

REPORT ON EVALUATION OF FORAGE SORGHUM GENOTYPES

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Executive summary

Introduction: During 2020-21 four multi-location trials, two on single-cut forages, one on multi-cut forages and one advanced seed yield trial were carried out across 15 locations, comprising of two zones (zone I- 7 locations in North India; zone II- 8 locations in rest of India). The most important findings of forage breeding trials for the year are mentioned below.

A. Multi-location trials

Trial 1: Advanced Varietal and Hybrid trial (Single-cut)

- There were 7 trial entries consisting of 2 hybrids with CSH 40F and CSH 13 as check and 5 varieties with CSV 21F, CSV 30F and CSV 35F as checks, besides a local check.
- Among test varieties (in AVT-I), SPV 2704 was superior to check with more than 5% higher dry fodder yield per ha at All India level. It also exhibited more than 10% superiority for crude protein content.
- In zone II, SPV 2704 and SPV 2705 exhibited >5% superiority over respective best check for dry fodder yield. In zone I, none of the entries exceeded the best check by more than 5% for fodder yield traits.

Trial 2: Initial Varietal and Hybrid trial (Single-cut)

- This trial was conducted during 2020 in 12 locations, 6 locations in each zone. There were 20 trial entries consisting of 6 hybrids with CSH 36F and CSH 40F as checks and 14 varieties with CSV 21F, CSV 30F and CSV 35F as checks, besides a local check.
- CSH 36F was the best hybrid check at All India and zonal levels. CSV 21F were the best checks at All India and zone I while CSV 35F was the best check in zone II, based on green fodder yield.
- Test variety SPV 2801 was superior to the best check at All India level for green fodder yield. In zone I, SPV 2800 and SPV 2801 qualified for promotion with more than 5% superiority for green fodder yield.
- In zone II the test hybrid SPH 1985 qualified for promotion with more than 5% superiority for both green and dry fodder yield over the best check hybrid.

Trial 3: Initial and Advanced varietal and hybrid trial (Multi-cut)

- There were 19 trial entries consisting of 12 hybrids with CSH 24MF as check and 7 varieties with CSV 33MF and SSG 59-3 as varietal checks.
- In AHT I level of testing, none of the entries were superior at all India level and zone I. In zone II, test hybrids SPH 1933, SPH 1934 and SPH 1935 exceeded the check CSH 24MF by more than 5% for green fodder yield, both by taking 2 cuts and 3 cuts data.
- SPH 1967 was better than check by more than 5% in IHT at All India level as well as zone I. SPH 1966 and SPH 1967 from IHT in zone II - were superior to check by more than 5% for green fodder yield/ha, both by taking 2 cuts and 3 cuts data. SPH 1970 was superior by more than 5% over check for green fodder yield when 3 cuts total data were taken.
- In zone II, SPH 1933 and SPH 1934 from AHT I, and SPH 1970, SPH 1966 and SPH 1967 from IHT in zone II - were superior to check by more than 5% for dry fodder yield/ha. Whereas while 3 cut data was taken the superiority of SPH 1967 from IHT declined below 5%. SPH 1970 was superior in dry fodder yield by more than 5% at all India level as well.

Trial 4: Advanced seed yield trial

- 10 genotypes consisting of 5 single cut test varieties, 2 multi-cut varieties and three checks were evaluated for seed yield potential at five locations.
- The single-cut varieties and multi-cut varieties were on par with checks for seed production ability across locations.

Overall conclusions

- Among single-cut advanced test entries, SPV 2704 was superior to check with more than 5% higher dry fodder yield per ha at All India level. It also exhibited more than 10% superiority for crude protein content. In zone II, SPV 2704 and SPV 2705 exhibited >5% superiority over respective best check for dry fodder yield.
- Among the new entries tested for single cut, test variety SPV 2801 was superior to the best check at All India level for green fodder yield. In zone I, SPV 2800 and SPV 2801 recorded more than 5% superiority for green fodder yield. In zone II the test hybrid SPH 1985 had more than 5% superiority for both green and dry fodder yield over the best check hybrid.
- Over three years, the single-cut variety SPV 2584 was found to have superiority for green and dry fodder yields over the best check, CSV 21F in zone I. It also showed more than 5% superiority for green fodder yield at all India level.
- In multi-cut, SPH 1967 was better than check by more than 5% in IHT at All India level as well as zone I. SPH 1966 and SPH 1967 from IHT in zone II - were superior to check by more than 5% for green fodder yield/ha.
- In zone II, test hybrids SPH 1933, SPH 1934 and SPH 1935 exceeded the check CSH 24MF by more than 5% for green fodder yield. SPH 1933 and SPH 1934 from AHT I, and SPH 1970, SPH 1966 and SPH 1967 from IHT - were superior to check by more than 5% for dry fodder yield/ha.

- Over three years, the multi-cut hybrid SPH 1904 and SPH 1905 have showed superiority for dry fodder yield, and protein content in comparison to the check, CSH 24MF.
- The single-cut varieties and multi-cut varieties were on par with checks for seed production ability across locations.

Shortfalls

- Uniformity in recording traits such as stem girth need to be observed by all the centres, as per the SOP.
- Plant population per plot and days to flowering for single cut trials was not given by some centres.
- Recommended plot size should be adopted

Follow-up for Kharif 2021

- Promising genotypes from initial trials of both single-cut and multi-cut types will be evaluated in the advanced trials during kharif 2021.

Detailed report

During 2020-21 emphasis was given on identification of genotypes with improved fodder yield and quality both for single-cut and multi-cut forages. Four multilocation trials experiments were conducted for single cut and multi-cut fodder sorghum evaluation. 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. The performance of test genotypes was evaluated at all India level as well as in two zones.

Zone I : UP, Uttaranchal, Gujarat, Rajasthan, Haryana and Punjab

Zone II: Maharashtra, Telangana, 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. The co-ordinated trials which were conducted as per technical programme of kharif 2020 over 15 locations are listed below:

Trial 1: Advanced Varietal and Hybrid Trial on Single-cut forage Sorghum

Trial 2: Initial Varietal and Hybrid Trial on Single-cut forage Sorghum

Trial 3: Initial and Advanced Varietal and Hybrid Trial on Multi-cut forage Sorghum Trial 4: Seed yield trial

The results of the above experiments are discussed below.

Trial 1. Advanced varietal and Hybrid trial on Single-cut forage sorghum

There were 7 trial entries consisting of 2 hybrids with CSH 40F and CSH 13 as check and 5 varieties with CSV 21F, CSV 30F and CSV 35F as checks, besides a local check. All test entries were within safe limits of HCN (<200ppm). CSH 40F was the best hybrid check and CSV 21F was the best varietal check for green fodder yield.

The genotypes were tested for their green fodder yield, dry fodder yield, per day productivity and quality parameters. The summary of performance of checks and test entries is given in the table below (Table 1).

