Forage sorghum: Kharif, 2011

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Executive summary

Introduction: During 2011-12 three multilocation trials, one each on single-cut forages and multi-cut forages and one advanced seed yield trial were carried out across 16 locations, comprising of two zones (zone I- 9 locations in North India; zone II- 7 locations in rest of India).Three more basic experiments were conducted under co-ordinated forage sorghum research. The most important findings of forage breeding trials for the year are mentioned below.

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A. Multi-location trials

Single-cut - Trial 1: Initial and Advanced varietal trial (Single-cut)

- Eleven genotypes along with 2 checks (HC 308 and CSV 21F) were evaluated at 16 locations during kharif 2011.
- The genotype, SPV 2057 (from Rahuri) in the second year of testing ranked first for green (435 q/ha) and second for dry (144 q/ha) fodder yields with 12% and 13% improvement for green and dry fodder yields over CSV 21F at national level.
- Other varieties in the second year of testing, SPV 2058 (from DSR) and SPV 2056 (from Rahuri) recorded 7% improvement for green fodder yield over CSV 21F.
- SPV 2057 had more per day productivity compared to the checks and ranked first for protein yield (10 q/ha) and digestible dry matter also (65.1 q/ha).
- SPV 2057 recorded very less shoot fly deadhearts (43%) compared to the checks, HC 308 (61%) and CSV 21F (60%).
- Among the initial varieties, SPV 2131 (420 q/ha), SPV 2130 (413 q/ha) and SPV 2128 (412 q/ha) were found promising with more than 5% improvement for green fodder yield over CSV 21F.

Multi-cut - Trial 2: Initial varietal and hybrid trial (Multi-cut)

- Eleven entries including 6 test hybrids, 2 test varieties, 2 hybrid checks (CSH 20MF and CSH 24MF) and one variety check (SSG 59-3) were evaluated over 17 locations.
- The hybrid SPH 1700 (from DSR) recorded 10% improvement for green (1030 q/ha) and dry (241 q/ha) fodder yields over the check, CSH 24MF. Its per day productivity of green and dry fodder yields was also high.
- Another hybrid SPH 1697 (from Pantnagar) recorded 9% improvement for green (1017 q/ha) and dry (242 q/ha) yields over CSH 24MF.
- Protein yield and digestible dry matter were high in SPH 1695 (19.8 q/ha; 104 q/ha) and SPH 1697 (18.3 q/ha; 112 q/ha).
- None of the multi-cut varieties could exceed SSG 59-3 for fodder yield.

Trial 3: Advanced seed yield trial

- Eight genotypes including three single cut varieties, two multicut varieties, two single cut national checks (HC 308 and CSV 21F) and one multicut check (SSG 59-3) were evaluated for grain yield at four locations.
- The single-cut varieties, SPV 2058 (24.8 q/ha) and SPV 2056 (23.2 q/ha) yielded 22% and 14% increase in seed yield compared to CSV 21F.
- The multi-cut variety, SPV 2107 (22.5 q/ha) recorded 5% increase over SSG 59-3.

B. Co-ordinated forage sorghum research

Trial 4: Evaluation of forage locals from different states for fodder yield and quality

- Nineteen genotypes involving 12 forage lines from different states, 4 sweet sorghum genotypes and 3 checks were evaluated in RCBD with 3 replications in 9 locations.
- CO(FS) 29 from Tamil Nadu recorded high green and dry fodder yields and per day productivity compared to the checks.
- High leaf stem ratio was observed in Ramkel, Rampur local and the sweet sorghum genotypes.

- High protein percent was observed in S 541 (8.2%) and HC 136 (7.8%). High digestibility was observed in RSSV 9 (56.8%) and HC 136 (54.2%).
- TSS was high in the sweet sorghum genotypes, and in SL 44 and GFS 5.

Trial 5: Screening and making selections in F_4 progenies developed for specific traits

- F_4 progenies of 20 crosses made for improvement of different traits were distributed to 6 centres.
- A total of 108 selections were made at different centres for different target traits

Trial 6: DUS characterization of promising mutagenic derivatives of SSG 59-3

- Sixteen mutagenic derivatives of SSG 59-3 promising for fodder yield components and quality were evaluated for DUS traits
- A lot of variation was observed for different quantitative and qualitative traits between the lines.
- The lines SSG 236 (20.9 g), SSG 231 (18.5 g) and SSG 253 (16.8 g) had more test weight compared to SSG 59-3 (14 g)

Overall conclusions

- In IAVT (SC), SPV 2057 the variety in the advanced testing, was the most promising genotype for green and dry fodder yields, per day productivity and fodder quality with significantly higher fodder yield compared to the checks.
- SPV 2057 had high level of tolerance to shoot pests.
- The performance of SPV 2057 over two years in the multi location testing for fodder yield, quality and shoot pest resistance was also found promising.
- Among the entries in the initial testing, SPV 2131, SPV 2130 and SPV 2128 were promising for fodder yield.
- In IVHT (MC), the hybrid SPH 1700 recorded significant improvement for green fodder yield over the checks, CHS 20MF and CSH 24MF. Its per day productivity of green and dry fodder yields was also high compared to the checks.
- Another multicut hybrid, SPH 1697 recorded 9% improvement for green and dry fodder yields over CSH 24MF.
- In the advanced seed yield trial, the single cut varieties, SPV 2058 and SPV 2056 and the multicut variety, SPV 2107 were found to yield more grain compared to the respective checks at all India level.
- The experiment on evaluation of forage local germplasm and sweet sorghum lines showed that fodder variety from Coimbatore, CO(FS) 29 had high fodder yields and per day productivity.
- For fodder quality S 541, GFS 5 and HC 136 were found promising. TSS was high in all sweet sorghum genotypes and in SL 44 and GFS 5.
- Under trait based improvement program for forage sorghum, 108 F_4 progeny selections were made for different traits.
- In the trial on DUS characterization of SSG mutagenic derivatives, lot of variation was observed between the genotypes for both quantitative and qualitative traits.

Follow-up for Kharif 2012

- Promising genotypes from initial trials of both single-cut and multi-cut types will be evaluated in the advanced trials during kharif 2012
- The selections made under trait specific breeding program will be tested across locations based on the uniformity of the line and the seed available.
- The promising germplasm and breeding lines identified with good fodder quality attributes will be utilized in the breeding program to enhance fodder quality
- Promising SSG mutant derivatives will be registered with NBPGR

Detailed report

During 2011-12 emphasis continued to be given on identification of genotypes with improved fodder yield and quality. Six trials were conducted, 3 under multilocation trials and 3 under Co-ordinated forage sorghum research. This year the advanced and initial trials were combined into one single trial in single cut sorghums. The improved genotypes were contributed by various SAUs, ICAR institutes and private organizations for their evaluation at all India level under different eco-geographical regions of the country. A new program on trait based improvement of forage genotypes has been initiated during 2008 involving different centers working on forage sorghum. The F_4 progenies of those crosses were distributed to different centers and selections were made. The performance of test genotypes was evaluated at all India level as well as in two zones.

Zone I : UP, Uttaranchal, Gujarat, Rajasthan, Haryana, Punjab and Bihar
Zone II: Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu

Zone I is characterized by the areas where sorghum is utilized as fodder whereas Zone II involves the states where grain and dual purpose sorghums are mainly grown. During kharif 2011, following co-ordinated trials were conducted over 16 locations. The trials conducted as per technical programme of kharif 2011 are listed below:

A. Multi-location trials
   Trial 1: Initial and Advanced Varietal Trial on Single-cut forage Sorghum
   Trial 2: Initial Hybrid/Varietal Trial on Multi-cut forage Sorghum
   Trial 3: Seed yield trial

B. Co-ordinated forage sorghum research
   Trial 4: Evaluation of forage locals from different states for yield and quality
   Trial 5: Screening and making selections in F_4 progenies developed for specific traits
   Trial 6: DUS characterization of SSG 59-3 improved through mutagenesis

The results of the above experiments are discussed below.

1. Single-cut forage sorghum

A trial comprising of 14 single-cut forage genotypes (3 in first year of advanced trial and 8 entries in initial trial, two nationally released single cut forage sorghum checks, CSV 21F and HC 308, and one local check) was conducted under initial and advanced single-cut forage sorghum experiment. This trial was conducted in 16 locations. Data from these 16 locations was used for presenting the results. The genotypes were tested for their green fodder yield, dry fodder yield, per day productivity, quality and resistance to important pests and diseases. The summary of performance of checks and test entries is given in the table below (Table 1).

