Progress and achievements in Kharif grain Sorghum Breeding: 2018-19

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Trial	No.
Multi-location	6
Collaborative experiments	2

Team

Zone I : Bailhongal, Bhavanisagar, Chamarajnagar, Coimbatore, Dharwad, Hagari, Palem, Nuziveedu seeds (8)

Zone II: Akola, Aurangabad, Buldhana, Hytech seeds, Indore, Karad, Parbhani, Somnathpur, Yavatmal (9)

Zone III: Aseda, Deesa, Mangrol, Pali, Pratapgarh, Surat, Udaipur (7)

Major Recommendations of 48th AGM & action taken

Recommendation	Action taken
To give emphasis on development of early maturing hybrids	Breeding for early genotypes is taken up specifically by Akola, Dharwad and IIMR
Red sorghum has export potential. Hence there is need to conduct a trial involving colored sorghum.	A trial with available colored sorghum lines is taken up
Each center to give plot wise observations on some special aspects like tan/non-tan types, grain luster, seed size, breakdown of fertility in hybrids etc.	Plot wise information is given by few centers only
Use of stable resistant sources identified by entomology and pathology disciplines in breeding programme	Some stable resistant sources were identified such as GMN 46, GMRP 261 and GMRP 106 for grain molds; and RSSV 9, RSV 1410, SLR 84, SLV 145 and NRCSFR 09-3 for shoot fly.

Progress report

Multi-location AICSIP yield trials

- Advanced Hybrid Trial (AHT: 6+4 entries at 24 locations- 21 reported)
- Advanced Varietal Trial (AVT: 10+5 entries at 21 locations- 20 reported)
- Initial Hybrid Trial (IHT: 9+5 entries at 15 locations- 12 reported)
- Initial Variety Trial (IVT: 15+5 entries at 15 locations- 14 reported)