Table 1. Summary results of Single-cut Advanced varietal and Hybrid trial

S No	Entry	Green fodder yield (kg/ha)	Dry fodder yield (kg/ha)	Days to flowering	Crude Protein (%)	IVDMD (%)	HCN (ppm)	Anthraxnose (1-9)	Shootfly deadhearts (%)	Stem borer deadhearts (%)
1	CSH 13	439.3	132.9	72.86	7.41	44	58.65	2.40	44.5	22.71
2	CSH 40F	467.7	146.2	75.3	7.53	43.63	60.49	2.00	29.0	28.67
3	CSV 21F	429.0	127.3	73.8	7.03	43.19	57.94	2.87	37.0	21.74
4	CSV 30F	383.5	118.9	78.45	6.99	43.1	72.13	4.27	45.6	22.30
	CSV 35F	421.8	127.0	78.05	7.04	44.55	63.26	2.80	34.6	19.19
	General Mean	423.2	128.4	74.07	7.16	43.33	63.48			
	CV(%)	14.55	14.9	5.2	10.91	8.08	6.03			
	SE of Difference	27.7	10.3	1.64	0.3	1.88	5.22			
	P-Value	0.01	0.18	0	0.07	0.82	0.08			

S No	Entry	Green fodder yield (kg/ha)	Dry fodder yield (kg/ha)	Days to flowering	Crude Protein (%)	IVDMD (%)	HCN (ppm)	Anthracnose (1-9)	Shootfly deadhearts (%)	Stem borer deadhearts (%)
	CD(5%)	54.7	20.4	3.24	0.59	3.82	11.38			
	CD(1%)	72.2	26.9	4.28	0.79	5.12	15.95			
	Lines sig. > check				SPV 2704					
	Lines > best check				SPV 2704, SPV 2705					
	Data from locations (no)	15	15	14	6	4	5			
	Loc. for national av. (no)	13	13	14	6	4	2			

1.1 Advanced Varietal and Hybrid Trial for single-cut forage sorghum (AVHT-SC)

The advanced varietal and hybrid trial consisting of 7 single cut genotypes comprising of 2 hybrids and 5 varieties alongwith 3 varietal checks (CSV 21F, CSV 30F and CSV 35F) and 2 hybrid checks (CSH 13 and CSH40F) and one local check –was carried out at 15 locations during kharif 2020. The genotypes were tested for their green fodder yield, dry fodder yield, per day productivity and quality parameters. Out of the test entries, two were varieties which were in the first year of advanced testing. The zone wise and all India results of the trial are presented in Tables 1.1 to 1.16 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: None of the varieties and hybrids exceeded the best check significantly in this zone.

Dry fodder yield: For dry fodder yield, even 5% more improvement was not recorded by the entries against checks.

SPV 2584 was late flowering by 3 days to the high yielding check CSV 21F.

Performance of test entries in AVHT-Single Cut Trial During Kharif 2020- Zone I

Entry	Level of testing	Green fodder yield (q/ha)			Dry fodder yield (q/ha)			Days to flowering	
		Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank
CSH 13		545.8	5		136.8	6		75.3	2
CSH 40F		570.2	3		135.4	7		79.4	6
CSV 21F		559.9	4		143.1	2		80.0	10
CSV 30F		434.1	12		106.6	12		82.3	12
CSV 35F		464.6	11		114.3	10		80.4	11
Local Check		538.6	8		143.0	3		74.1	1
SPH1958	II	477.2	10	-16.32	111.5	11	-17.68	75.8	3
SPH1961	II	570.4	2	0.03	140.6	4	3.82	78.0	4
SPV2584	II	581.7	1	3.90	147.5	1	3.09	82.8	13
SPV2587	II	423.5	13	-24.35	101.8	13	-28.87	79.8	8
SPV2593	II	543.9	6	-2.84	133.8	8	-6.51	79.9	9
SPV2704	I	539.0	7	-3.72	140.5	5	-1.82	79.0	5
SPV2705	I	534.2	9	-4.58	132.6	9	-7.37	79.5	7
General Mean		521.8			129.8			79.0	
CV(%)		12.0			13.5			2.4	
SE of Difference		41.6			12.0			2.1	
P-Value		0.0			0.0			0.0	
CD(5%)		83.2			23.96			4.2	
CD(1%)		110.7			31.9			5.6	

Zone-II:

Yield parameters

Green fodder yield: In Zone II, the variety SPV 259 was 9.8% superior to best check variety whereas SPV 2584 was 8.8% more yielding than the best check CSV 21F.

Dry fodder yield: For dry fodder yield, entries SPV 2704 and SPV 2705 showed more than 10% superiority over check. SPV 2593 and SPV 2584 exhibited a superiority of 9.3% and 5.3% over the best check CSV 21F.

For both the above traits, none of the test hybrids exceeded the best check hybrid. SPV 2593 was also late to flower by nearly 9 days compared to CSV 21F.

Summary of performance of test entries in AVHT-Single Cut Trial During Kharif 2020- Zone II

Entry	Level of testing	Green fodder yield (q/ha)			Dry fodder yield (q/ha)			Days to flowering	
		Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank
CSH 13		347.9	5		129.6	4		70.43	7
CSH 40F		379.9	2		155.4	1		71.26	9
CSV 21F		316.8	9		113.7	12		67.86	2
CSV 30F		340.1	8		129.3	5		74.48	11
CSV 35F		385.1	1		137.9	2		74.65	12
Local Check		285.9	13		107.2	13		67.93	3
SPH1958	I	360.7	3	-5.04	135.8	3	-12.58	70.71	8
SPH1961	I	357.3	4	-5.94	128.8	6	-17.09	67.48	1
SPV2584	II	344.8	7	8.84	119.7	10	5.30	69.43	6
SPV2587	II	314.1	10	-0.85	117.3	11	3.23	73.59	10
SPV2593	II	347.8	6	9.79	124.2	9	9.30	76.87	13
SPV2704	I	311.4	11	-1.69	128.7	7	13.21	69.14	5
SPV2705	I	310.1	12	-2.10	125.6	8	10.49	68.67	4
General Mean		338.6			127.2			70.36	
CV(%)		17.9			16.0			6.8	
P-Value		0.1			0.2			0	
CD(5%)		64			29.59			4.77	

National level: Among the entries in second year of advanced testing, none of the hybrids showed significant improvement over the best check CSH 40F. Among the varieties in the second year of testing, SPV 2584 was the most promising with 5.87% increase in green fodder yield (454.1 q/ha) over CSV 21F.

There were no hybrids in the first year of advanced testing. Among the varieties in the first year of testing, SPV 2704 was superior to check by more than 5% for dry fodder yield (1341. q/ha) and more than 10% superior (7.77%) for crude protein.