Table 1. Summary results of single-cut trial (Trial 1)

S. No	Traits	GFY (q/ha)	DFY (q/ha)	GFY/day (q/ha)	DFY/day (q/ha)	Pro-tein %	PY (q/ha)	IVDMD (%)	DDM (q/ha)
1	HC 308	386.2	124.3	5.09	1.74	7.94	8.6	46.6	54.1
2	CSV 21F	387.9	127.0	5.22	1.80	7.71	9.0	46.4	57.5
3	Mean	399.1	130.0	5.35	1.84	7.79	8.1	46.9	51.8
4	Min.	346.2	116.7	4.72	1.67	7.48	7.0	44.1	42.6
5	Max.	434.8	144.0	5.77	2.01	8.02	10.0	49.1	65.1
6	CD (0.05)	38.8	16.7	0.51	0.24	0.83	3.0	6.5	20.9
7	CV (%)	13.4	17.1	13.0	16.9	7.59	26.3	8.06	21.4
8	Advanced lines sig. > check	SPV 2057	SPV 2057	SPV 2057	Nil	Nil	Nil	Nil	Nil
9	Adv. lines > best check	SPV 2056, SPV 2058	SPV 2056, SPV 2058	SPV 2058, SPV 2056	SPV 2057, SPV 2058	SPV 2057, SPV 2056	SPV 2057	SPV 2056, SPV 2058, SPV 2057	SPV 2057
10	Initial lines sig..> check	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
11	Initial lines > best check	SPV 2131, SPV 2130, SPV 2128, SPV 2132	SPV 2128, SPV 2127, SPV 2130, SPV 2132, SPV 2131	SPV 2132, SPV 2128, SPV 2130, SPV 2127	SPV 2127, SPV 2132, SPV 2128, SPV 2130, SPV 2131	SPV 2132, SPV 2131	Nil	SPV 2127, SPV 2129, SPV 2132	SPV 2127
12	Data from locations (no)	16	16	16	16	7	7	5	4
13	Loc. for national av. (no)	15	14	15	13	7	7	5	4

1.1 Initial and Advanced Varietal Trial for single-cut forage sorghum (IAVT-SC)

The initial and advanced varietal trial for single cut forages was carried out with 14 genotypes including two national checks, HC 308 and CSV 21F and one local check. Out of the test entries, three were in first year of advanced testing (SPV 2056, SPV 2057 and SPV 2058), and eight were in initial testing (SPV 2126, SPV 2127, SPV 2128, SPV 2129, SPV 2130, SPV 2131, SPV 2132 and SPV 2133). The zone wise and all India results of the trial are presented below (Tables 1.1 to 1.19 and 1A to 1 F). The single-cut genotypes tested in the trial are given in the table 2.

Zone-I

Yield parameters

- *Green fodder yield:* SPV 2057 ranked first for green fodder yield (401 q/ha) in this zone followed by HC 308 (398 q/ha) and CSV 21F (390 q/ha). None of the other entries could yield more than the checks, HC 308 and CSV 21F in Zone I. None of the initial entries could yield better than the checks.
- *Dry fodder yield:* SPV 2057 ranked first for dry fodder yield also (114 q/ha) followed by CSV 21F (112 q/ha) and HC 308 (108 q/ha) in zone I. Again none of the initial entries could yield better than the check varieties.
- *Green fodder yield per day:* Per day green fodder productivity was reported to be more in the advanced entry SPV 2057 (5.03 q/ha) followed by the initial entry SPV 2131 (5.02 q/ha). The checks HC 308 and CSV 21F yielded 4.94 q/ha and 4.84 q/ha of green fodder per day in this zone. The initial entries SPV 2132 (4.89 q/ha) and SPV 2127 (4.86 q/ha) recorded slightly better green fodder per day compared to CSV 21F.
- *Dry fodder yield per day:* The advanced entry SPV 2057 (1.49 q/ha) was the best for per day dry fodder productivity, followed by SPV 2127 (1.47 q/ha) and CSV 21F (1.45 q/ha). Another check, HC 308 recorded 1.39 q/ha of dry fodder yield per day.

Phenology and morphological parameters

- *Days to 50% flowering* ranged from 72 to 80 days. SPV 2126 was the earliest (72 days) genotype in this zone followed by SPV 2131 (74 days). Both the checks, HC 308 and CSV 21F flowered in 79 days.
- *Early vigour* varied from 2.53 to 3.4. Among the test entries SPV 2127 recorded high vigor with a score of 3.37 in zone I.
- *Plant height* of the entries ranged from 223 to 250 cm in this zone. The check HC 308 was the tallest (250 cm) in this trial followed by SPV 2057 (248 cm) and SPV 2130 (248 cm).
- *Leaf parameters* There was no much difference in number of leaves among the entries. Long and broad leaves were observed in SPV 2126 (81.8 cm; 7.7 cm), SPV 2058 (81.7; 7.62 cm), SPV 2129 (81.5 cm; 7.86 cm) and SPV 2132 (80.3 cm; 7.34 cm).
- *Stem girth* ranged from 2.4 cm to 3.19 cm. Thin stems were observed in CSV 21F (2.4 cm), SPV 2057 (2.54 cm) and SPV 2127 (2.61 cm).
- *High leaf-stem ratio* was observed in SPV 2056 (0.30) followed by SPV 2058 (0.29) and SPV 2130 (0.29). The checks showed leaf-stem ratio of 0.26 (HC 308) and 0.25 (CSV 21F).

Zone-II

Yield parameters

- *Green fodder yield:* In Zone II, eight varieties recorded significant improvement over the best check, CSV 21F (385 q/ha). SPV 2058 ranked first for green fodder yield (481 q/ha) followed by SPV 2057 (473 q/ha) and SPV 2056 (462 q/ha). Among the initial entries, SPV 2129 and SPV 2130 (459 q/ha) were standing first followed by SPV 2131 (456 q/ha) and SPV 2132 (450 q/ha) with green fodder yields significantly higher than the checks, HC 308 (373 q/ha) and CSV 21F (385 q/ha).
- *Dry fodder yield:* For this trait, SPV 2128 (186 q/ha) ranked first followed by SPV 2130 (144 q/ha), SPV 2057 (183 q/ha), SPV 2132 (183 q/ha), SPV 2058 (181 q/ha) and SPV 2127 (178 q/ha), all with significantly higher dry fodder yields compared to the checks, HC 308 and CSV 21F which yielded 147 q/ha of dry fodder.
- *Green fodder yield per day* ranged from 4.88 to 6.68 q/ha in this zone. For this trait, eight varieties showed significant improvement over the checks. The variety SPV 2058 (6.68 q/ha) was in the first rank followed by SPV 2057 (6.62 q/ha), SPV 2131 (6.52 q/ha), SPV 2056 (6.52 q/ha), SPV 2132 (6.46 q/ha), SPV 2130 (6.40

q/ha and SPV 2129 (6.38 q/ha). The checks, HC 308 and CSV 21F recorded 5.27 and 5.66 q/ha of green fodder yield per day.

- For *Dry fodder yield per day* SPV 2128 (2.69 q/ha) and SPV 2132 (2.65 q/ha) yielded significantly higher dry fodder per day compared to both the checks, HC 308 (2.14 q/ha) and CSV 21F (2.21 q/ha). Other promising entries for per day dry fodder productivity in zone II were SPV 2058, SPV 2057, SPV 2130 and SPV 2127 all with 2.6 q/ha of dry fodder yield per day.

Phenology and morphological parameters

- *Days to 50% flowering:* All the genotypes flowered earlier compared to zone I. It ranged from 65 to 71 days, the earliest genotype in this zone being CSV 21F (65 days) followed by SPV 2126 (67 days). The other check, HC 308 flowered in 69 days.
- *Early vigour* was observed to be more in SPV 2132 (3.89) in this zone followed by SPV 2056 and SPV 2058 (3.78). All others ranged from 2.78 to 3.67.
- *Plant height* in this zone varied from 221 to 280 cm. SPV 2129 was the tallest, followed by SPV 2057 (278 cm) and SPV 2131 (271 q/ha). HC 308 and CSV 21F recorded 256 cm and 266 cm of plant height in this zone.
- *Leaf parameters:* There was no much difference between the entries for number of leaves which ranged from 9-11 per plant. Long and broad leaves were observed in SPV 2129 (87.1 cm; 7.17 cm), SPV 2058 (84.2 cm; 7.45 cm) and SPV 2056 (79.7 cm; 7.52 cm) compared to the checks, HC 308 (73.7 cm long and 6.55 cm wide leaves) and CSV 21F (76.4 cm long and 6.0 cm wide leaves). SPV 2057 was having wider leaves (7.66 cm) compared to all entries.
- *Stem girth* ranged from 2.78 to 3.21 cm with thinner stems in CSV 21F followed by HC 308 (2.85 cm). Among the test entries, SPV 2126 was having thin stems of 3.2 cm stem girth.
- *Leaf-stem ratio* ranged from 0.52 to 0.64, and was higher in the varieties SPV 2126 (0.64 cm), SPV 2128 (0.61 cm) and SPV 2129 (0.60 cm).

National level

Yield parameters

- *Green fodder yield:* Among the advanced entries SPV 2057 ranked at the top (435 q/ha) at all India level with significant improvement over both the checks, HC 308 (386 q/ha) and CSV 21F (388 q/ha) It showed 12% improvement over the checks for this trait at all India level. The other two advanced varieties, SPV 2056 (414 q/ha) and SPV 2058 (415 q/ha) also showed about 7% improvement over the checks. Among the initial varieties, SPV 2131 (420 q/ha), SPV 2130 (413 q/ha), SPV 2128 (412 q/ha) and SPV 2132 (410 q/ha) were promising with more than 5% improvement over the checks.
- *Dry fodder yield:* SPV 2057 (144 q/ha) was the best among all the entries for dry fodder yield with significantly higher dry fodder yield over the checks. It showed 13% improvement over the best check CSV 21F (127 q/ha) for this trait. Among the initial varieties, SPV 2128, SPV 2127, SPV 2130 and SPV 2132 were promising with 136 q/ha of dry fodder yield.
- *Green fodder yield per day:* Per day green fodder productivity ranged from 4.72 to 5.77 q/ha. Highest per day productivity was observed in SPV 2057 (5.77 q/ha) followed by SPV 2131 (5.72 q/ha) and SPV 2132 (5.62). The checks CSV 21F and HC 308 yielded 5.09 q/ha and 5.22 q/ha of green fodder per day.
- *Dry fodder yield per day:* Dry fodder yield per day ranged from 1.67 to 2.01 q/ha at all India level. The advanced entry SPV 2057 (2.01 q/ha) was the best for per day dry fodder productivity, followed by SPV 2127 (1.97 q/ha), SPV 2132 (1.96 q/ha), SPV 2128 (1.95 q/ha), SPV 2130 (1.91 q/ha) and SPV 2131 (1.90 q/ha). The checks, CSV 21F and HC 308 yielded 1.80 and 1.74 q/ha of dry fodder per day.