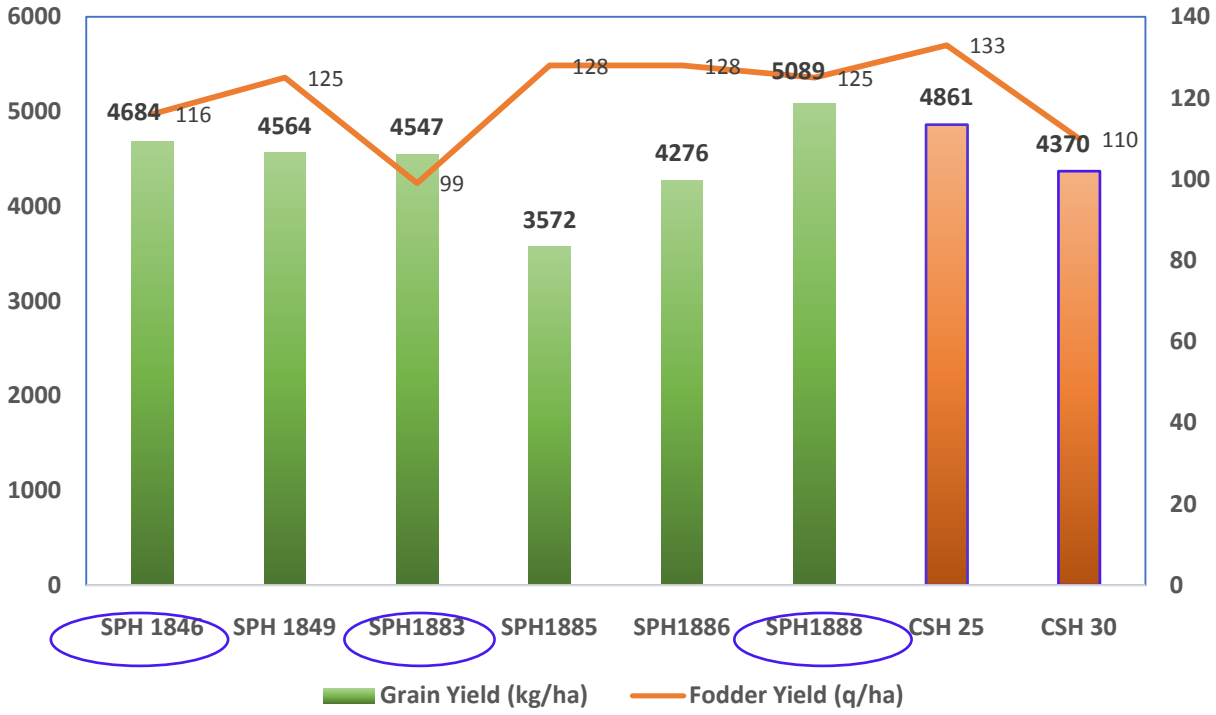
Efficiency of trial execution: 89.3%

Co-ordinated breeding research

- Initial early hybrid trial (IEHT: 11+2 entries at 4 locations)
- Specialty sorghum trial (ISSVT: 27+3 entries at 5 locations)
- Grain Mold trial (GMT: 33+2 entries at 4 locations)

Publications

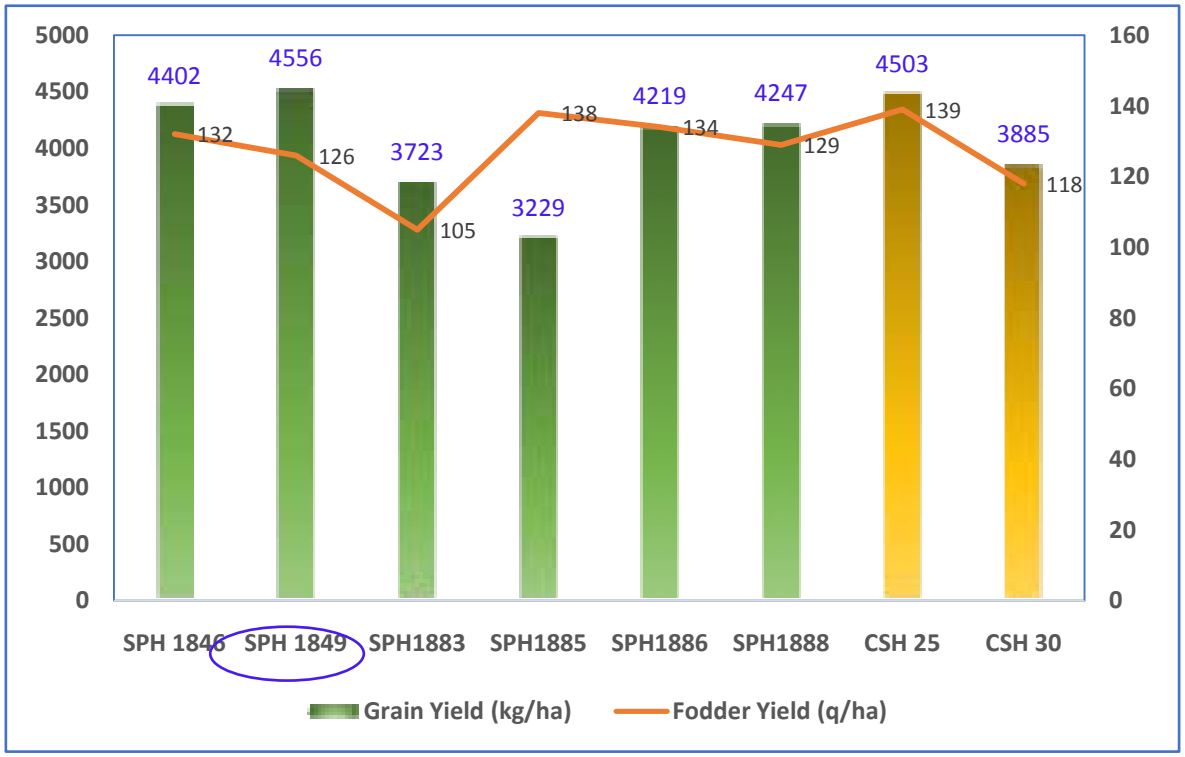
Performance of hybrids in AHT Zone I



Entries- 6 (2+4)
Checks- 4
Locations-9

- SPH 1888 & SPH 1846: early with high grain yield (16 &7%) over the checks
- SPH 1883: extra early (<60 days to flower) with 4% increase in GY and 12% in FY over early check, CSH 30
- SPH 1846: better level of tolerance to shoot fly and grain molds (3.3 GMS vs 4.1 in CSH 30; 43% SFDH vs 46%)

