 1813	Dharwad	2980	2	16.6	8188	6	73	117	204	26.4
3	SPV 1816	Coimbatore	2979	3	16.6	8380	4	70	113	213	27.7
4	SPV 1812	Akola	2960	4	15.9	8681	2	66	109	235	26.1
5	SPV 1818	Parbhani	2937	5	15.0	8044	8	68	111	243	28.7
6	SPV 1814	Dharwad	2820	6	10.4	6349	19	70	113	148	30.8
7	SPV 1817	Coimbatore	2805	7	9.8	8106	7	68	111	233	26.5
8	SPV 1807	Surat	2766	8	8.3	8270	5	69	113	262	28.6
9	CSV 15	CSV 15	2733	9	7.0	7520	13	68	111	215	22.5
10	SPV 1808	Udaipur	2618	10	2.5	7537	12	68	111	227	25.0
11	SPV 1820	Indore	2577	11	0.9	6210	20	63	108	201	32.0
12	SPV 462	SPV 462	2555	12	0.0	6882	16	70	115	208	24.0
13	SPV 1811	Akola	2520	13	-1.4	7813	11	66	109	226	28.0
14	SPV 1810	Akola	2515	14	-1.6	7823	10	63	109	220	32.6
15	SPV 1819	Indore	2487	15	-2.7	8426	3	74	117	238	23.0
16	SPV 1817	Parbhani	2473	16	-3.2	6929	15	65	109	192	30.9
17	SPV 1815	Dharwad	2426	17	-5.0	6457	18	70	113	146	28.0
18	SPV 1809	Udaipur	2283	18	-10.6	7951	9	73	117	216	23.2

S. No	Entry	Location	Grain yield kg/ha	R	% ± over check SPV 462	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
19	SPV 1821	NRCS Elan	2017	20	-21.1	9562	1	56	99	316	29.4
20	CSV 17	CSV17	2255	19	-11.7	6481	17	61	103	134	23.0
	L. MEAN		2636			7656		67	111	216	27.5
	C.D. (5%)		678			2940		3	5	32	8.0
	C.D. (1%)		927			4018		4	7	42	10.9
	C.V. (%)		12.3			18.4		2.0	2.9	8.9	13.8

Initial Hybrid Trial (Table 46): In this trial, 16 hybrids with four checks were evaluated for agronomic superiority.

Days to flowering- The variation for flowering was between 60 to 72 days.

Plant height- The plant height varied from 161 to 289 cm.

Grain yield - Three hybrids, SPH Nos. 1609, 1606, and 1616 were numerically superior to the check, CSH 18. SPH 1609 yielded maximum of 3985 kg /ha of grain against 3483 kg/ha of CSH 18, check.

Fodder yield- Highest fodder yield was recorded by SPH 1603 (10148 kg / ha) followed by SPH 1604 (9807 kg / ha) as compared to the check, CHS 18 (8381 kg/ha).

Grain size Highest grain weight was recorded in SPH 1608 (38 g / 1000 grain).

Remarks- Superior dual purpose hybrid was SPH No 1604.

Table 46. Performance of Hybrids in initial hybrid trial (IHT) - late kharif 2007

S. No	Entry	Location	Grain yield kg/ha	R	% ± over check CSH 18	Fodder yield kg/ha	R	Time for flowering (days)	Time for maturity (days)	Plant height (cm)	1000 grain weight (g)
1	SPH 1609	G Tech Seed Exports	3985	1	14.4	8950	5	70	115	193	28.0
2	CSH 16	CHECK	3940	2	13.1	8574	10	65	108	184	30.6
3	SPH 1606	Krishidhan Seeds	3854	3	10.7	8592	9	69	112	191	30.0
4	SPH 1616	Emergent Genetics	3723	4	6.9	9205	4	69	113	211	28.4
5	SPH 1617	Pradham Biotech	3568	5	2.4	8229	15	66	113	185	25.9
6	SPH 1604	Ganga Kaveri	3542	6	1.7	9807	2	68	111	289	23.7
7	SPH 1610	JK Seeds	3540	7	1.6	9376	3	67	113	206	32.5
8	SPH 1612	Advanta	3535	8	1.5	8167	17	72	117	161	28.0
9	CSH 18	CHECK	3483	9	0.0	8381	13	70	115	210	27.3
10	CSH 23	CHECK	3447	10	-1.0	7776	19	63	107	186	28.6
11	SPH 1615	Kaveri Seeds	3367	11	-3.3	8249	14	68	113	214	28.4
12	SPH 1611	Srirama Agritech	3359	12	-3.6	7438	20	65	109	188	30.5
13	Local check	Local check	3317	13	-4.8	8710	8	70	115	235	35.2
14	SPH 1603	Ganga Kaveri	3309	14	-5.0	10148	1	69	113	261	31.7
15	SPH 1614	Parbhani	3302	15	-5.2	8787	7	69	112	200	31.2
16	SPH 1602	Udaipur	3265	16	-6.3	7818	18	60	106	157	30.9
17	SPH 1613	Parbhani	3189	17	-8.4	8791	6	68	111	207	31.2
18	SPH 1605	Akola	3152	18	-9.5	8178	16	63	108	204	28.6
19	SPH 1607	Nuziveedu Seeds	3095	19	-11.1	8562	11	62	106	191	32.0
20	SPH 1608	Mahyco	3090	20	-11.3	8483	12	62	107	217	38.1
	LOC. MEAN		3453			8611		67	111	204	30.0
	C.D. (5%)		671			1809		3	4	31	6.5
	C.D. (1%)		917			2473		4	6	42	8.9
	C.V. (%)		9.3			10.0		2.2	2.3	9.3	10.3