Phenology and morphological parameters

- *Days to 50% flowering* ranged from 69 - 76 days. Among the test entries, SPV 2127 was the earliest to flower (70 days), followed by SPV 2131 and SPV 2132 which flowered in 71 days. The checks HC 308 and CSV 21F flowered in 74 and 72 days respectively.
- *Early vigor* ranged from 2.85 to 3.37. High vigour was observed in SPV 2131 (3.37) followed by SPV 2056 (3.35 score) and SPV 2132 (3.33).
- *Plant height* ranged from 223 to 261 cm. SPV 2057 was the tallest followed by SPV 2130 (258 cm).

- *Leaf parameters:* Not much variation was observed among the varieties for number of leaves which ranged from 11-12 per plant. Long and broad leaves were observed in SPV 2129 (83.7 cm; 7.58 cm), SPV 2058 (82.7 cm; 7.55 cm) and SPV 2126 (80.7 cm; 7.49 cm).
- *Stem girth* ranged from 2.56 to 3.17 cm. Thin stems were observed in CSV 21 F, followed by SPV 2057 (2.71 cm) and SPV 2127 (2.73 cm).
- *Leaf-stem ratio* ranged from 0.37 to 0.42. SPV 2126 was the best genotype (ratio of 0.42) followed by SPV 2058, SPV 2129, SPV 2127 and SPV 2131, all showing the leaf-stem ratio of 0.41.

Reaction to major pest and diseases

- *Shoot fly* resistance: In the entomology trials, SPV 2057 was found to be the best among all the varieties in this trial with deadheart percentage (DH%) of 42.8%. It was followed by SPV 2130 (57.3% DH) and SPV 2127 (58.8% DH). Both the checks reported 60% of shoot fly deadhearts.
- *Stem borer resistance*: For stem borer resistance also SPV 2057 was the best genotype with 18.9% of stem borer deadhearts in the entomology trials. SPV 2133 and SPV 2058 with 20% stem borer deadhearts stands in the next position. The checks CSV 21F and HC 308 recorded 28% and 23% stem borer deadhearts respectively.
- For *leaf diseases:* In the pathology trials, SPV 2126, SPV 2128 and SPV 2132 showed multiple leaf disease resistance, and were on par with the checks. .

Quality parameters: Elevan test genotypes along with two single-cut forage checks, HC 308 and CSV 21F, and one local check were analyzed for quality for the samples of 5 locations and the results are presented below.

- *Total soluble sugars* ranged from 8.87% (SPV 2058) to 11.2% (SPV 2126). The checks, HC 308 and CSV 21F had TSS of 10.7 and 9.62% respectively. Among the initial entries, SPV 2126 (11.2%), SPV 2127 (10.97%), SPV 2131 (10.96%) and SPV 2132 (10.8%) were promising for TSS. While among advanced varieties, SPV 2056 (10.9%) had better TSS compared to the checks.
- *HCN* content ranged from 64.5 (CSV 21F) to 80.5 (SPV 2129) ppm which is within the safe limit of <200ppm. All the entries had HCN with in the safe limits.
- *Protein percent* varied from 7.48 (SPV 2058) to 8.02 percent (SPV 2132). The checks have recorded protein percent of 7.94 (HC 308) and 7.71% (CSV 21F). The advanced varieties SPV 2057 (8.01%) and SPV 2056 (7.96%) and the initial varieties SPV 2132 (8.02%) and SPV 2131 (7.95%) recorded better protein percent compared to HC 308.
- *Protein yield* (q/ha) varied from 7.0 q/ha (SPV 2126) to 10.0 q/ha (SPV 2057). The checks CSV 21F and HC 308 recorded protein yield of 9.0 and 8.6 q/ha respectively. Only the advanced entry, SPV 2057 (10 q/ha) could give protein yield better than HC 308.
- *IVDMD* values ranged from 44.1 (SPV 2126) to 49.1% (SPV 2056) among the test entries and the checks. SPV 2056 was the best entry for IVDMD with 49.1% followed by SPV 2127 (48.2%) and SPV 2129 (48.2%). The entries SPV 2058 (48.1%) and SPV 2057 (47.2%) had better digestibility compared to the checks, HC 308 and CSV 21F (47%).
- *Digestible dry matter (DDM)* yield ranged from 42.6 q/ha (SPV 2126) to 65.1 q/ha (SPV 2057). The best variety for DDM was SPV 2057, which was followed by SPV 2127 (60.9 q/ha). The checks HC 308 and CSV 21F recorded 54.1 and 57.5 q/ha of digestible dry matter.

Table 2: Performance of single-cut sorghum genotypes in initial and advanced trial during 2011-12 (Entries- 11; Checks- 2; Locations: 16)

	GFY (q/ha)				DFY (q/ha)				GFY/day (q/ha)		DFY/day (q/ha)		PY (q/ha)		DDM (q/ha)		SF	SB	ALS	ZLS	LB
Entry		*R*	*% +/- over CSV 21F*	*% +/- over HC 308*		*R*	*% +/- over CSV 21F*	*% +/- over HC 308*		*R*		*R*		*R*		*R*					
Advanced entries																					
SPV 2056	414	4	6.75	7.22	130	8	2.3	4.5	5.48	7	1.80	10	7.6	11	48.5	9	59.8	25	4.3	3.3	3.9
SPV 2057	435*	1	12.1	12.6	144*	1	13.4	15.8	5.77*	1	2.01	1	10.0	1	65.1	1	42.8	18.9	4.8	3.1	3.7
SPV 2058	415	3	6.96	7.43	130	7	2.7	4.9	5.53	5	1.87	7	7.1	13	45.3	12	67.3	20.3	2.7	2.5	2.9
Initial entries																					
SPV 2126	346	14	-10.8	-10.4	117	14	-8.1	-6.1	4.72	14	1.68	13	7.0	14	42.6	14	63.6	21.0	3.4	3.0	4.4
SPV 2127	397	8	2.37	2.82	136	3	7.3	9.7	5.41	8	1.97	2	8.3	5	60.9	2	58.5	25.9	3.5	2.9	5.0

	GFY (q/ha)				DFY (q/ha)				GFY/day (q/ha)		DFY/day (q/ha)		PY (q/ha)		DDM (q/ha)		SF	SB	ALS	ZLS	LB
Entry		*R*	*% +/- over CSV 21F*	*% +/- over HC 308*		*R*	*% +/- over CSV 21F*	*% +/- over HC 308*		*R*		*R*		*R*		*R*					
SPV 2128	412	6	6.14	6.6	136	2	7.3	9.7	5.54	4	1.95	4	7.9	8	51.4	8	62.1	22.2	3.3	3.5	4.1
SPV 2129	395	9	1.73	2.18	125	11	-1.3	0.8	5.26	9	1.80	8	7.2	12	42.6	13	67.1	21.0	2.3	2.7	3.1
SPV 2130	413	5	6.42	6.89	136	4	7.0	9.3	5.50	6	1.91	5	7.9	10	48.1	10	57.3	22.3	5.1	3.3	3.2
SPV 2131	420	2	8.25	8.73	133	6	4.8	7.1	5.72	2	1.90	6	8.3	6	52.2	7	62.1	24.7	3.2	3.0	4.4
SPV 2132	410	7	5.72	6.19	136	5	6.8	9.1	5.62	3	1.96	3	7.9	9	46.7	11	68.2	23.6	3.3	3.4	4.5
SPV 2133	384	12	-0.98	-0.54	127	9	0.24	2.4	5.03	12	1.75	11	8.5	4	54.5	5	62.1	20.0	3.5	-	3.1
Checks																					
HC 308	386	11			124	12			5.09	11	1.74	12	8.6	3	54.1	6	60.5	23.1	3.5	3.4	3.6
CSV 21F	388	10			127	10			5.22	10	1.80	9	9.0	2	57.5	3	60.2	27.9	3.5	3.7	3.3
CD (5%)	38.8				16.7				0.51		0.24		3		20.9		12.5	6.68	1.4	ns	Ns
CD (1%)	51.2				22.0				0.67		0.32		4		28.3		16.6	9	-	-	-
C.V. (%)	13.4				17.1				13.0		16.9		26.3		21.4		14.8	18.2	30.6	20.4	21.9

GFY- Green fodder yield, DFY- Dry fodder yield, PY- Protein yield; DDM- Digesible dry matter, SF- Shoot fly (% deadhearts), SB- Stem *borer (% deadhearts), ZLS- Zonate leaf spot, ALS- Anthracnose leaf spot, LB- Leaf Blight (1-9 scale)*

The advanced entry, SPV 2057 was the most promising variety for fodder yield, per day productivity and quality. It has better level of tolerance to shoot pests compared to other varieties. Among the initial entries, SPV 2131, SPV 2130 and SPV 2128 were promising for fodder yield. The performance of promising genotypes tested in All India Co-ordinated trials during last 2 years is presented in the following table:

Table 3: Performance of single cut sorghum genotypes tested in AICSIP over last 2 years