Table 2: Performance of promising single-cut forage sorghum genotypes in AVHT-SC during 2020-21
(Hybrids- 2; Varieties- 5; Checks-5; Locations: 15)

Entry	Level of testing	Green fodder yield (q/ha)			Dry fodder yield (q/ha)			Crude Protein (%)			IVDMD (%)			Days to flowering	
		Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank
CSH 13		439.3	4		132.9	4		7.41	7		44	4		72.86	3
CSH 40F		467.7	1		146.2	1		7.53	4		43.63	5		75.3	8
CSV 21F		429.0	6		127.3	8		7.03	12		43.19	8		73.8	6
CSV 30F		383.5	12		118.9	12		6.99	13		43.1	9		78.45	12
CSV 35F		421.8	7		127.0	9		7.04	11		44.55	2		78.05	11
Local Check		402.6	11		123.7	11		7.43	5		42.89	10		70.8	1
SPH1958	II	414.5	9	-11.38	124.6	10	-14.76	7.7	3	2.26	41.45	13	-5.00	73.25	4
SPH1961	II	455.6	2	-2.58	134.3	2	-8.15	7.14	10	-5.18	43.38	7	-0.57	72.74	2
SPV2584	II	454.1	3	5.87	132.5	5	4.15	7.82	1	11.24	42.48	11	-1.64	75.5	9
SPV2587	II	364.6	13	-15.01	110.2	13	-13.44	7.32	8	4.13	43.5	6	0.72	77.13	10
SPV2593	II	438.3	5	2.18	128.7	7	1.09	7.43	6	5.69	45.2	1	4.65	79.4	13
SPV2704	I	416.5	8	-2.91	134.1	3	5.41	7.77	2	10.53	41.88	12	-3.03	74.03	7
SPV2705	I	413.6	10	-3.59	128.8	6	1.22	7.25	9	3.13	44.13	3	2.18	73.78	5
General Mean		423.2			128.4			7.16			43.33			74.07	
CV(%)		14.55			14.9			10.91			8.08			5.2	
SE of Difference		27.7			10.3			0.3			1.88			1.64	

Entry	Level of testing	Green fodder yield (q/ha)			Dry fodder yield (q/ha)			Crude Protein (%)			IVDMD (%)			Days to flowering	
		Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank	% over CSH 40F / CSV 21F	Mean	Rank
P-Value		0.01			0.18			0.07			0.82			0	
CD(5%)		54.7			20.4			0.59			3.82			3.24	
CD(1%)		72.2			26.9			0.79			5.12			4.28	

Entry	Level of testing	HCN (ppm)	Anthraco- nose (1- 9)	Zonate leaf spot (1-9)	Gray leaf spot (1-9)	Leaf blight (1-9)	Rust (1- 9)	Sh fly DH (%) 28 DAE	Stem borer DH (%)
CSH 13		58.65	2.40	2.67	4.33	1.56	1.00	44.5	22.71
CSH 40F		60.49	2.00	2.50	4.00	1.89	2.00	29.0	28.67
CSV 21F		57.94	2.87	3.83	3.33	2.67	3.00	37.0	21.74
CSV 30F		72.13	4.27	3.50	3.67	2.67	2.33	45.6	22.30
CSV 35F		63.26	2.80	3.67	5.00	2.00	1.00	34.6	19.19
Local Check		63.65	3.87	3.83	3.33	2.22	1.00	33.6	20.94
SPH1958	II	66.11	2.47	3.33	2.00	2.11	2.33	32.3	30.44
SPH1961	II	53.73	4.20	4.33	3.67	2.44	4.00	29.5	22.64
SPV2584	II	64.6	3.93	3.83	6.00	1.89	3.00	34.8	19.06
SPV2587	II	73.7	3.87	3.67	4.67	2.67	5.00	22.2	21.62
SPV2593	II	61.21	2.27	3.33	1.00	2.33	1.00	24.1	24.07
SPV2704	I	67.94	2.33	3.33	1.00	3.44	1.67	33.2	23.55
SPV2705	I	61.84	3.00	3.17	3.33	3.33	3.00	29.7	22.88
General Mean		63.48							
CV(%)		6.03							
SE of Difference		5.22							
P-Value		0.08							
CD(5%)		11.38							
CD(1%)		15.95							

Performance of single cut forage sorghum genotypes tested in AICSIP over last 3 years

The performance of promising genotypes tested in All India Co-ordinated trials during last 3 years is presented in the following table:

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

	GFY			DFY			CP			IVDMD		
	zone I	zone II	All India	zone I	zone II	All India	zone I	zone II	All India	Zone I	zone II	All India
CSV 21F	557	384	464	154	115	133	7.00	6.61	7.04	46.2	47.8	46.1
CSV 30F	434	397	414	115	120	118	6.90	7.29	7.15	45.6	47.0	45.6
SPV2584	596	408	495	163	117	139	7.31	7.12	7.56	46.8	46.3	46.2
SPV2587	460	414	435	118	122	120	7.13	6.62	7.28	45.8	44.8	45.4
SPV2593	533	433	479	136	122	128	7.19	6.93	7.32	47.9	46.0	47.0

GFY- Green fodder yield, DFY- Dry fodder yield, ivdmd- in vitro dry matter digestibility, R=Rank

	Green fodder yield			Dry fodder yield		
	zone I	zone II	All India	zone I	zone II	All India
Test entry	Superiority over check			Superiority over check		
	CSV 21F	CSV 30F	CSV 21F	CSV 21F	CSV 30F	CSV 21F
SPV2584	7.1	2.7	6.7	6.3	-2.1	4.4
SPV2587	-17.4	4.3	-6.1	-23.5	1.7	-9.7
SPV2593	-4.3	9.1	3.4	-11.6	1.7	-3.3

Conclusions: Over three years the variety SPV 2584 was found to have superiority for green and dry fodder yields over the best check, CSV 21F in zone I. It also showed more than 5% superiority for green fodder yield at all India level.

Trial 2. Initial varietal and Hybrid trial on Single-cut forage sorghum

Twenty-six single-cut genotypes comprising of 6 hybrids and 14 varieties along with 3 varietal checks (CSV 21F, CSV 30F and CSV 32F) and two hybrid checks (CSH 13 and CSH 40F) and one local check were evaluated across 13 locations during kharif 2020. The genotypes were tested for their green fodder yield, dry fodder yield, per day productivity and quality parameters. The summary of performance of checks and test entries is given in the table below (Table 4).

Table 4. Summary results of Single-cut initial varietal and Hybrid trial

Genotype	Green fodder yield (kg/ha)	Dry fodder yield (kg/ha)	Crude Protein (%)	IVDMD (%)	Days to flowering	HCN (ppm)
CSH 40F	512.23	146.42	7.41	41.27	75.72	69.53
CSH 36F	551.95	160.49	7.7	42.45	78.12	87.01
CSV 21F	487.65	151.62	7.42	41.92	75.84	70.17
CSV 30F	398.80	123.76	7.53	39.45	81.82	80.23
CSV 35F	475.72	138.03	7.24	44.2	82.54	73.86
Local Check	468.69	146.08	7.78	42.32	73.78	74.36
General Mean	461.53	137.84	7.54	41.92	75.92	71.4
CV(%)	18.69	16.37	8.23	9.25	5.89	12.98
SE of Difference	36.44	10.75	0.31	1.94	2.05	10
P-Value	0.00	0	0.68	0.05	0	0.59
CD(5%)	71.86	21.19	0.62	3.86	4.04	20.09
CD(1%)	94.78	27.95	0.82	5.12	5.32	26.79

2.1 Initial Varietal and Hybrid Trial for single-cut forage sorghum (IVHT-SC)

Twenty-six single-cut genotypes comprising of 6 hybrids and 14 varieties along with 3 varietal checks (CSV 21F, CSV 30F and CSV 32F) and two hybrid checks (CSH 13 and CSH 40F) and one local check were evaluated across 13 locations during kharif 2020. The zone wise and all India results of the trial are presented below (Tables 2.1 to 2.16 and 2A to 2F).