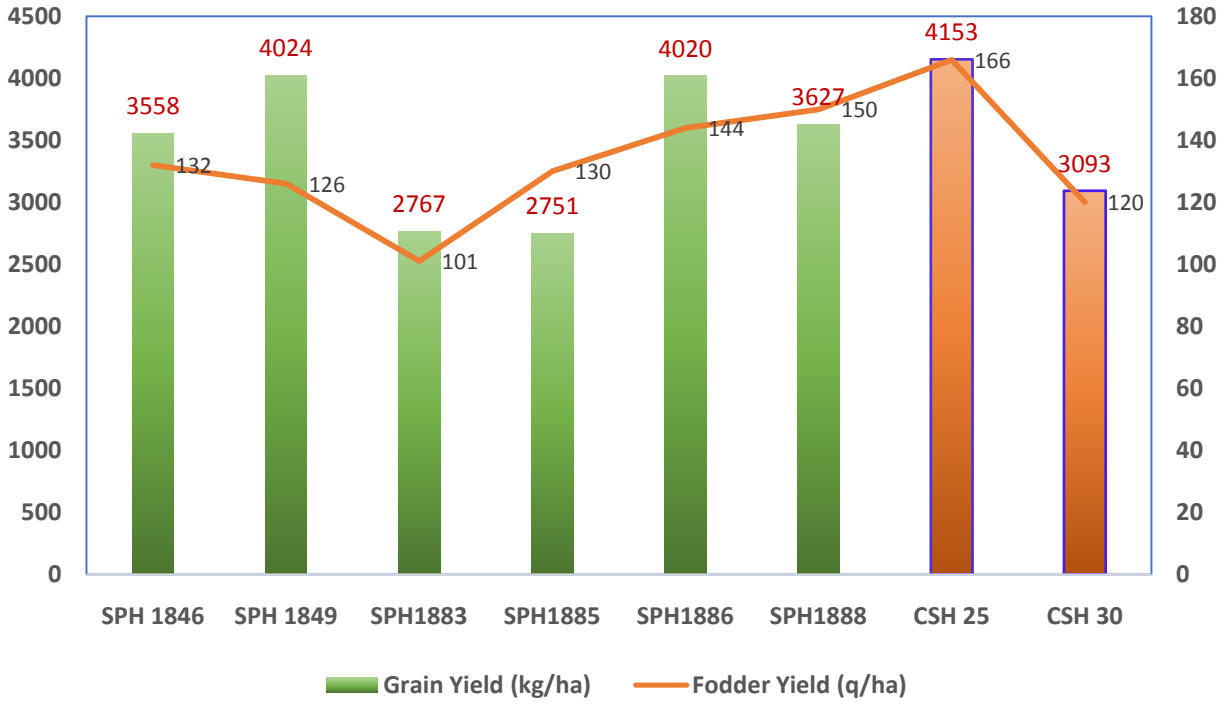
Performance of hybrids in AHT Zone II



Entries- 6 (2+4)
Checks- 4
Locations-6

- **SPH 1849: marginal grain yield improvement over CSH 25**
- **SPH 1846 and SPH 1849 recorded better level of resistance to shoot fly (43% DH vs 56% in CSH 25)**