		Yield								Quality				Insect pests DH (%)		Diseases (score)		
		GFY (q/ha)		*DFY (q/ha)*		*GFY/day (q/ha)*		*DFY/day (q/ha)*		*PY (q/ha)*		*DDM (q/ha)*		*SF*	*SB*	*ALS*	*ZLS*	*LB*
Entry	Year		R		R		R		R		R		R					
SPV 2056	2010	456	2	132	1	5.98	2	1.76	1	9.9	1	49.9	6	34.3	23.5	2.9	2.8	3.0
	2011	414	4	130	8	5.48	7	1.80	10	7.6	11	48.5	9	59.8	25	4.3	3.3	3.9
	Av	435		131		5.73		1.78		8.8		49.2		47.1	24.3	3.6	3.1	3.5
SPV 2057	2010	458	1	130	2	6.03	1	1.73	2	9.9	2	54.1	1	15.3	24.2	3.5	3.3	3.9
	2011	435	1	144	1	5.77	1	2.01	1	10.0	1	65.1	1	42.8	18.9	4.8	3.1	3.7
	Av	447		137		5.9		1.87		9.95		59.6		29.1	21.6	4.2	3.2	3.8
SPV 2058	2010	432	4	128	3	5.7	6	1.66	4	9.0	5	51.5	4	55.6	25.1	2.8	2.6	2.3
	2011	415	3	130	7	5.53	5	1.87	7	7.1	13	45.3	12	67.3	20.3	2.7	2.5	2.9
	Av	424		129		5.62		1.77		8.1		48.4		61.5	22.7	2.8	2.6	2.6
HC 308	2010	436	3	122	4	5.77	4	1.64	5	9.0	6	52.3	3	54.7	22.8	2.8	2.9	2.6
	2011	386	11	124	12	5.09	11	1.74	12	8.6	3	54.1	6	60.5	23.1	3.5	3.4	3.6
	Av	411		123		5.43		1.69		8.8		53.2		57.6	23.0	3.2	3.2	3.1
CSV 21F	2010	425	5	120	5	5.78	3	1.67	3	9.3	3	53.2	2	30.6	22.2	2.9	2.9	2.4
	2011	388	10	127	10	5.22	10	1.80	9	9.0	2	57.5	3	60.2	27.9	3.5	3.7	3.3
	Av	407		124		5.5		1.74		9.2		55.4		60.5	25.1	3.2	3.3	2.9

GFY- Green fodder yield, DFY- Dry fodder yield, PY- Protein yield; DDM- Digesible dry matter, SF- Shoot fly (% deadhearts), SB- Stem borer (% deadhearts), ZLS- Zonate leaf spot, ALS- Anthracnose leaf spot, GLS- Grey leaf spot (1-9 scale)

Conclusions: The variety SPV 2057 was the best genotype in terms of fodder yield and per day productivity compared to the checks. For quality also, SPV 2057 was the most promising. It has better level of tolerance to shoot pests.

2. Multi-cut forage sorghum

A multi-cut forage trial comprising of 12 entries (6 hybrids, 2 varieties, 2 hybrid checks, one variety check and one local check) was conducted in 13 locations. All the test entries were in the initial year of evaluation. The genotypes were tested for their green fodder yield, dry fodder yield, per day productivity at different cuts, quality and resistance to important pests and diseases.

Table 4: Summary results of multi-cut trial

S. No	Traits	GFY (q/ha)	DFY (q/ha)	GFY/day (q/ha)	DFY/day (q/ha)	Protein %	PY (q/ha)	IVDMD (%)	DDM (q/ha)
1	SSG 59-3	880.6	215.6	6.63	1.95	8.46	17.7	42.2	93.4
2	CSH 20MF	934.0	218.1	6.88	1.90	8.58	16.9	44.5	99.3
	CSH 24MF	935.6	220.7	6.74	1.91	8.37	16.9	41.9	95.2
3	Mean	898.1	218.0	6.67	1.93	8.46	16.9	43.8	95.5

S. No	Traits	GFY (q/ha)	DFY (q/ha)	GFY/day (q/ha)	DFY/day (q/ha)	Protein %	PY (q/ha)	IVDMD (%)	DDM (q/ha)
4	Min.	770.5	185.0	5.74	1.64	8.12	14.9	40.8	79.5
5	Max.	1029.7	242.7	7.59	2.18	8.81	19.8	45.9	111.8
6	CD (0.05)	89.6	35.2	0.67	0.31	0.84	3.4	10.4	23.9
7	CV (%)	12.9	20.0	12.9	20.1	6.80	13.6	12.1	13.4
8	Lines signi.> check	SPH 1700	Nil	SPH 1700, SPH 1697	-	-	-	-	-
9	Lines > check	SPH 1697, SPH 1698, SPH 1695	SPH 1697, SPH 1700, SPH 1698, SPH 1695	SPH 1695, SPH 1698	SPH 1698, SPH 1695, SPH 1700, SPH 1697	SPH 1697, SPH 1695, SPV 2108	SPH 1695, SPH 1697, SPH 1698	SPH 1700; SPH 1696, SPH 1699, SPH 1695, SPV 2108 (over SSG 59-3)	SPH 1697, SPH 1695, SPH 1698
10	Data loc. (no)	13	13	13	13	7	7	5	4
11	Loc. for national av. (no)	13	12	13	12	7	7	5	4

2.1 Initial Varietal and Hybrid Trial for multi-cut forage sorghum (IVHT-MC)

The initial varietal and hybrid trial for multi cut forages was carried out with 12 genotypes including 8 hybrids (six test entries and two checks), 3 varieties (2 in initial evaluation and one check) and one local check. One multi-cut variety SSG 59-3 and two hybrids, CSH 20MF and CSH 24MF were included as checks for this experiment. The results of the trial are presented below (Tables 2.1 to 2.51 and 2.A and 2.L). The performance of multi-cut genotypes tested during kharif 2011 are given in table 5.

Zone-I

Yield parameters

- *Green fodder yield:* The hybrid, SPH 1700 (1114 q/ha) ranked first for total green fodder yield followed by SPH 1697 (1111 q/ha) and SPH 1698 (1094 q/ha). The checks, CSH 20MF and CSH 24MF yielded 1026 and 1057 q/ha of total green fodder yield from three cuts in this zone. Considering the green fodder yield in individual cuts, SPH 1700 showed consistently good yield in all the 3 cuttings in this zone followed by SPH 1697. Among the varieties, none could out yield the check, SSG 59-3 which yielded 983 q/ha green fodder over 3 cuts.
- *Dry fodder yield:* For total dry fodder yield, the hybrid SPH 1698 (242 q/ha) ranked first, followed by SPH 1695 (226 q/ha), SPH 1697 (226 q/ha) and SPH 1700 (226 q/ha) in this zone. The hybrids checks, CSH 20MF and CSH 24MF recorded 213 and 216 q/ha of total dry fodder yield in this zone. Among the varieties, none were found to be better than SSG 59-3 (220 q/ha). The variety, SPV 2108 yielded slightly better than SSG 59-3 in the first cut, but in subsequent cuts it yielded less. The other variety, SPV 2107 could not yield better than SSG 59-3 in any of the cuttings.
- *Green fodder yield per day:* Average per day productivity of green fodder over 3 cuts was reported to be high in SPH 1697 and SPH 1700 (7.15 q/ha) followed by SPH 1698 (7.11 q/ha). The checks, CSH 20MF and CSH 24MF yielded 6.6 q/ha 6.75 q/ha of green fodder yield per ha per day. None of the varieties could perform better than SSG 59-3 (6.47 q/ha) in this zone. The per day productivity of SPH 1700 was consistently good in all the 3 cuts. The variety, SPV 2054 performed better than SSG 59-3 for this trait in the first cut, but not in subsequent cuts.
- *Dry fodder yield per day:* Per day productivity of dry fodder over all the cuts was high in the hybrid SPH 1698 (2.18 q/ha) followed by SPH 1695 (2.18 q/ha) and SPH 1700 (2.12 q/ha). The checks, CSH 20MF and CSH 24MF recorded 1.80 and 1.89 q/ha of dry fodder per day in this zone. SPH 1697 showed relatively good per day productivity in all the three cuts. None of the varieties could give better dry fodder yield per day compared to SSG 59-3.

Phenology and morphological parameters

- *Days to 50% flowering* ranged from 62 to 71 days, SPH 1695 being the earliest of all in this zone, followed by SPH 1699 (63 days). The checks, CSH 20MF and CSH 24MF flowered in 67 and 71 days respectively while SSG 59-3 flowered in 66 days in this zone.
- *Early vigour* was found to be high in SPH 1700 (3.29) which was on par with CSH 20MF. This hybrid was followed by SPH 1698 (3.25). CSH 24MF recorded early vigour score of 3.04. Both the varieties SPV 2107 and SPV 2108 showed vigor score of 3.13, while it was 3.08 for SSG 59-3.

- *Plant height*: SPH 1695 was the tallest (220 cm) among the test entries, followed by SPH 1698 (218 cm). The check hybrid, CSH 20MF was 205 cm tall, while CSH 24MF had 193 cm of height. Both the varieties were shorter than SSG 59-3 (205 cm) in this zone.
- *Leaf parameters* were found to be good in SPH 1696 which had more number (13) of leaves that are long (88 cm) and wide (7.33 cm). SPH 1697 also had long (85.5 cm) and wide (6.93 cm) leaves in this zone. SPV 2108 (12.5) had more number of leaves compared to SSG 59-3 (11). The leaf length and width was more than that of SSG 59-3.
- *Stem girth* varied from 2.29 cm to 3.46 cm. Thin stems (2.29 cm) were observed in SPV 2108 followed by SSG 59-3 (2.31 cm) in this zone. Among the hybrids, SPH 1695 (2.58 cm) had thin stems followed by SPH 1698 (2.71 cm).
- *Number of tillers* ranged from 2-4 in all the genotypes tested, the highest being in SSG 59-3 (4.33).
- *High leaf-stem ratio* was observed in SPH 1696 (0.40) followed by SPH 1699 and SPH 1697 (0.38). The check, CSH 20MF recorded leaf-stem ratio of 0.34 and CSH 24MF recorded 0.36. Both the varieties were found to have leaf-stem ratio onpar with SSG 59-3 (0.34).