Performance of test entries in IVHT-Single Cut Trial During Kharif 2020- Zone I

S No	Entry	Green fodder yield (kg/ha)			Dry fodder yield (kg/ha)			Crude Protein (%)			IVDMD (%)			Days to flowering		HCN (ppm)
		Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank	
1	CSH 40F	568.90	4		139.81	6		7.61	22		41.13	23		78.23	11	69.5
2	CSH 36F	615.30	1		156.47	1		7.96	8		44.33	7		80.7	23	87
3	CSV 21F	547.13	6		152.73	4		7.73	18		43	12		79.19	14	70.2
4	CSV 30F	404.62	25		104.82	24		7.82	13		38.87	26		78.19	10	80.2
5	CSV 35F	502.79	13		122.51	17		7.42	25		45.6	4		80.87	24	73.9
6	Local Check	504.07	12		137.33	9		7.89	11		43.57	10		74.88	3	74.4
7	SPH1984	522.06	9	-15.2	128.51	12	-17.9	8.03	6	0.9	41.63	20	-6.1	79.21	15	66.1
8	SPH1985	553.61	5	-10.0	131.01	11	-16.3	7.74	17	-2.8	42.67	14	-3.7	74.21	2	68.9
9	SPH1986	520.65	10	-15.4	118.58	19	-24.2	8.12	2	2.0	44.37	6	0.1	80.59	21	81.2
10	SPH1987	535.04	7	-13.0	142.19	5	-9.1	7.8	15	-2.0	41.57	21	-6.2	76.12	7	59.9
11	SPH1988	491.52	15	-20.1	127.09	14	-18.8	7.99	7	0.4	42.57	17	-4.0	75.28	5	76.1
12	SPH1989	451.74	20	-26.6	119.52	18	-23.6	7.63	21	-4.1	45.13	5	1.8	73.83	1	70.2
13	SPV2796	417.24	24	-23.7	111.30	22	-27.1	7.66	20	-0.9	41.83	19	-2.7	76.44	9	63.9
14	SPV2797	444.20	22	-18.8	114.47	21	-25.1	8.07	3	4.4	46.77	1	8.8	76.17	8	81.9
15	SPV2798	480.59	17	-12.2	128.01	13	-16.2	7.52	24	-2.7	39.87	25	-7.3	78.24	12	71.1
16	SPV2799	517.37	11	-5.4	138.92	8	-9.0	8.29	1	7.2	41.3	22	-4.0	78.67	13	69.2
17	SPV2800	578.48	3	5.7	153.21	2	0.3	7.85	12	1.6	43.93	8	2.2	82.12	25	67
18	SPV2801	593.65	2	8.5	153.12	3	0.3	7.75	16	0.3	43.6	9	1.4	83.52	26	66.8
19	SPV2802	465.91	19	-14.8	117.40	20	-23.1	8.06	4	4.3	46.7	2	8.6	79.21	16	75.6
20	SPV2803	309.43	26	-43.4	81.59	26	-46.6	7.69	19	-0.5	43.43	11	1.0	80.54	20	79.2
21	SPV2804	489.81	16	-10.5	122.72	16	-19.6	7.39	26	-4.4	42.67	14	-0.8	80.67	22	63.8
22	SPV2805	472.15	18	-13.7	134.20	10	-12.1	8.06	5	4.3	40.5	24	-5.8	80.46	19	80.6

S No	Entry	Green fodder yield (kg/ha)			Dry fodder yield (kg/ha)			Crude Protein (%)			IVDMD (%)			Days to flowering		HCN (ppm)
		Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank	
23	SPV2806	448.74	21.00	-18.0	102.25	25	-33.1	7.89	10	2.1	41.97	18	-2.4	79.35	17	75.1
24	SPV2807	418.13	23.00	-23.6	108.07	23	-29.2	7.81	14	1.0	42.63	16	-0.9	80.1	18	67.5
25	SPV2808	495.30	14.00	-9.5	122.81	15	-19.6	7.58	23	-1.9	46.53	3	8.2	75.22	4	65.5
26	SPV2809	525.31	8.00	-4.0	139.43	7	-8.7	7.94	9	2.7	42.8	13	-0.5	76.08	6	67.1
	General Mean	496.01			127.46			7.82			43.04			77.56		71.4
	CV(%)	20.30			18.91			7.97			8.27			3.59		13
	P-Value	0			0			0.76			0.07			0.02		0.59
	CD(5%)	97.42			27.87			0.72			4.53			6		20.1

Zone-II:

CSV 35F was the best check in zone II, based on green fodder yield. For the comparison of quality traits, in zone II, since there were only one or two locations these traits, All India means were considered to determine the competitiveness of the entries of zone II w.r.to such traits.

The test hybrid SPH 1985 qualified for promotion with more than 5% superiority for both green and dry fodder yield over the best check hybrid.

Performance of test entries in IVHT-Single Cut Trial During Kharif 2020- Zone II

S No	Entry	Green fodder yield (kg/ha)			Dry fodder yield (kg/ha)			Days to flowering	
		Mean	Rank	% over CSH 36F / CSV 35F	Mean	Rank	% over CSH 36F / CSV 35F	Mean	Rank
1	CSH 40F	398.88	8		159.64	11		73.25	10
2	CSH 36F	425.25	4		168.54	5		76.06	18
3	CSV 21F	368.70	23		149.41	21		72.5	6
4	CSV 30F	387.15	13		161.63	10		81.66	26
5	CSV 35F	421.60	5		169.09	4		81.39	24
6	Local Check	397.93	9		163.60	9		72.99	9
7	SPH1984	386.41	14	-9.1	165.68	7	-1.7	69.89	2
8	SPH1985	447.75	1	5.3	177.64	1	5.4	76.46	19
9	SPH1986	426.23	3	0.2	172.10	2	2.1	75.74	16
10	SPH1987	371.00	21	-12.8	142.45	26	-15.5	73.89	11
11	SPH1988	378.93	19	-10.9	152.52	19	-9.5	71.39	3
12	SPH1989	401.84	7	-5.5	157.91	15	-6.3	69.5	1
13	SPV2796	379.06	18	-10.1	153.56	18	-9.2	75.78	17
14	SPV2797	369.88	22	-12.3	151.34	20	-10.5	72.83	8
15	SPV2798	373.85	20	-11.3	147.87	23	-12.5	74.89	14
16	SPV2799	382.28	16	-9.3	165.29	8	-2.2	74.78	13
17	SPV2800	363.62	25	-13.8	147.81	24	-12.6	72.7	7
18	SPV2801	385.07	15	-8.7	156.25	16	-7.6	74.5	12
19	SPV2802	382.23	17	-9.3	155.90	17	-7.8	81.66	25
20	SPV2803	366.39	24	-13.1	148.28	22	-12.3	79.01	22
21	SPV2804	415.35	6	-1.5	166.19	6	-1.7	76.59	20
22	SPV2805	389.78	12	-7.5	158.57	13	-6.2	79.66	23
23	SPV2806	439.78	2.00	4.3	170.23	3	0.7	78.86	21
24	SPV2807	394.83	11.00	-6.3	158.59	12	-6.2	74.97	15
25	SPV2808	396.65	10.00	-5.9	158.36	14	-6.3	72.33	5
26	SPV2809	360.32	26.00	-14.5	144.14	25	-14.8	71.61	4
	General Mean	392.72			158.56			74.79	
	CV(%)	11.47			12.03			7.11	
	P-Value	0.28			0.09			0	
	CD(5%)	61.63			20.92			5.58	
	CD(1%)	82.16			27.89			7.38	

National level:

Twenty-six single-cut genotypes comprising of 6 hybrids and 14 varieties along with 3 varietal checks (CSV 21F, CSV 30F and CSV 32F) and two hybrid checks (CSH 13 and CSH 40F) were evaluated. All test entries were within safe limits of HCN (<200ppm). CSV 21F was the best varietal check and CSH 36F was the best hybrid check. test variety SPV 2801 was superior to the best check at All India level for green fodder yield. SPV 2797 showed more than 10% superiority for digestibility (IVDMD).