Performance of hybrids in AHT Zone III



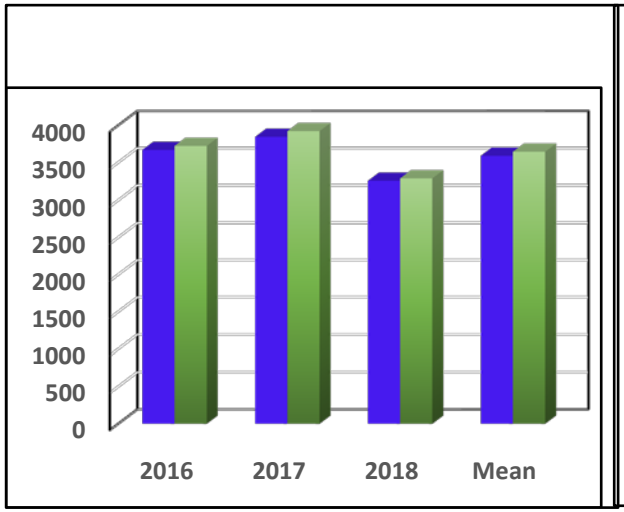
Entries- 6 (2+4)
Checks- 4
Locations-6

- **None of the entries could out yield CSH 25**

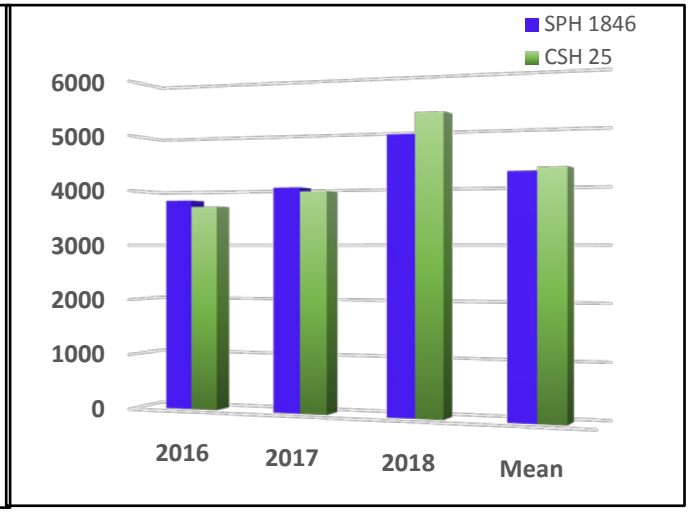
Hybrids evaluated over 3 years

SPH 1846

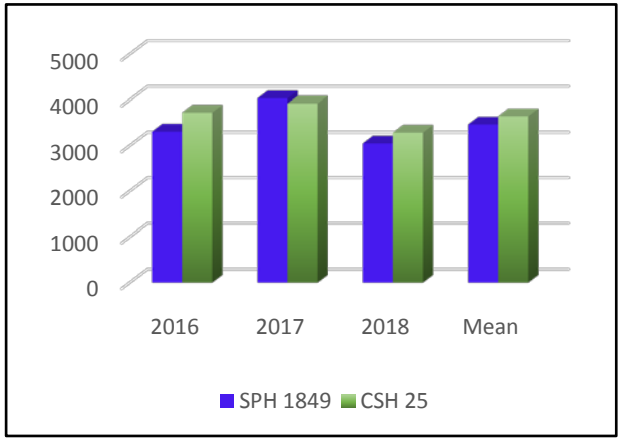
Zone I

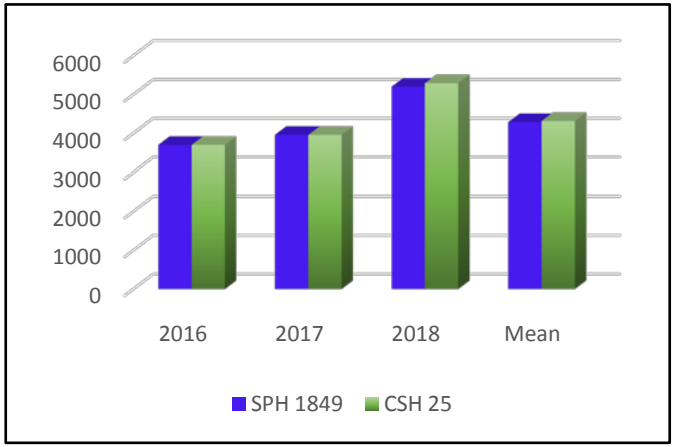


Zone II

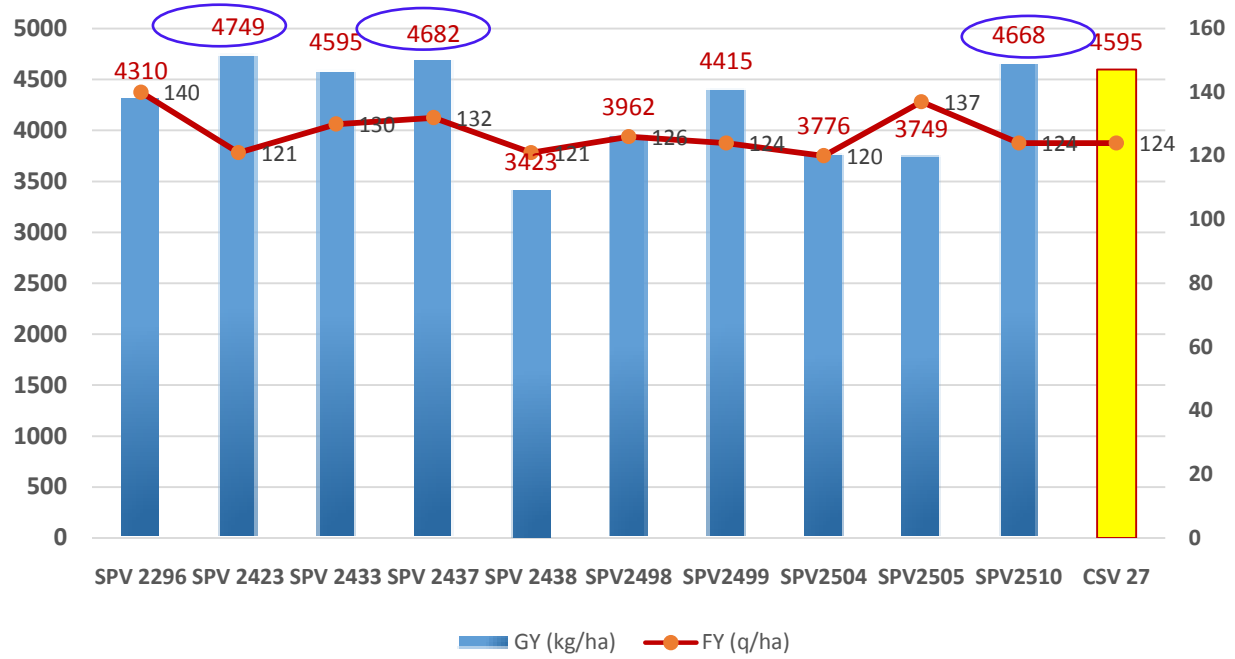


SPH 1849