Zone-II

Yield parameters

- *Green fodder yield*: In the zone II also, SPH 1700 produced highest green fodder yield across all the cuts (841 q/ha), followed by SPH 1697 (807 q/ha) and SPH 1695 (784 q/ha) where CSH 20MF and CSH 24MF had given 727 q/ha and 661 q/ha of total green fodder in this zone. None of the varieties had better fodder yield compared to SSG 59-3 (651 q/ha).
- *Dry fodder yield*: For total dry fodder yield, SPH 1697 (277 q/ha) ranked first in zone II, followed by SPH 1700 (273 q/ha) & SPH 1695 (256 q/ha). The checks, CSH 20MF and CSH 24MF yielded 218 q/ha and 221 q/ha of total dry fodder yield in this zone. SPH 1700 and SPH 1697 yielded consistently well in all the three cuts. None of the varieties could out yield the check, SSG 59-3 for dry fodder (208 q/ha).
- *Green fodder yield per day:* The average green fodder yield per day over all the 3 cuts ranged from 6.17 to 8.67 q/ha, the highest being in SPH 1695 (8.67 q/ha) followed by SPH 1700 (8.59 q/ha) and SPH 1697 (7.94 q/ha) in this zone. The hybrid checks, CSH 20MF and CSH 24MF yielded 7.51 and 6.7 q/ha of green fodder per day respectively in this zone. None of the varieties were better than SSG 59-3 (6.63 q/ha) for this trait.
- *Dry fodder yield per day:* Per day productivity of dry fodder in this zone ranged from 1.64 q/ha to 2.18 q/ha, the highest being in SPH 1700 (2.47 q/ha), followed by SPH 1695 (2.47 q/ha) and SPH 1697 (2.35 q/ha). The checks CSH 20MF and CSH 24MF recorded 1.9 q/ha of dry fodder yield per day in this zone. None of the varieties were better than the check, SSG 59-3 (1.95 q/ha) for dry fodder yield per day.

Phenology and morphological parameters

- *Days to 50% flowering:* All the genotypes flowered earlier compared to zone I. It ranged from 57 to 65 days. SPH 1699 and SPH 1700 were the earliest to flower (57 days), followed by SPH 1698 and CSH 20MF (58 days). The varieties, SPV 2107 and SPV 2108 flowered in 61 and 62 days respectively whereas SSG 59-3 flowered 59 days.
- *Early vigour* was observed to be more in SPH 1697 & SPH 1698 (4.33) followed by SPH 1700 (3.67).
- *Plant height* ranged from 235 to 266 cm in this zone. SPH 1695 was the tallest, followed by SPH 1698 (262 cm) among the hybrids. Among the varieties, SPV 2107 (261 cm) was the tallest where the check, SSG 59-3 recorded 259 cm of plant height.
- *Leaf parameters* were observed to be good in SPH 1696 and SPH 1697 besides CSH 24MF. All these hybrids had long and broad leaves. Number of leaves were more in CSH 24MF followed by SPH 1697 and SPV 2107.
- *Leaf-stem ratio* ranged from 0.76 to 0.97 and was higher in SPV 2108 (0.97), followed by SPH 1697 (0.92).

National level

Yield parameters

- *Green fodder yield:* The hybrid SPH 1700 (1030 q/ha) recorded significant improvement for green fodder yield over both the checks, CSH 20MF (934 q/ha) and CSH 24MF (936 q/ha) at all India level. Other hybrids,

SPH 1697 and SPH 1698 showed 8.7% and 4.2% improvement over CSH 24MF. None of the varieties could out yield the varietal check, SSG 59-3 (881 q/ha) for total green fodder yield at all India level. SPH 1700 performed well in all the three cuts, while SPH 1697 showed good performance in first two cuts.

- *Dry fodder yield:* It ranged from 185 to 243 q/ha at all India level. SPH 1697 which ranked first for total dry fodder yield (243 q/ha) recorded 10% improvement over the check, CSH 24MF (221 q/ha). The hybrid, SPH 1700 (241 q/ha) recorded 9.3% improvement over CSH 24MF. Other hybrids, SPH 1698 and SPH 1695 recorded 8% and 7% improvement for total dry fodder yield over CSH 24MF. None of the varieties could yield better than SSG 59-3 (216 q/ha) for dry fodder yield at all India level. Eventhough SPV 2108 yielded better dry fodder compared to SSG 59-3 in the first cut, it could not outyield SSG 59-3 in subsequent cuts.
- *Green fodder yield per day:* For per day productivity of green fodder also SPH 1700 (7.59 q/ha) recorded significant improvement over the checks, CSH 20MF (6.88 q/ha) and CSH 24MF (6.74 q/ha). SPH 1700 was followed by SPH 1697 (7.4 q/ha), SPH 1695 (7.27 q/ha) and SPH 1698 (7.24 q/ha) at all India level. None of the varieties were on par with SSG 59-3 (6.63 q/ha) for per day green fodder yield.
- *Dry fodder yield per day:* Per day dry fodder productivity was high in SPH 1698 and SPH 1695 (2.18 q/ha) followed by SPH 1700 (2.12 q/ha) and SPH 1697 (2.08 q/ha). CSH 20MF recorded 1.90 q/ha of dry fodder yield per day, while CSH 24MF had 1.91 q/ha per day. Again none of the varieties were better than SSG 59-3 (1.95 q/ha) for this trait.

Phenology and morphological parameters

- *Days to 50% flowering* ranged from 60 - 67 days. SPH 1695 and SPH 1699 were early to flower (60 days) among all the genotypes, where the checks, CSH 20MF and CSH 24MF flowered in 62 and 66 days respectively. SSG 59-3 flowered in 63 days and both the varieties, SPV 2107 and SPV 2108 flowered on par with the variety.
- *Early vigour* ranged from 2.73 to 3.47. SPH 1698 showed highest vigour (3.47), followed by SPH 1700 (3.37). The check hybrids recorded early vigour score of 3.23 (CSH 20MF) and 3.03 (CSH 24MF). The vigour score of SSG 59-3 was 3.2.
- *Plant height* ranged from 205 to 234 cm. SPH 1695 was the tallest among all (234 cm), followed by SPH 1698 (231 cm) and SSG 59-3 (222 cm).
- *Leaf parameters:* Among all the entries, SPH 1696 was found to be good with desirable leaf parameters such as more number of leaves per plant (12) and long (87 cm) and wide (7.33 cm) leaves. SPH 1697 was also found to have longer (83.8 cm) and wider (6.83 cm) leaves.
- *Stem girth* ranged from 2.4 to 3.56 cm. The varieties were having thiner stems compared to the hybrids. SSG 59-3 (2.40 cm) was found to have thin stems followed by SPV 2108 (2.45 cm).
- *Number of tillers* varied from 2-4 in all the genotypes, the highest being in SSG 59-3 (4.33). The hybrids were on par with each other for tiller number
- For *leaf-stem ratio,* SPH 1696 was the best genotype (ratio of 0.54) followed by SPH 1697 (0.53) and SPV 2108 (0.52). The hybrid checks showed leaf-stem ratio of 0.47 (CSH 20MF) and 0.50 (CSH 24MF). Among the varieties, SPV 2108 had better leaf-stem ratio (0.52) compared to the check, SSG 59-3 (0.47).

Regenerability score: Since regeneration is a very important trait for multi-cut forages, it was scored on a 1-5 scale, where 1 is poor regeneration and 5 is high regeneration. In this trial, it ranged from 2.75 to 4.25. SSG 59-3 had the best regeneration capacity followed by SPV 2107 (4.0) and SPH 1695 (3.92).

Reaction to major pests and diseases

- *Shoot fly* incidence was found to be in the range of 56.7 to 68.1% deadhearts in the multi-cut entomology trial at all India level. The hybrid, SPH 1696 recorded 60.1% of deadhearts followed by CSH 20MF and SPH 1699 with 61% shoot fly deadhearts. Another hybrid check, CSH 24MF recorded 64.9% of deadhearts. Among the varieties, SPV 2108 and SSG 59-3 recorded 62% of shoot fly deadhearts.
- *Stem borer* incidence in the multi-cut entomology trial ranged from 13.7 to 20.2% of stem borer deadhearts. The varieties in general showed low incidence of stem borer compared to the hybrids. SPV 2107 showed 13.7% of stem borer deadhearts while it was 14.4% in SSG 59-3. Among the hybrids the lowest deadheart percentage was observed in SPH 1695 (16.2%) followed by SPH 1698 (16.7%) and SPH 1696 (16.9%). The hybrid check, CSH 24MF recorded 18.7% of stem borer deadhearts.

- For *leaf diseases* all the genotypes were observed to be on par with the checks. The hybrids SPH 1698 and SPH 1699, and the variety SPV 2108 were found to have multiple resistance to leaf diseases.

Quality parameters

- *Total soluble sugars* ranged from 6.57 to 8.12% at all India level. Among the hybrids, TSS was found to be high in SPH 1699 (8.12%) followed by SPH 1695 (7.19%). The checks CSH 20MF and CSH 24MF recorded 6.7% and 6.81% of TSS respectively. Among the varieties, SPV 2108 (7.94%) recorded more total soluble sugars compared to SSG 59-3 (7.11%).
- *HCN* of all the test entries was within the safe limit ranging from 72.7 to 85.7 ppm during the first cut, the lowest value being in SPH 1696.
- *Protein percent* ranged from 8.12 to 8.81%, the highest being in SPH 1697, followed by SPH 1695 (8.79%) and CSH 20MF (8.58%). The checks SSG 59-3 and CSH 24MF recorded 8.46% and 8.37% of protein respectively. Among the varieties, SPV 2108 had protein of 8.57%.
- *Average protein yield* over two cuts was high in SPH 1695 (19.8 q/ha), followed by SPH 1695 (18.3 q/ha) and SPH 1698 (18.1 q/ha). The hybrid checks yielded 16.9 q/ha of protein. None of the varieties were better than SSG 59-3 (17.7 q/ha) for protein yield.
- *IVDMD* values ranged from 40.8 to 45.9%. The hybrid SPH 1700 had high IVDMD value (45.9%) followed by SPH 1696 (45.3%), SPH 1699 (44.7%) and SPH 1695 (44.6) compared to the checks, CSH 20MF (44.5%) and CSH 24MF (41.9%). The variety, SPV 2108 (43.8%) recorded slightly better IVDMD value compared to SSG 59-3 (42.2%).
- *Total digestible dry matter (DDM)* over two cuts ranged from 79.5 to 111.8 q/ha in this trial. It was highest in the hybrid SPH 1697 (112 q/ha) followed by SPH 1695 (104 q/ha), SPH 1698 (103 q/ha) and SPH 1696 (101 q/ha). The hybrid checks, CSH 20MF and CSH 24MF recorded 99.3 and 95.2 q/ha of digestible dry matter. None of the varieties could give DDM better than SSG 59-3 (93.4 q/ha).