Table 5: Performance of promising single-cut forage sorghum genotypes in IVHT-SC during 2020-21
(Hybrids- 6; Varieties- 14; Checks- 5; Locations: 13)

S No	Entry	Green fodder yield (kg/ha)			Dry fodder yield (kg/ha)			Crude Protein (%)			IVDMD (%)			Days to flowering	
		Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank	% over CSH 36F / CSV 21F	Mean	Rank
1	CSH 40F	512.23	4		146.42	7		7.41	21		41.27	18		75.72	9
2	CSH 36F	551.95	1		160.49	1		7.7	7		42.45	8		78.12	19
3	CSV 21F	487.65	7		151.62	3		7.42	20		41.92	13		75.84	10
4	CSV 30F	398.80	25		123.76	25		7.53	15		39.45	25		81.82	24
5	CSV 35F	475.72	10		138.03	13		7.24	25		44.2	4		82.54	26
6	Local Check	468.69	13		146.08	8		7.78	6		42.32	10		73.78	4
7	SPH1984	476.84	9	-13.6	140.9	12	-12.2	7.82	2	1.6	40.87	20	-3.7	74.49	6
8	SPH1985	518.32	3	-6.1	146.56	6	-8.7	7.63	8	-0.9	42.42	9	-0.1	77.32	16
9	SPH1986	489.18	6	-11.4	136.42	15	-15.0	7.82	3	1.6	42.17	11	-0.7	77.91	18
10	SPH1987	480.36	8	-13.0	142.28	10	-11.3	7.54	14	-2.1	40.27	21	-5.1	75.03	8
11	SPH1988	453.99	16	-17.7	135.57	16	-15.5	7.79	4	1.2	41.75	14	-1.6	73.34	2
12	SPH1989	435.11	21	-21.2	132.32	19	-17.6	7.56	11	-1.8	44	5	3.7	71.67	1
13	SPV2796	404.51	24	-17.0	125.39	22	-17.3	7.28	23	-1.9	39.72	23	-5.2	76.11	12
14	SPV2797	419.43	22	-14.0	126.76	21	-16.4	7.6	10	2.4	46.45	1	10.8	74.5	7
15	SPV2798	445.01	18	-8.7	134.63	18	-11.2	7.34	22	-1.1	39.1	26	-6.7	76.57	13
16	SPV2799	472.34	11	-3.1	147.71	5	-2.6	7.88	1	6.2	40.12	22	-4.3	76.72	14
17	SPV2800	506.86	5	3.9	151.41	4	-0.1	7.42	19	0.0	42.9	6	2.3	76.05	11
18	SPV2801	524.12	2	7.5	154.17	2	1.7	7.46	18	0.5	41.65	15	-0.6	77.63	17
19	SPV2802	438.02	20	-10.2	130.24	20	-14.1	7.56	12	1.9	44.25	3	5.6	82.49	25
20	SPV2803	329.27	26	-32.5	104.05	26	-31.4	7.63	9	2.8	42.65	7	1.7	80.51	23
21	SPV2804	464.99	14	-4.6	137.21	14	-9.5	7.12	26	-4.0	40.9	19	-2.4	78.58	20
22	SPV2805	444.69	19	-8.8	142.32	9	-6.1	7.79	5	5.0	39.65	24	-5.4	80.22	22
23	SPV2806	445.75	17	-8.6	124.91	24	-17.6	7.54	13	1.6	41.4	17	-1.2	79.68	21
24	SPV2807	410.36	23	-15.8	124.91	23	-17.6	7.48	16	0.8	42.05	12	0.3	77.28	15
25	SPV2808	462.41	15	-5.2	134.66	17	-11.2	7.26	24	-2.2	44.4	2	5.9	73.78	3
26	SPV2809	470.32	12	-3.6	141	11	-7.0	7.48	17	0.8	41.6	16	-0.8	73.83	5
	General Mean	461.53			137.84			7.54			41.92			75.92	
	CV(%)	18.69			16.37			8.23			9.25			5.89	
	P-Value	0.00			0			0.68			0.05			0	
	CD(5%)	71.86			21.19			0.62			3.86			4.04	

S No	Entry	Anthrachnose (1-9)	Zonate LS(1-9)	Leaf blight (1-9)	Grey leaf spot (1-9)	Shoot fly deadhearts (%) at 28 DAE	stem borer deadhearts (%) at 45 DAE
1	CSH 40F	2.75	3.22	1.67	1.33	49.8	25.8
2	CSH 36F	2.54	3.89	2.17	5.67		
3	CSV 21F	2.50	3.33	3.00	2.67	37.4	24.6
4	CSV 30F	3.13	3.56	1.00	5.67	27.4	25.0
5	CSV 35F	2.58	3.33	2.00	2.00	46.6	23.9
6	Local Check	4.33	5.00	1.00	7.00	46.0	23.9
7	SPH1984	2.42	2.78	1.33	1.07	46.9	29.2
8	SPH1985	3.00	4.11	1.00	4.00	56.8	25.6
9	SPH1986	2.92	3.67	1.33	6.00	55.0	25.7
10	SPH1987	2.75	2.89	2.00	2.67	51.3	24.0
11	SPH1988	2.75	3.44	2.00	1.33	42.1	26.2
12	SPH1989	2.50	3.44	3.00	1.33	48.0	25.1
13	SPV2796	2.92	3.67	2.33	1.33	50.6	31.6
14	SPV2797	3.42	4.11	2.00	1.33	44.2	23.6
15	SPV2798	3.58	3.44	1.33	5.00	56.5	25.3
16	SPV2799	3.08	3.78	1.00	6.33	43.7	27.4
17	SPV2800	2.92	3.44	2.67	1.33	51.5	22.0
18	SPV2801	2.50	3.33	3.67	1.33	47.4	25.7
19	SPV2802	3.50	3.67	1.00	5.67	29.8	29.4
20	SPV2803	4.00	4.00	1.00	6.00	36.8	34.3
21	SPV2804	3.42	2.89	1.00	6.00	21.0	25.7
22	SPV2805	2.75	4.44	1.33	5.00	39.0	26.3
23	SPV2806	3.67	4.11	1.33	8.00	60.1	24.9
24	SPV2807	4.00	4.33	1.33	7.67	52.7	28.7
25	SPV2808	3.08	3.44	2.33	1.33	42.0	26.8
26	SPV2809	2.67	3.22	2.33	1.1	27.5	23.9
	General Mean						
	CV(%)						
	P-Value						

Trial 3. Initial & Advanced varietal and hybrid trial on Multi-cut forage sorghum

A multi-cut forage trial comprising of 23 entries (12 test hybrids, 7 test varieties, 2 hybrid checks, one variety check and one local check) was conducted across 12 locations. Data was reported from 12 locations. The genotypes were tested for their green fodder yield, dry fodder yield, per day productivity at different cuts, other forage yield parameters and forage quality parameters.