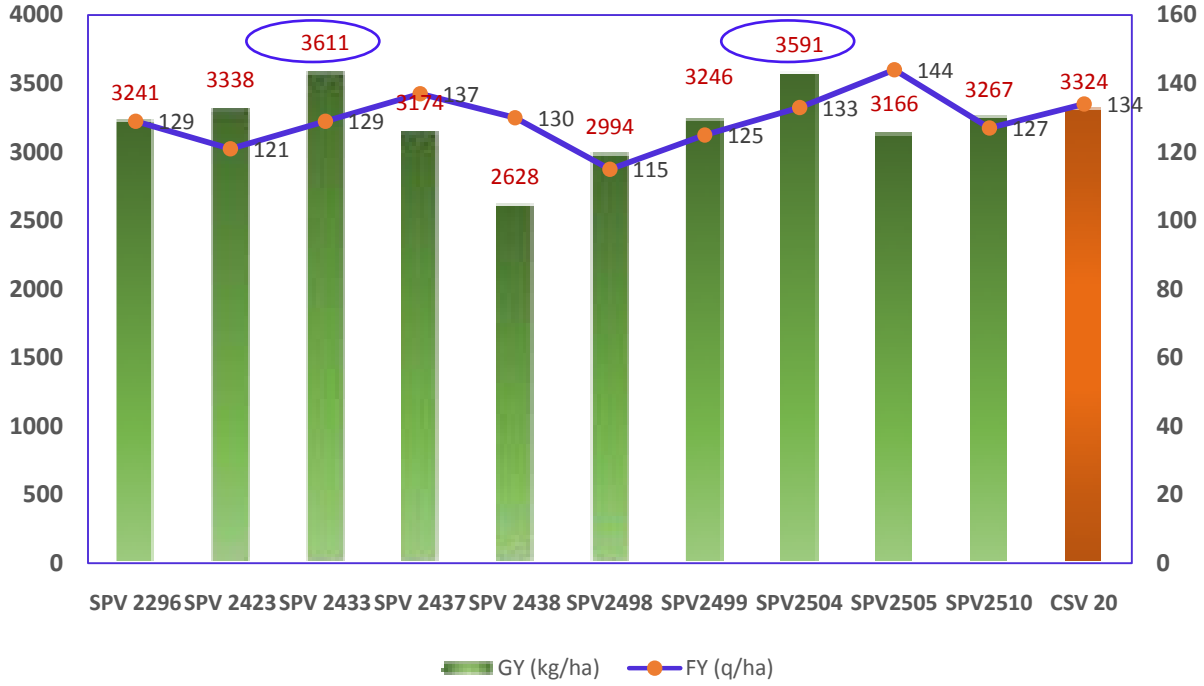
Performance of varieties in AVT- Zone I



Entries- 10 (5+5)
Checks- 5
Locations-7

- SPV 2423, SPV 2437 and SPV 2510 recorded grain yield onpar with CSV 27
- SPV 2433 and SPV 2510 were early with 5% yield improvement over CSV 20
- SPV 2296 and SPV 2438 had better level of tolerance to GM (4.3 TGS vs 5.2 of CSV 27)
- SPV 2433 and SPV 2498 had bold seed (>3g/100 seed)