Table 5. Performance of multi-cut sorghum genotypes in initial trial during 2011-12
(Entries- 8; Checks- 3; Locations: 13)

	GFY (q/ha)				DFY (q/ha)				GFY/day (q/ha)		DFY/day (q/ha)		PY (q/ha)		DDM (q/ha)		SF	SB	ALS	ZLS	GLS	SS
Entry		*R*	*% +/- over CSH 24MF*	*% +/- over SSG 59-3*		*R*	*% +/- over CSH 24MF*	*% +/- over SSG 59-3*		*R*		*R*		*R*		*R*						
Hybrids																						
SPH 1695	950	4	1.49	-	236	4	6.93	-	7.27	3	2.18	2	19.8	1	104	2	61.9	16.2	2.00	3.11	2.33	2.33
SPH 1696	771	12	-17.6	-	185	12	-16.2	-	5.74	12	1.64	12	14.9	12	101	4	60.1	16.9	1.83	2.67	3.00	3.00
SPH 1697	1017	2	8.73	-	242	1	9.97	-	7.40	2	2.04	4	18.3	2	112	1	63.1	20.2	1.92	3.11	2.67	2.67
SPH 1698	975	3	4.25	-	238	3	7.88	-	7.24	4	2.18	1	18.1	3	103	3	62.6	16.7	1.83	3.00	2.33	2.33
SPH 1699	806	9	-13.9	-	194	11	-12	-	5.99	11	1.73	11	15.9	9	88.2	9	61.5	19.0	1.75	2.89	2.33	2.33
SPH 1700	1030*	1	10.1	-	241	2	9.33	-	7.59*	1	2.12	3	16.5	7	97.5	6	67.9	20.9	1.92	3.11	2.67	2.67
Checks																						
CSH 20MF	934	6	-	-	218	7	-	-	6.88	5	1.90	8	16.9	6	99.3	5	61.2	13.9	1.83	3.11	2.00	2.00
CSH 24MF	936	5	-	-	221	6	-	-	6.74	6	1.91	6	16.9	5	95.2	7	64.9	18.7	1.92	2.67	3.00	3.00
Varieties																						
SPV 2107	797	11	-	-9.45	195	10	-	-9.51	6.11	9	1.76	10	15.7	10	79.5	12	68.1	13.7	2.25	2.89	3.00	3.00
SPV 2108	805	10	-	-8.62	204	9	-	-5.24	6.00	10	1.79	9	16.2	8	86.2	11	61.7	14.6	2.08	3.00	3.00	3.00
SSG 59-3	881	7	-	-	216	8	-	-2.31	6.63	7	1.95	5	17.7	4	93.4	8	62.3	14.4	2.08	3.22	2.67	2.67
CD (5%)	89.6				35.2				0.67		0.31		3.4		23.9		15.5	-	0.42	0055	0.72	0.72
CD (1%)	118.4				46.5				0.88		0.41		4.6		33.8		20.7	-	0.57	0.75	0.98	0.98
C.V. (%)	12.9				20.0				12.9		20.1		13.6		13.4		18.0	-	15.1	10.7	16.0	16.0

GFY- Green fodder yield, DFY- Dry fodder yield, PY- Protein yield; DDM- Digesible dry matter, DH- deadhearts, SF- Shoot fly, SB- Stem *borer, ZLS-Zonate leaf spot, ALS- Anthracnose leaf spot, LB-Leaf Blight, SS-Sooty stripe*

Conclusions: The hybrid, SPH 1700 recorded 10% improvement for both green and dry fodder yields over the best hybrid check, CSH 24MF. Its per day productivity of green and dry fodder yields was also high compared to the checks. Another hybrid, SPH 1697 recorded 9% improvement for fodder yield over CSH 24MF. SPH 1695 and SPH 1698 recorded 4-8% improvement for fodder yield over CSH 24MF. SPH 1695 and SPH 1697 were promising for fodder quality. None of the varieties could yield better than SSG 59-3.

3. Advanced seed yield trial

The seed yield trial was taken up at 4 locations to understand the seed production ability of the varieties in advanced trials of single-cut sorghum. There were 8 entries including the checks, CSV 21F, HC 308 and SSG 59-3. Out of five test entries, three are single cut genotypes and two are multi cut genotypes. Data was recorded on grain yield, dry fodder yield, days to 50% flowering, days to maturity, plant height and early vigour (Tables 3.1 to 3.4). The results are discussed below.

Zone-I

- Grain yield of the entries in this zone ranged from 6.4 q/ha to 12.5 q/ha. Highest grain yield was reported in SPV 2058 (12.5 q/ha) followed by SPV 2056 (8.1 q/ha). CSV 21F and HC 308 yielded 7.05 and 7.48 q/ha of grain respectively. Both the multicut genotypes had given grain yield less than SSG 59-3.
- Dry fodder yield ranged from 256 q/ha to 377 q/ha in this zone. Highest dry fodder yield was recorded in SSG 59-3. All the three checks yielded higher dry fodder compared to the test entries.
- Days to flower range from 80 (SSG 59-3) to 95 days (SPV 2056) in this experiment
- Days to maturity ranged from 118 to 136 days. SSG 59-3 matured earlier to all (118 days), followed by SPV 2058 (119 days).

Zone-II

- Grain yield varied from 33.6 to 38.3 q/ha. Highest grain yield was observed in SPV 2056 (38.3 q/ha) followed by the multicut variety, SPV 2107 (38.2 q/ha) and SPV 2058 (37.2 q/ha).
- Dry fodder yield in this zone ranged from 146 q/ha (SPV 2058) to 172 q/ha (SPV 2057). SPV 2058 was followed by SPV 2056 (164 q/ha) for dry fodder yield in this zone.
- Days to flower in this zone ranged from 64 to 71 days, the earliest being SSG 59-3 followed by SPV 2107 and SPV 2108 (66 days).
- Days to maturity SPV 2107 was the earliest to mature in 105 days in this zone. The maturity ranged from 105 to 117 days.

National level

- Grain yield ranged from 20.3 to 24.8 q/ha. The best genotype with high grain yield was SPV 2058 (24.8 q/ha) followed by SPV 2056 (23.2 q/ha). The single cut checks, HC 308 and CSV 21F yielded 22.1 and 20.3 q/ha of grain. Both the multi-cut genotypes, SPV 2107 (22.5 q/ha) and SPV 2108 (21.5 q/ha) recorded better grain yield compared to the check, SSG 59-3 (21.3 q/ha).
- Dry fodder yield at all India level varied from 213 q/ha to 290 q/ha, the highest being in SSG 59-3 (290 q/ha), followed by HC 308 (276 q/ha). CSV 21F yielded 273 q/ha of dry fodder in this trial.
- Days to flower ranged from 73 to 85 days at all India level. SSG 59-3 was the earliest to flower in 73 days.
- Days to maturity ranged from 114-129 days, with SSG 59-3 as the earliest to mature followed by SPV 2058 (117 days)

Conclusions: The single-cut varieties, SPV 2058 and SPV 2056, and the multicut variety, SPV 2107 were found to yield more grain compared to the respective checks at all India level.

4. Evaluation of forage locals from different states for fodder yield and quality

The experiment on evaluation of forage local genotypes and sweet sorghum lines was continued during kharif 2011. This was initiated in order to increase the variability in the breeding material. As a first step, the local germplasm from different states was collected. This experiment was conducted at 9 locations (Pantnagar, Hisar, Ludhiana, Surat, Coimbatore, Deesa, Jhansi, Akola and DSR) to evaluate the germplasm for fodder yield and quality. The material includes 12 local forage germplasm, 4 sweet sorghum lines and 3 checks. At each centre the experiment was conducted in RCBD with 3 replications. Data was recorded on green and dry fodder yields, days to flower, early vigour, leaf parameters, and quality traits like protein, digestibility and HCN content. The data is presented in Tables 6 to 8. The genotype CO(FS)29 from Tamilnadu had given high green fodder and dry fodder yields compared to the checks confirming last year's results. The per day productivity of green and dry fodder was also high in CO(FS)29.