Table 6: Summary results of IAVHT-multi-cut trial

	Green forage yield (q/ha)	Dry forage yield (q/ha)	Crude protein (%)	IVDMD(%)
CSH 24MF	619.2	165.4	8.21	45.3
CSV 33MF	703.9	193.2	8.06	43.4
SSG 59-3 (Local check)	579.0	149.9	7.90	45.6
Mean	568.35	149.45	8.14	44.94
CV(%)	15.57	18.17	7.53	7.79
SE of Difference	39.67	11.6	0.26	1.75
P-Value	0	0	0.7	0.87
CD(5%)	78.26	22.91	0.51	3.5
CD(1%)	103.23	30.23	0.67	4.65

3.1 Initial & Advanced Varietal & Hybrid Trial for multi-cut forage sorghum (IAVHT-MC)

The multi-cut forage trial comprising of 23 entries (12 test hybrids, 7 test varieties, 2 variety checks, one hybrid check and one local check) was conducted across 12 locations and data was reported from 12 locations. The entries SPH 1904 and SPH 1905 completed 3 years of testing. The results of the trial are presented below (Tables 3.1 to 3.22 and 3.1).

Zone-I:

In AHT I level of testing, as seen from the summary of entries qualifying the promotion criteria, none of the entries were superior at all India level and zone I. SPH 1967 was better than check by more than 5% in IHT. In IVT and AHT I, none of the test varieties exhibited superiority over the best check CSV 33MF for green and dry fodder yields.

Performance of promising multi-cut sorghum genotypes in initial and advanced trial Zone- I

Treatment		Green forage yield (q/ha)		Dry forage yield (q/ha)		Crude protein (%)		IVDMD(%)		HCN (ppm)	
		Zone I	Superiority (%) over CSH 24MF/CSV 33MF	Zone I	Superiority (%) over CSH 24MF/CSV 33MF	Zone I	Superiority (%) over CSH 24MF/CSV 33MF	Zone I	Superiority (%) over CSH 24MF/CSV 33MF	Zone I	Superiority (%) over CSH 24MF/CSV 33MF
	Level of Testing	Mean	R	Mean	R	Mean	R	Mean	R	Mean	R
CSH 24MF	Check hybrid	640.9	4	147.5	3	8.59	8	46.2	14	55.49	18
CSV 33MF	Check variety	728.3	1	176.4	1	8.24	22	45.9	17	52.06	20
SSG 59-3	Local Check	616.8	7	141.7	6	8.46	16	46.5	13	56.61	15
SPH 1904	AHT II	613.3	9	136.4	10	8.58	11	46.0	16	56.98	13
SPH 1905	AHT II	586.3	11	128.3	13	8.45	17	47.8	6	56.61	16
SPH 1932	AHT I	524.5	17	118.2	16	8.50	14	47.2	8	60.03	9
SPH 1933	AHT I	538.2	16	116.5	17	9.10	1	45.6	19	62.15	6
SPH 1934	AHT I	612.0	10	137.5	9	8.44	18	45.9	18	61.13	7
SPH 1935	AHT I	621.4	6	139.5	7	8.73	5	44.4	22	64.69	3
SPH 1966	IHT	615.9	8	138.3	8	8.36	21	47.0	9	56.83	14
SPH 1967	IHT	675.7	2	147.3	4	8.40	20	48.5	3	59.88	10
SPH 1968	IHT	627.2	5	146.0	5	8.55	12	45.0	20	63.99	4
SPH 1969	IHT	565.2	12	128.5	12	8.54	13	48.9	1	58.37	11
SPH 1970	IHT	652.1	3	152.8	2	8.83	3	46.1	15	56.24	17
SPH 1971	IHT	366.0	21	77.5	21	8.70	6	47.7	7.0	51.21	21
SPV 2669	AVT I	478.49	20	109.91	20	8.42	19	46.8	10.0	50.75	22
SPV 2670	AVT I	508.0	18	110.6	19	8.77	4	44.7	21.0	55.1	19
SPV 2764	IVT	484.49	19	112.29	18	8.59	9	48.3	4.0	60.07	8
SPV 2765	IVT	544.6	15	128.9	11	8.97	2	46.8	11.0	58.03	12
SPV 2766	IVT	550.8	14	123.1	14	8.48	15	47.8	5.0	62.21	5
SPV 2767	IVT	553.53	13	121.25	15	8.61	7	48.55	2	65.56	2

SPV 2768	IVT	308.2	22	-57.68	69.27	22	-60.72	8.58	10	4.13	46.72	12	1.74	69.29	1
Mean		564.17			127.62			8.61			46.72			58.78	
CV(%)		12.49			14.21			6.72			7.47			9.98	
P-Value		0			0			0.76			0.72			0.6	
CD(5%)		83.21			24.49			0.65			4.07			14.66	

Zone-II:

In zone II, test hybrids SPH 1933, SPH 1934 and SPH 1935 exceeded the check CSH 24MF by more than 5% for green fodder yield. SPH 1966 and SPH 1967 from IHT in zone II - were superior to check by more than 5% for green fodder yield/ha. SPH 1933 and SPH 1934 from AHT I, and SPH 1970, SPH 1966 and SPH 1967 from IHT in zone II - were superior to check by more than 5% for dry fodder yield/ha.

Performance of promising multi-cut sorghum genotypes in initial and advanced trial Zone- II

	Level of Testing	Green forage yield (q/ha)			Dry forage yield (q/ha)			Crude protein (%)			IVDMD(%)		
		Mean	R	Superiority (%) over CSH 24MF/CSV 33MF	Mean	R	Superiority (%) over CSH 24MF/CSV 33MF	Mean	R	Superiority (%) over CSH 24MF/CSV 33MF	Mean	R	Superiority (%) over CSH 24MF/CSV 33MF
CSH 24MF	Check hybrid	586.7	10		201.3	7		7.44	11		42.4	5	
CSV 33MF	Check variety	667.3	4		226.9	3		7.68	3		35.7	20	
SSG 59-3	Local Check	522.2	16		166.2	20		6.82	22		41.2	8	
SPH 1904	AHT II	583.7	11	-0.51	194.9	10	-3.19	7.34	15	-1.34	39.1	13	-7.78
SPH 1905	AHT II	636.4	6	8.46	184.3	13	-8.41	7.21	18	-3.09	34.6	22	-18.40
SPH 1932	AHT I	564.7	13	-3.75	165.8	21	-17.60	7.64	5	2.69	41.8	6	-1.42
SPH 1933	AHT I	698.1	2	18.97	233.6	1	16.04	7.52	7	1.08	43.8	1	3.30
SPH 1934	AHT I	653.9	5	11.44	221.1	4	9.86	7.19	19	-3.36	40.7	9	-4.01
SPH 1935	AHT I	616.7	7	5.10	197.0	8	-2.10	7.46	9	0.27	42.5	4	0.24
SPH 1966	IHT	687.9	3	17.23	218.2	5	8.43	7.68	2	3.23	43.6	2	2.83
SPH 1967	IHT	724.4	1	23.46	209.8	6	4.21	7.36	14	-1.08	35.6	21	-16.04
SPH 1968	IHT	602.2	8	2.64	196.7	9	-2.28	7.17	20	-3.63	39.4	11	-7.08
SPH 1969	IHT	564.9	12	-3.73	182.9	14	-9.12	7.46	10	0.27	38.5	15	-9.20
SPH 1970	IHT	601.2	9	2.47	227.6	2	13.06	7.41	12	-0.40	37.5	19	-11.56
SPH 1971	IHT	401.3	21	-31.60	157.9	22	-21.55	7.27	16	-2.28	43.3	3.0	2.12
SPV 2669	AVT I	555.35	14	-16.77	175.34	19	-22.73	8.11	1	5.60	38.1	17.0	6.72
SPV 2670	AVT I	546.7	15	-18.07	186.3	12	-17.88	7.26	17	-5.47	38.7	14.0	8.40
SPV 2764	IVT	516.98	18	-22.52	178.18	17	-21.48	7.64	4	-0.52	39.1	12.0	9.52
SPV 2765	IVT	511.4	19	-23.36	181.1	15	-20.17	7.63	6	-0.65	37.7	18.0	5.60
SPV 2766	IVT	522.1	17	-21.76	176.0	18	-22.46	6.93	21	-9.77	39.9	10.0	11.76
SPV 2767	IVT	502.51	20	-24.69	187	11	-17.59	7.4	13	-3.65	38.2	16	7.00
SPV 2768	IVT	374.87	22	-43.82	180.31	16	-20.54	7.51	8	-2.21	41.5	7	16.25
Mean		574.61			193.11			7.29			39.59		
CV(%)		19.16			20.41			8.98			7.74		
P-Value		0			0.08			0.79			0.19		
CD(5%)		154.42			48.14			0.97			6.37		