Annexure I: List of pedigrees for the varieties studied in multi-location trials

S.No.	Entry	Centre/source	Centre code	Pedigree
1	SPV 1600	Dharwad	SPV 1600	
2	SPV 1630	SPV 1630	SPV 1630	
3	SPV 1696	SPV 1696	SPV 1696	
4	SPV 1730	SU 1175	AICSIP, MPUAT, Udaipur	SPV 1064 X ICSV 219-2 (SPV 1064=SPV 107 X SPV 306, ICSV 219-2=(E 35-1 X USIA 703)-2-1-1-2-3
5	SPV 1733	SR 666-1	GAU, Surat	SAR 19 X M 388
6	SPV 1742	NRCS Elan	EC 515837	
7	SPV 1746	Dharwad	DSV 6	
8	SPV 1774	UDAIPUR	SU 1212	SPV 1064 X ICSU 219; SPV 1064=SPV 107 X SPV 306; SPV 107=148; 148 = 1392XBP53; ICSU 219= (ES 35-1 X SUIA 703)-2-1-1-2-3

S.No.	Entry	Centre/source	Centre code	Pedigree
9	SPV1775	UDAIPUR	SU 1204	CSV 11 X SU 581-1; CSV 11=SPV 351= SC 108-3 X CS 3541; CS3541 = IS 3675 X IS 3541; SU 581-1 = SPV 221 X SPV 306; SPV 221 = 148 X 512; 148 = 1392 X BP53; SVP 306 = CS3541 X 839
10	SPV1786	AKOLA	AKSV 31	(MS 70B x GJ 40)-17.1
11	SPV1807	Surat	SR 1905	SPSB 94003 x SR 611 [SPSB 94003= ICRISAT Entry; SR 611= SR 322-1 x SR 310; SR 322-1= (M 250 x GJ 36) x GJ 37; SR 310= M 236 x M 205; M 236= M 50 x R 6908-2; M 50= (2077A x M 28) X Gundari]
12	SPV1808	Udaipur	SU 1228	[ICSV 298 x SPV 1329 [ICSV 298=Line from ICRISAT; SPV 1329=SPV 938 x SPV 775-8-1-2; SPV 938=SPV 221 x E 602; SPV 221=148 x 512]
13	SPV1809	Udaipur	SU 1241	ICSV 272 x SPV 1134[ICSV 272=Line from ICRISAT; SPV 1134= Somaclone of SPV 462; SPV 462= (2947 x 232) x CO 22 -27-1-1-1]
14	SPV1810	Akola	AKSV 94	
15	SPV1811	Akola	AKSV 88	
16	SPV1812	Akola	AKSV 24	
17	SPV1813	Dharwad	SVD 07-01	
18	SPV1814	Dharwad	SVD 07-02	
19	SPV1815	Dharwad	SVD 07-03	
20	SPV1816	Coimbatore	TNS 598	
21	SPV1817	Coimbatore	TNS 603	
22	SPV1817	Parbhani	PVK 1050	
23	SPV1 818	Parbhani	PVK 1051	
24	SPV1819	Indore	I-0-71	
25	SPV1820	Indore	I-0-72	
26	SPV1821	NRCS Elan	E 68-1	

Annexure II: List of pedigrees of the hybrids studied in multi-location trials

S.No.	Entry	Centre/source	Centre code	Pedigree
1	SPH 1567	PKSH 233	MAU PARBHANI	28A X C43; 28A= MS 29B X ICSB 94040B
2	SPH 1577	SPH 1577	SPH 1577	
3	SPH 1587	Kaveri Seeds	KSH-2K644	*
4	SPH 1596	MAHODAYA HYBRID	MDSH 297	*
5	SPH 1602	Udaipur	SHU 220	(AKMS 14A x SUR 663)
6	SPH 1603	Ganga Kaveri	GK 4032	*
7	SPH 1604	Ganga Kaveri	GK 4033	*
8	SPH 1605	Akola	AKSH 102	
9	SPH 1606	Krishidhan Seeds	KDSH 1179	*
10	SPH 1607	Nuziveedu Seeds	NSH 886	*
11	SPH 1608	Mahyco	SO3-649	*
12	SPH 1609	G Tech seed Sxports	GTSH 06016	*
13	SPH 1610	JK Seeds	JKSH 580	*
14	SPH 1611	Srirama Agritech	Dhanarasi 909	*
15	SPH 1612	Advanta	PAC 554	*
16	SPH 1613	Parbhani	PKSH 243	PMS 56A x C43
17	SPH 1614	Parbhani	PKSH	PMS 8A x C43
18	SPH 1615	Kaveri Seeds	KSH 6363	*
19	SPH 1616	Emergent Genetics	MLSH 60	*
20	SPH 1617	Pradham Biotech	G-99	*