Table 6. Performance of forage local genotypes for green and dry fodder yields

	Green fodder yield (q/ha)										Dry fodder yield (q/ha)							
	Pant-nagar	*Hisar*	*Coim-batore*	*Deesa*	*Ludhi-ana*	*Surat*	*DSR*	*Akola*	*Jhansi*	*Av.*	*Pant-nagar*	*Hisar*	*Akola*	*Deesa*	*Ludhi-ana*	*Surat*	*DSR*	*Av*
Ramkel	666.6	527.8	544.4	569.4	291.7	476.4	308.9	433.3	827.8	516.3	173.3	119.4	139.7	213.5	53.3	170.8	107.2	139.6
GFS 5	599.9	263.9	552.8	374.9	364.6	443.1	397.8	422.2	837.5	473.0	180.0	86.8	120.3	147.2	75.6	127.8	102.9	120.1
S 541	622.2	805.6	585.3	340.2	125.0	377.8	331.1	400.0	627.8	468.3	149.3	266.4	114.9	140.9	26.5	119.4	105.3	131.8
HC 136	677.7	631.9	591.0	354.1	104.2	411.1	432.5	622.2	743.1	507.5	162.7	200.4	192.3	123.1	24.8	123.6	124.5	135.9
HC 171	622.2	583.3	555.3	444.4	187.5	440.3	278.5	444.4	740.3	477.4	174.2	171.0	154.4	177.4	38.4	115.3	89.3	131.4
Rampur local	722.2	340.3	553.6	270.8	260.4	395.8	257.5	455.5	869.4	458.4	144.4	89.0	133.2	111.8	58.6	120.8	87.2	106.4
MP Chari	611.1	312.5	561.8	243.0	114.6	461.1	343.6	322.2	719.4	409.9	146.7	99.6	96.1	88.0	25.4	109.7	102.4	95.4
CO FS 29	1300	472.2	550.4	597.1	354.2	936.1	238.8	266.7	843.1	617.6	390.0	149.3	94.7	238.9	67.3	326.4	91.0	193.9
PSC 1	633.3	298.6	552.1	270.8	125.0	375.0	337.4	277.8	695.8	396.2	195.9	87.5	92.2	108.2	21.2	101.4	63.8	95.7
SL 44	588.8	284.7	616.7	187.5	312.5	429.2	153.4	244.4	688.9	389.6	196.3	85.3	76.2	70.0	51.3	118.1	37.3	90.6
Katarkhatav	655.5	513.9	590.3	256.9	354.2	283.3	248.9	422.2	726.4	450.2	144.2	153.5	139.3	102.6	73.4	102.8	69.4	112.2
Sangola hundi	611.1	472.2	566.5	527.7	260.4	487.5	322.1	411.1	726.4	487.2	162.9	137.1	120.4	187.5	54.6	129.2	75.3	123.9
HC 308	644.4	548.6	536.1	444.4	312.5	336.1	438.7	388.9	1107	528.5	141.8	155.7	131.4	177.0	53.7	90.3	122.4	124.6
CSV 21 F	644.4	444.4	581.3	493.0	239.6	954.2	347.9	388.9	1043	570.7	148.2	119.6	92.1	208.5	40.5	237.5	101.3	135.4
SSG 59-3	711.0	520.8	600.0	402.7	270.9	602.8	270.0	255.5	775.0	489.9	227.5	134.0	83.2	167.3	55.3	176.4	100.9	135.0
SSV 84	711.0	298.6	604.2	236.1	208.4	288.9	396.0	511.1	600.0	428.2	156.4	92.6	148.2	96.5	45.6	77.8	102.3	102.8
RSSV9	644.4	340.3	572.8	361.1	312.5	456.9	377.6	455.5	788.9	478.9	148.2	123.3	119.8	142.7	59.1	123.6	87.3	114.8
SSV 74	644.4	388.9	583.3	527.7	166.7	276.4	348.5	422.2	698.6	450.7	141.8	140.6	124.1	181.2	35.4	94.4	98.1	116.5
NSSV 13	633.3	430.6	561.3	361.1	62.5	344.4	401.9	500.0	740.3	448.4	139.3	132.5	127.7	136.3	13.4	83.3	121.7	107.7
Mean	681.2	446.3	571.5	382.2	233.0	461.9	328.0	402.3	778.9	476.2	174.9	133.9	121.1	148.3	46.0	134.1	94.2	121.8

Table 7: Performance of forage local genotypes for morphological traits

	Plant ht (cm)	DF	Leaf no.	Leaf length (cm)	Leaf breadth (cm)	Early vigour	Stem girth	Leaf Stem
Ramkel	257.21	50.33	12.70	83.93	6.04	3.11	2.68	0.34
GFS 5	252.71	56.22	12.27	82.83	5.80	2.98	2.40	0.32
S 541	252.55	48.37	13.02	78.98	5.73	3.26	2.34	0.30
HC 136	268.69	48.22	13.85	82.25	5.80	3.24	2.67	0.32
HC 171	261.08	49.04	12.84	75.68	5.88	3.32	2.33	0.30
Rampur local	238.46	48.70	12.37	77.80	5.96	2.81	2.40	0.34
MP Chari	272.25	47.78	12.90	80.84	5.13	2.87	2.35	0.33
CO FS 29	255.92	49.04	16.30	81.57	3.42	2.54	1.85	0.32
PSC 1	208.69	52.37	11.38	73.01	4.82	2.56	2.13	0.29
SL 44	219.88	52.33	10.16	68.26	5.07	2.74	1.86	0.29
Katarkhatav	230.35	49.33	12.82	77.85	5.92	2.98	2.33	0.33
Sangola hundi	226.1	51.26	13.69	72.06	6.09	2.96	2.10	0.30
HC 308	246.96	58.22	13.31	74.58	5.43	3.33	2.41	0.32
CSV 21 F	253.33	57.00	12.81	74.53	5.68	3.33	2.32	0.31
SSG 59-3	262.68	54.48	14.26	73.83	3.81	3.41	2.06	0.30
SSV 84	213.36	48.78	12.53	80.69	6.41	2.80	2.61	0.32
RSSV9	244.08	50.85	13.25	76.28	5.85	3.17	2.50	0.34
SSV 74	229.17	48.19	12.78	80.91	6.26	2.76	2.65	0.32
NSSV 13	240.26	48.04	12.14	76.58	6.07	2.94	2.61	0.28
Mean	243.88	50.98	12.91	77.50	5.53	3.01	2.35	0.31
C.D. 5%	19.6743	10.19	2.16	4.95	0.59	0.40	0.24	0.04
C.D. 1%	26.1025	13.52	2.87	6.57	0.79	0.54	0.31	0.06

The sweet sorghum genotypes, NSSV 13 and SSV 74 were early compared to other genotypes. Leaf parameters were good in CO(FS)29, Ramkel and GFS 5. High leaf stem ratio was observed in Ramkel, Rampur local and the sweet sorghum genotypes, RSSV 9, SSV 84, and SSV 74.

Table 8. Performance of forage local genotypes for fodder quality traits

	Protein %	Protein yield (q/ha)	IVDMD%	HCN	TSS
Ramkel	7.32	11.00	51	89.16	9.54
GFS 5	7.60	12.74	51.6	104.40	10.15
S 541	8.15	11.03	50.8	106.22	9.56
HC 136	7.78	10.61	54.2	112.06	9.66
HC 171	7.49	10.77	48.4	78.76	9.34
Rampur local	7.07	8.67	47.7	106.64	8.37
MP Chari	7.02	9.52	53.8	65.96	7.79
CO FS 29	7.58	25.41	47.4	78.81	7.97
PSC 1	7.66	12.08	47.2	112.22	8.97
SL 44	6.79	12.59	49.4	87.62	10.15
Katarkhatav	7.18	9.64	51.2	100.46	8.51
Sangola hundi	7.11	10.10	47.8	102.42	7.53
HC 308	6.97	8.89	52.2	69.94	10.29

	Protein %	Protein yield (q/ha)	IVDMD%	HCN	TSS
CSV 21 F	7.68	9.08	50.4	88.17	10.10
SSG 59-3	8.16	16.90	46.8	95.93	9.67
SSV 84	7.50	12.42	47	65.10	10.79
RSSV9	7.06	9.40	56.8	58.91	10.42
SSV 74	7.37	9.51	53.6	113.30	10.89
NSSV 13	7.01	8.91	49.4	98.99	11.33
Mean	7.39	11.54	50.35	91.32	9.53
C.D. 5%	0.21	0.84	0.41	0.84	1.12
C.D. 1%	0.28	1.11	0.54	1.11	1.48

High protein was observed in improved S 541, while high protein yield was observed in CO(FS)29 and GFS 5. IVDMD was high in HC 136, MP Chari and in all the sweet sorghum genotypes. HCN was least in RSSV 9. TSS was high in all the sweet sorghum genotypes and in SL 44 and GFS 5.

Conclusions: The sweet sorghum genotypes have good fodder yield and quality traits indicating their suitability for forage purpose. The identified locals with good fodder yield and quality traits will be used in the breeding program.

5. Making selections in F_4 progenies developed for specific traits

Breeding program for trait based improvement of forage sorghum genotypes for quality and resistances had been initiated during kharif 2008. The crosses were made under this program by different AICSIP centers. The F_2 of these crosses were distributed to different centres during kharif 2009 and selections were made. The selections were again distributed to the centres and F_3 generation was raised during kharif 2010. 108 promising selections were made among the F_4 families at different centres during kharif 2011(Table 9). The most promising selections made in each centre will be pooled and tested across the centres during 2012.