National level:

SPH 1967 was better than check by more than 5% in IHT at All India level as well as zone I. SPH 1970 was superior in dry fodder yield by more than 5% at all India level as well.

In IVT and AHT I, none of the test varieties exhibited superiority over the best check CSV 33MF at all India level and zones, for green and dry fodder yields.

Table 7. Performance of promising multi-cut sorghum genotypes in initial and advanced trial

(Entries- 23; Checks- 3; Locations: 13)

Genotypes	Level of Testing	Green forage yield (kg/ha)			Dry forage yield (k/ha)			Crude protein (%)			IVDMD(%)			HCN (ppm)	
		Mean	R	% over CSH 24MF / CSV 33MF	Mean	R	% over CSH 24MF / CSV 33MF	Mean	R	% over CSH 24MF / CSV 33MF	Mean	R	% over CSH 24MF / CSV 33MF	Mean	R
CSH 24MF	Check hybrid	619.2	7		165.4	4		8.21	11		45.3	9		55.5	18
CSV 33MF	Check variety	703.9	1		193.2	1		8.06	18		43.4	19		52.1	20
SSG 59-3	Local Check	579.0	12		149.9	11		7.90	22		45.6	7		56.6	15
SPH 1904	AHT II	601.5	11	-2.86	155.9	9	-5.77	8.16	14	-0.61	44.2	15	-2.25	57.0	13
SPH 1905	AHT II	606.3	9	-2.08	147.0	12	-11.16	8.04	19	-2.07	44.5	14	-1.77	56.6	16
SPH 1932	AHT I	540.6	14	-12.70	134.1	19	-18.96	8.22	9	0.12	45.8	6	1.22	60.0	9
SPH 1933	AHT I	602.1	10	-2.76	155.5	10	-6.00	8.56	1	4.26	45.1	10	-0.33	62.2	6
SPH 1934	AHT I	628.7	5	1.54	165.4	5	-0.02	8.02	20	-2.31	44.6	12	-1.48	61.1	7
SPH 1935	AHT I	619.5	6	0.04	158.7	8	-4.06	8.31	5	1.22	43.9	16	-2.92	64.7	3
SPH 1966	IHT	644.7	3	4.11	164.9	6	-0.31	8.14	15	-0.85	46.1	3	1.88	56.8	14
SPH 1967	IHT	695.2	2	12.27	168.1	3	1.61	8.06	17	-1.83	45.3	9	0.00	59.9	10
SPH 1968	IHT	617.2	8	-0.33	162.9	7	-1.54	8.09	16	-1.46	43.6	18	-3.76	64.0	4
SPH 1969	IHT	565.1	13	-8.74	146.6	13	-11.36	8.18	13	-0.37	46.3	2	2.21	58.4	11
SPH 1970	IHT	631.7	4	2.02	177.7	2	7.41	8.35	3	1.71	43.9	17	-2.98	56.2	17
SPH 1971	IHT	380.2	21	-38.61	104.3	22	-36.94	8.22	10	0.12	46.6	10	2.98	51.2	21.0
SPV 2669	AVT I	509.24	19	-27.66	131.72	20	-31.82	8.34	4	3.47	44.6	11.0	2.95	50.8	22.0
SPV 2670	AVT I	523.5	18	-25.64	135.8	17	-29.69	8.26	7	2.48	43.2	19.0	-0.35	55.1	19.0
SPV 2764	IVT	497.49	20	-29.32	134.26	18	-30.51	8.28	6	2.73	46.0	4.0	6.07	60.1	8.0
SPV 2765	IVT	531.3	17	-24.52	146.3	14	-24.27	8.51	2	5.58	44.5	13.0	2.65	58.0	12.0
SPV 2766	IVT	539.3	15	-23.39	140.7	16	-27.16	7.96	21	-1.24	45.8	6.0	5.65	62.2	5.0
SPV 2767	IVT	533.12	16	-24.26	143.16	15	-25.90	8.21	12	1.86	45.96	5	6.00	65.56	2
SPV 2768	IVT	334.87	22	-52.43	106.28	21	-44.99	8.23	8	2.11	45.41	8	4.73	69.29	1
Mean		568.35			149.45			8.14			44.94			58.78	
CV(%)		15.57			18.17			7.53			7.79			9.98	
P-Value		0			0			0.7			0.87			0.6	
CD(5%)		78.26			22.91			0.51			3.5			14.66	

Table 8: Performance of Multicut cut forage sorghum genotypes tested in AICSIP over last 3 years

Year of testing	No of Trials in Zone I	Dry Fodder Yield (q/ha) in Zone I		
		CSH 24MF	SPH 1904	SPH 1905
2018	7	204	220.3	241.6
2019	7	231	228.5	238.9
2020	6	147.5	136.4	128.3
Weighted mean	20	197.47	214.44	218.83
% over check			0.76	5.16

Over three years, the hybrid SPH 1904 and SPH 1905 have showed superiority for dry fodder yield, and protein content in comparison to the check, CSH 24MF.

Trial 4. Advanced seed yield trial

The seed yield trial was taken up at 5 locations to understand the seed production ability of the varieties in advanced trials of single-cut and multi-cut sorghums. Three of these locations were from zone I (Hisar, Panthnagar and Ludhiana, and two were from zone II (Akola and Coimbatore). There were 7 test entries and three checks, CSV 21F, CSV 32F and CSV 30F. The test entries include 5 single-cut varieties and 2 multi-cut varieties. Data was recorded on grain yield, days to 50% flowering, days to maturity and plant height (Table 4.1). The results are discussed below.

Grain yield ranged from 959 kg/ha to 1261 kg/ha on All India basis in single-cut varieties. There was no significant difference for grain yield across single-cut genotypes indicating that test varieties are on par with both check varieties. The multi-cut test varieties SPV 2669 and SPV 2670 recorded 1261 kg/ha and 1232 kg/ha grain yield, higher than the check CSV 33MF.