Annexure III: Compliance report

Location	Net plot size (sq.m.)	Date of sowing	Date of harvest	Date of Reporting
Advanced Varietal & Hybrid Trial (AVHT) - Kharif 2007				
Palem	11.10	13 June 2007	15 Oct 2007	26 Nov 2007
Coimbatore	6.66	15 June 2007	5 Oct 2007	21 Nov 2007
BhavaniSagar	-	-	-	-
Parbhani	11.10	-	-	15 Nov 2007
Akola	11.10	25 June 2007	12 Nov 2007	26 Nov 2007
Nanded	-	-	-	-
Aurangabad	7.56	-	-	17 Dec 2007
Somnathpur	11.10	-	-	6 Dec 2007
Buldana	11.10	22 June 2007	20 Oct 2007	7 Dec 2007
Yavatmal	11.10	26 June 2007	22 Oct 2007	2 Jan 2008
Karad	-	-	-	-
Digraj	-	-	-	-
Dharwad	11.10	25 June 2007	12 Nov 2007	12 Dec 2007
Bheemarayana	11.10	26 July 2007	16 Nov 2007	25 Jan 2008
Bidar	7.38	18 July 2007	-	25 Dec 2007
Devi Hosur	6.75	11 July 2007	1 Dec 2007	17 Dec 2007
Indore	7.92	29 June 2007	At maturity	22 Nov 2007
Surat	11.10	29 June 2007	22 Nov 2007	1 Dec 2007
Deesa	11.10	7 July 2007	-	10 Nov 2007
Tancha	11.10	18 July 2007	18 Dec 2007	28 Jan 2008
Kota	11.10	21 July 2007	4 Nov 2007	2 Feb 2008
Udaipur	9.90	3 July 2007	10 Oct 2007	23 Nov 2007
Mauranipur	11.10	1 July 2007	29 Oct 2007	20 Nov 2007
Kanpur	11.10	18 July 2007	3 Dec 2007	7 Jan 2008
Bhilwara	-	-	-	-
Nirmal Seeds	-	-	-	-
Kaveri Seeds	-	-	-	-
Krishidhan seed	-	-	-	-
Krishna seed	-	-	-	-
Nuziveedu seed	11.10	28 June 2007	20 Oct 2007	20 Nov 2007
Ranchi	9.00	13 July 2007	14 Nov 2007	25 Jan 2008
Initial Varietal Trial (IVT) - Kharif 2007				
Palem	11.10	13 June 2007	15 Oct 2007	26 Nov 2007
Coimbatore	6.66	15 June 2007	5 Oct 2007	21 Nov 2007
Parbhani	11.10	-	-	15 Nov 2007
Akola	11.10	26 June 2007	12 Nov 2007	26 Nov 2007
Karad	11.10	12 July 2007	24 Nov 2007	25 Jan 2008
Dharwad	11.10	25 June 2007	14 Nov 2007	12 Dec 2007
Indore	7.92	29 June 2007	At maturity	22 Nov 2007
Surat	11.10	4 July 2007	22 Nov 2007	1 Dec 2007
Deesa	11.10	7 July 2007	-	10 Nov 2007
Udaipur	9.90	4 July 2007	8 Oct 2007	23 Nov 2007
Mauranipur	11.10	1 July 2007	29 Oct 2007	20 Nov 2007
Kanpur	11.10	18 July 2007	7 Dec 2007	7 Jan 2008
Initial Hybrid Trial (IHT) - Kharif 2007				
Palem	11.10	13 June 2007	15 th Oct 2007	26 Nov 2007
Coimbatore	6.66	15 June 2007	5 Oct 2007	21 Nov 2007
Parbhani	11.10	-	-	15 Nov 2007
Akola	11.10	26 June 2007	12 Nov 2007	26 Nov 2007
Dharwad	11.10	26 June 2007	10 Nov 2007	12 Dec 2007
Bheemarayana	11.10	26 July 2007	16 Nov 2007	25 Jan 2008
Indore	7.92	29 June 2007	At maturity	22 Nov 2007
Surat	11.10	29 June 2007	22 Nov 2007	1 Dec 2007
Udaipur	9.90	3 July 2007	8 Oct 2007	23 Nov 2007
Mauranipur	11.10	1 July 2007	29 Oct 2007	20 Nov 2007
Kaveri Seeds	11.10	8 June 2007	28 Sept 2007	17 Nov 2007
Krishidhan seed	-	-	-	-
Krishna seed	-	-	-	-
Nuziveedu seed	11.10	28 June 2007	20 Oct 2007	20 Nov 2007
Jk seeds agra	11.10	26 June 2007	8 Oct 2007	5 Dec 2007