Table 9: Selections made from F_4 progenies for different traits

S No.	Cross	Trait	Centres distributed	No. of selections made
1	ICSV 705 x UPMC 503	Shoot fly	Udaipur, Ludhiana, DSR	4
2	IS 2122 x UPMC 503	Shoot fly	Udaipur, Ludhiana, Coimbatore, DSR	5
3	UPMC 503 x IS 2122	Shoot fly	Udaipur, Ludhiana, Coimbatore, DSR	6
4	UPMC 512 x ICSR 705	Shoot fly	Udaipur, DSR	5
5	UPMC 503 x IS 18551	Shoot fly	Deesa, DSR, Coimbatore	13
6	HC 308 x IS 18551	Shoot fly	Deesa, DSR, Coimbatore, Ludhiana	11
7	ICSV 700 x S 541	Stem borer	Deesa, DSR	2
8	HC 171 x ICSV 700	Stem borer	Deesa, DSR	7
9	S 541 x ICSV 700	Stem borer	Deesa, Hisar, DSR	8
10	EC 582506 x PANTCHARI 3	Quality	Pantnagar, Hisar, Coimbatore, DSR	3
11	PANTCHARI 4 x EC 582508	Quality	Pantnagar, DSR	4
12	EC 582506 x UP Chari	Quality	Hisar, Pantnagar, Ludhiana	4
13	PANT CHARI 4 x EC 582510	Quality	Hisar, Pantnagar, Coimbatore	5
14	HC 308 x UPMC 503	R line improvement	Ludhiana, Coimbatore	9
15	HC 308 x UPMC 512	R line improvement	Ludhiana, Hisar	2
16	NR 184 x UPMC 512	R line improvement	Ludhiana, Pantnagar	2
17	UPMC 503 x AKR 150	R line improvement	Deesa, Pantnagar, Coimbatore	6
18	SPV 1616 x UPMC 512	R line improvement	Hisar	2
19	SPV 1616 x UPMC 503	R line improvement	Deesa, Pantnagar	10

6. DUS characterization of promising SSG 59-3 mutant derivatives

The mutagenic derivatives of SSG 59-3 were evaluated for two years during 2009 and 2010 for fodder yield and quality across locations. Sixteen mutagenic derivatives were observed to be promising for different yield components and quality traits. These were characterised for DUS traits inorder to facilitate registration of these genotypes. Most of these genotypes were distinctly different from SSG 59-3 both for qualitative and quantitative traits (Tables 10 & 11).

Table 10. DUS characterisation of SSG mutants for quantitative traits

S. No.	Genotype	Length of flag leaf (cm)	Width of flag leaf (cm)	Anther length (mm)	Stigma length (mm)	Stem diameter (mm)	Plant height (cm)	Plant height upto the base of flag leaf (cm)	Neck of panicle visible above sheath (cm)	Panicle length without peduncle (cm)	Panicle length of branches (cm)	1000 Grain weight (g)
1	SSG 224	57.02	4.97	2.69	4.29	14.32	291.0	216.3	13.07	35.97	11.58	15.3
2	SSG 225	45.70	4.76	3.02	3.37	13.21	260.2	216.5	19.70	32.25	10.33	15.80
3	SSG 226	43.54	4.82	2.89	3.05	12.69	256.2	201.3	24.65	37.62	14.50	11.98
4	SSG 227	41.43	5.11	2.78	3.35	13.99	264.7	223.3	12.83	32.55	10.42	16.74
5	SSG 231	39.56	4.12	2.76	4.01	10.64	254.2	202.2	22.47	29.73	13.33	18.47
6	SSG 232	61.27	6.24	3.32	3.23	14.15	347.7	279.7	18.67	29.67	9.00	14.37
7	SSG 233	49.91	4.82	2.78	3.71	15.24	313.3	257.2	17.17	32.83	12.33	14.40
8	SSG 234	77.51	5.71	2.69	3.29	13.89	306.0	252.5	19.33	33.00	13.67	16.62
9	SSG 236	56.09	5.80	2.85	2.98	15.71	306.7	256.5	14.17	33.83	20.50	20.92
10	SSG 237	65.71	5.77	2.80	3.85	16.57	333.5	297.2	9.93	27.50	15.17	20.68
11	SSG 241	47.18	4.58	2.87	3.63	12.95	265.8	206.8	18.50	28.17	9.92	16.37
12	SSG 244	48.71	5.44	2.59	2.83	15.86	267.8	213.2	15.17	32.67	10.08	13.43
13	SSG 253	46.89	4.64	3.02	3.88	18.04	357.7	308.7	14.50	33.83	17.33	16.80
14	SSG 256	54.01	4.67	2.48	3.08	15.91	288.5	241.8	15.67	31.33	10.83	15.68
15	SSG 260	53.89	5.80	2.45	3.02	15.40	278.7	238.0	11.92	32.58	9.50	13.43
16	SSG 9	48.14	4.73	3.08	3.25	15.02	305.2	256.5	20.17	32.67	12.83	13.46
17	SSG 59-3	61.99	5.39	2.30	2.85	14.33	303.5	262.7	11.67	41.17	16.17	14.02

Table 11. DUS characterisation of SSG mutants for qualitative traits

Parameter	State	Genotype/ lines
Flag leaf yellow colouration of midrib	Absent	SSG 9, SSG 59-3, SSG 234, SSG 232, SSG 233, SSG 225, SSG 226, SSG 227, SSG 231, SSG 244
	present	SSG 224, SSG 236, SSG 237, SSG 241, SSG 253, SSG 256, SSG 260
Lemma arista formation	Absent	-
	Present	SSG 224, SSG 225, SSG 226, SSG 227, SSG 231, SSG 241, SSG 244, SSG 256, SSG 260, SSG 9, SSG 59-3, SSG 253, SSG 237 SSG 234, SSG 236, SSG 232, SSG 233
Stigma anthocyanine colouration	Absent	SSG 226, SSG 227
	Present	SSG 231, SSG 241, SSG 244, SSG 256, SSG 260, SSG 9, SSG 59-3, SSG 253, SSG 237, SSG 234, SSG 236, SSG 232, SSG 233, SSG 224, SSG 225
Stigma Yellow colouration	Absent	SSG 225, SSG 227, SSG 236, SSG 23, SSG 260
	Present	SSG 226, SSG 231, SSG 241, SSG 244, SSG 256, SSG 9, SSG 59-3, SSG 253, SSG 234, SSG 232, SSG 233, SSG 224
Grain shape (in profile view)	Narrow elliptic	SSG 9, SSG 253, SSG 244, SSG 226
	Elliptic	SSG 231, SSG 241, SSG 256, SSG 59-3, SSG 234, SSG 232, SSG 233, SSG 224, SSG 225,SSG 227, SSG 236,SSG 237, SSG 260
	Circular	
Grain shape (in dorsal view)	Narrow elliptic	SSG 9, SSG 253, SSG 244, SSG 226, SSG 260
	Elliptic	SSG 231, SSG 241, SSG 256, SSG 59-3, SSG 234, SSG 232, SSG 233, SSG 224, SSG 225,SSG 227, SSG 236,SSG 237
	Circular	
Grain texture of endosperm (in longitudinal section)	Fully vitreous(100% corneous)	
	¾ vitreous(75% corneous)	SSG 231, SSG 232
	½ vitreous (50%corneous)	SSG 260, SSG 237, SSG 241, SSG 234, SSG 256, SSG 236, SSG 227, SSG 226, SSG 233, SSG 253
	¾ farinaceous (25% corneous)	SSG 225, SSG 9, SSG 244
	Fully farinaceous(0% corneous)	
Grain colour of vitreous albumen	Grayed yellow (RHS 160-162)	SSG 244, SSG 232, SSG 225, SSG 9, SSG 260, SSG 234, SSG 241
	Grayed orange (RHS 166)	
	Grayed purple (RHS N187)	SSG 231, SSG 237, SSG 256, SSG 236, SSG 227, SSG 226, SSG 233, SSG 253
Grain size of mark germ	Very small	
	Small	
	Medium	SSG 9, SSG 260, SSG 237, SSG 244, SSG 241, SSG 234, SSG 256
	Large	SSG 232, SSG 231, SSG 236, SSG 253, SSG 225, SSG 227, SSG 226, SSG 233
	Very large	

7. Hybrid making using common MS lines

Nine male sterile lines were pooled from three centres (Pantnagar, Hisar and DSR). About 25 hybrids were made at four centres (Pantnagar, Hisar, DSR and Akola) on these ms lines using 2-3 restorers at each centre. Based on the quantity of seed available, these hybrids will be tested at 3-4 centres.

Overall conclusions

- In IAVT (SC), SPV 2057 the variety in the advanced testing, was the most promising genotype for green and dry fodder yields, per day productivity and fodder quality with significantly higher fodder yield compared to the checks.
- SPV 2057 had high level of tolerance to shoot pests.
- The performance of SPV 2057 over two years in the multi location testing for fodder yield, quality and shoot pest resistance was also found promising.

- Among the entries in the initial testing, SPV 2131, SPV 2130 and SPV 2128 were promising for fodder yield.
- In IVHT (MC), SPH 1700 recorded significant improvement for green fodder yield over the checks, CHS 20MF and CSH 24MF. Its per day productivity of green and dry fodder yields was also high compared to the checks.
- Another multicut hybrid, SPH 1697 recorded 9% improvement for green and dry fodder yields over CSH 24MF.
- In the advanced seed yield trial, the single cut varieties, SPV 2058 and SPV 2056 and the multicut variety, SPV 2107 were found to yield more grain compared to the respective checks at all India level.
- The experiment on evaluation of forage local germplasm and sweet sorghum lines showed that fodder variety from Coimbatore, CO(FS) 29 had high fodder yields and per day productivity.
- For fodder quality S 541, GFS 5 and HC 136 were found promising. TSS was high in all sweet sorghum genotypes and in SL 44 and GFS 5.
- Under trait based improvement program, 108 F_4 progeny selections were made for different traits.
- In the trial on DUS characterization of SSG mutagenic derivatives, lot of variation was observed between the genotypes for both quantitative and qualitative traits.

Shortfalls

- The suggested plot size was not taken up by many of the centres
- It is very important to note regenerability score in multi-cut genotypes which is not being taken by some centres.
- Plant population per plot was not given by some centres.

Follow-up for Kharif 2012

- Promising genotypes from initial trials of both single-cut and multi-cut types will be evaluated in the advanced trials during kharif 2012
- The selections made under trait specific breeding program will be tested across locations based on the uniformity of the line and the seed available.
- The promising germplasm and breeding lines identified with good quality attributes will be utilized in the breeding program to enhance fodder quality
- Promising SSG mutant derivatives will be registered with NBPGR

Publications during 2011-12

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