Table 9. Seed yield potential of single-cut and multi-cut forage sorghum genotypes in advanced trial
(Entries- 7; Checks- 3; Locations: 5)

Genotype	Grain yield (kg/ha)		Plant height (cm)		Days to 50% flowering		Days to maturity	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
CSV 21F	1211	7	285	4	81.9	4	125	5
CSV 33MF	855	10	316	1	89.0	8	132	8
CSV 35F	1242	4	288	3	94.0	10	138	10
SPV2584	1257	2	277	6	84.9	6	128	7
SPV2587	959	9	283	5	85.6	7	125	4
SPV2593	1189	8	271	8	90.5	9	135	9
SPV2669	1261	1	269	9	79.3	3	120	3
SPV2670	1232	5	267	10	77.7	2	117	2
SPV2704	1218	6	272	7	83.5	5	126	6
SPV2705	1256	3	288	2	73.9	1	113	1
General Mean	1153		282		83.8		125	
CV(%)	11.42		8.01		6.66		6.21	
SE of Difference	166.79		14.27		5.74		7.96	
P-Value	0.21		0.07		0.05		0.12	
CD(5%)	339		29.0		11.7		16	

Conclusions: The single-cut varieties and multi-cut varieties were on par with checks for seed production ability across locations.

Overall conclusions

- Among single-cut advanced test entries, SPV 2704 was superior to check with more than 5% higher dry fodder yield per ha at All India level. It also exhibited more than 10% superiority for crude protein content. In zone II, SPV 2704 and SPV 2705 exhibited >5% superiority over respective best check for dry fodder yield.
- Among the new entries tested for single cut, test variety SPV 2801 was superior to the best check at All India level for green fodder yield. In zone I, SPV 2800 and SPV 2801 recorded more than 5% superiority for green fodder yield. In zone II the test hybrid SPH 1985 had more than 5% superiority for both green and dry fodder yield over the best check hybrid.
- Over three years, the single-cut variety SPV 2584 was found to have superiority for green and dry fodder yields over the best check, CSV 21F in zone I. It also showed more than 5% superiority for green fodder yield at all India level.
- In multi-cut, SPH 1967 was better than check by more than 5% in IHT at All India level as well as zone I. SPH 1966 and SPH 1967 from IHT in zone II - were superior to check by more than 5% for green fodder yield/ha.
- In zone II, test hybrids SPH 1933, SPH 1934 and SPH 1935 exceeded the check CSH 24MF by more than 5% for green fodder yield. SPH 1933 and SPH 1934 from AHT I, and SPH 1970, SPH 1966 and SPH 1967 from IHT - were superior to check by more than 5% for dry fodder yield/ha.
- Over three years, the multi-cut hybrid SPH 1904 and SPH 1905 have showed superiority for dry fodder yield, and protein content in comparison to the check, CSH 24MF.
- The single-cut varieties and multi-cut varieties were on par with checks for seed production ability across locations.

Shortfalls

- Uniformity in recording traits such as stem girth need to be observed by all the centres, as per the SOP.
- Plant population per plot and days to flowering for single cut trials was not given by some centres.
- Recommended plot size should be adopted

Follow-up for Kharif 2021

- Promising genotypes from initial trials of both single-cut and multi-cut types will be evaluated in the advanced trials during kharif 2021.

Publications during 2020-21

Journal Articles

1. Pummy Kumari, S. Arya, S.K. Pahuja, N.K.Thakral, D.S. Phogat, Satpal, J.Tokas, H.Kumar, V. Kumar and S. Devi. 2020. Genetic diversity study for identification of dual purpose sorghum. *Forage Res.*, 46(3) : pp. 287-290.
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5. Devi, S., Satpal, Kumari, P., Goyal, V. and Jangra, M. 2020. Variation in physiological responses to salt stress in sorghum [*Sorghum bicolor* L. Moench]. *Int. J. Curr. Microbiol. App. Sci.*, 9(4): 2236-2242.
6. Pummy Kumari, Satyan Arya, Su Mon Thant, Vinod Kumar, Bajrang Lal Sharma and Dalbir Singh Phogat. 2020. Assessment of quality biomass production potential of forage sorghum hybrids in semi-arid conditions of Haryana. *International Journal of Chemical studies*; 8(4): 1248-1252. (NAAS Rating 5.31).
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11. Archana Kumari, Meenakshi Goyal, Ravinder Kumar and R S Sohu (2020) Morpho-physiological and biochemical attributes influence intra genotypic preference of shoot fly [*Atherogona soccata* (rodani)] among sorghum genotypes. *Protoplasma* 258:87-102. DOI 10.1007/s00709-020-01554-5
12. Naveen Arora, Suraj Prashad Mishra, Rahul B Nitnavare, Jagdish Jaba, A Ashok Kumar, Joorie Bhattacharya, Rabinder Singh Sohu, Hari Chand Sharma (2021) Morpho-physiological and leaf surface chemicals as markers conferring resistance to sorghum shoot fly [*Atherigona soccata* Rondani] infestation. *Field Crops Research* 261:1-12. (Article No. 108029). <https://doi.org/10.1016/j.fcr.2020.108029>
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26. Mamta and Y. Singh (2020). Variability in pathological characters in *Gloeocercospora sorghi* isolates from sorghum. *Internat. J. Plant Protec.* 13(2): 148-155.

Book chapters

1. Singh, Y., Sharma, D. and Kharayat, B.S. (2021). Major Diseases of Sorghum and Their Management. *In Diseases of Field Crops: Diagnosis and Management.* Eds. Srivastava, J.N. and Singh, A.K. pp. 153-182. Apple Academic Press, U.S.A.
2. Singh, Y., Namriboi, B.K., Karibasappa, C.S. and Dubey, S. (2021). Sorghum: Smuts, Grain mold and Anthracnose. *In Diseases of Nationally Important Field Crops.* Eds. Khan, M.R., Haque, Z., and Ahamad, F. pp. 175-188. Today and Tomorrow's Printers and Publishers, New Delhi, India.

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2. Maninder Kaur, Ruchika Bhardwaj and Devinderpal Singh (March 2020). Garmi de agete chare bijo te vadhare labh kamayo. *Changi Kheti* 56(3): 21.
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5. Devinder Pal Singh, Rabinder Singh Sohu and Maninder Kaur (2021) Barseem de beej utpadan sabandhi jruri nukte. *Bhomantavi Kheti* (Jan-March): 10.
6. Devinder Pal Singh, Tosh Garg and Meenakshi Goyal (2021) J 1007- A new forage maize variety. *Progressive Farming* 57(2): 11
7. Rabinder Singh Sohu, Devinderpal Singh and Jasbir Singh Chawla (2021) Chare wali maki dee navin kisam: J 1007. *Changi Kheti* Vol. 57 (3):12
8. Devinder Pal Singh and Ruchika Bhardwaj (2021) Berseem daa gunvatta bharpoor beej kiwein tiyar kareeye. *Vigyanak Pashupalan* 16 (3):14-15
9. Singh Y., Karibasappa, C.S. and Namriboi, B.K. 2020. Foliar Diseases of Sorghum and their Management. *Agriculture & Food e-Newsletter* 2(6): 914-916.
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