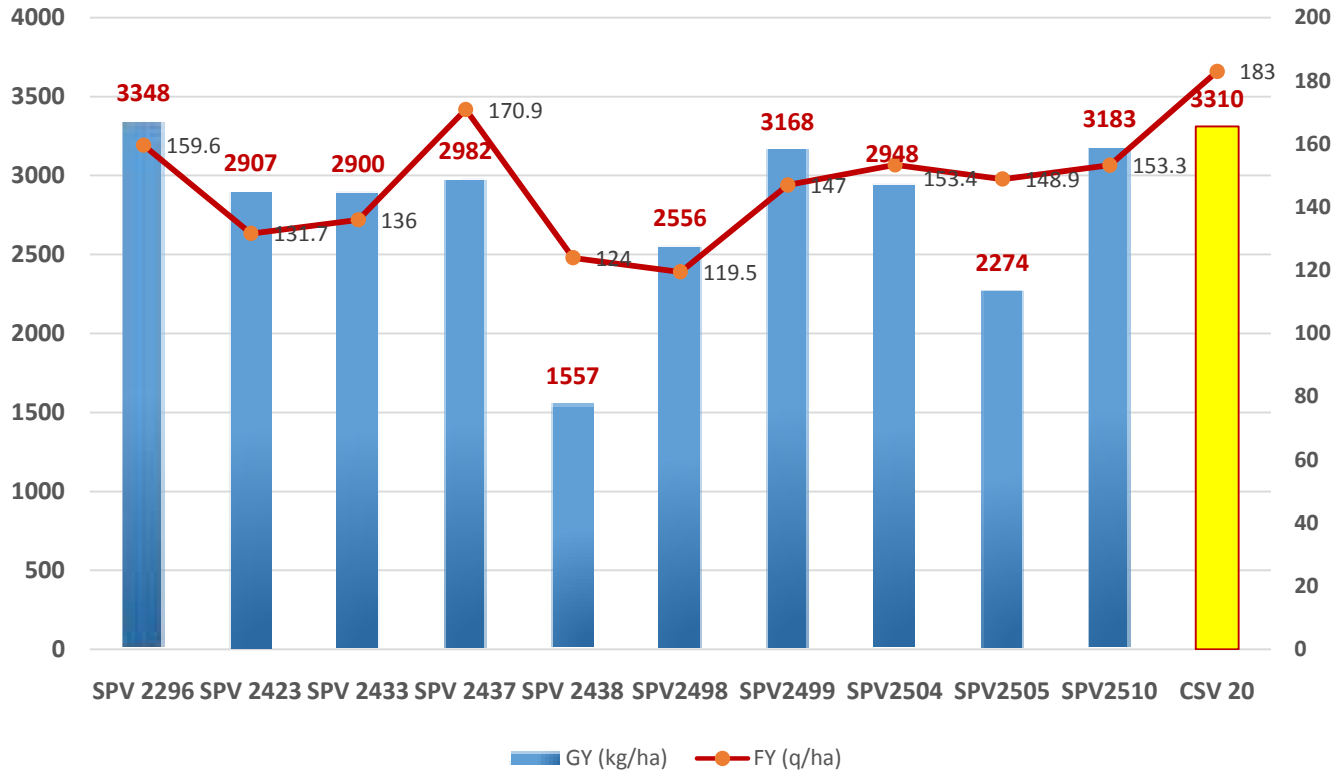
Performance of varieties in AVT Zone II



Entries- 10 (5+5)
Checks- 5
Locations-7

- **SPV 2433 and SPV 2504 recorded 8% increase in grain yield over the best check, CSV 20**
- **For fodder yield, SPV 2505 recorded >5% yield advantage over CSV 20**
- **SPV 2433 had bold seed (>3.0 g/100 seeds)**

Performance of varieties in AVT- Zone III



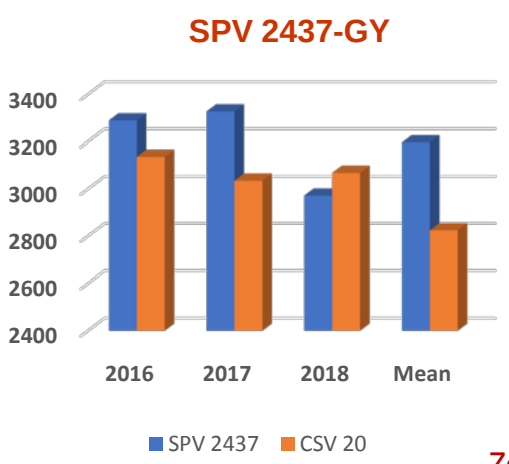
Entries- 10 (5+5)
Checks- 5
Locations-6

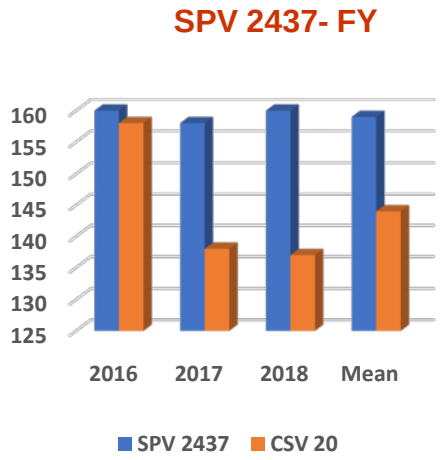
- **SPV 2296 was on par with CSV 20**

Performance of varieties evaluated over 3 years

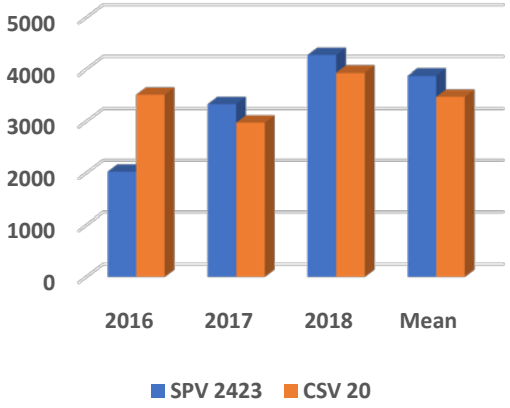
- SPV 2437 4% grain yield >10% fodder yield improvement over the check, CSV 20 over 3 years in Zone I
- SPV 2423 recorded >10% increase in grain yield with fodder yield on par with CSV 20
- SPV 2433 recorded >5% grain yield over CSV 20 in zone II

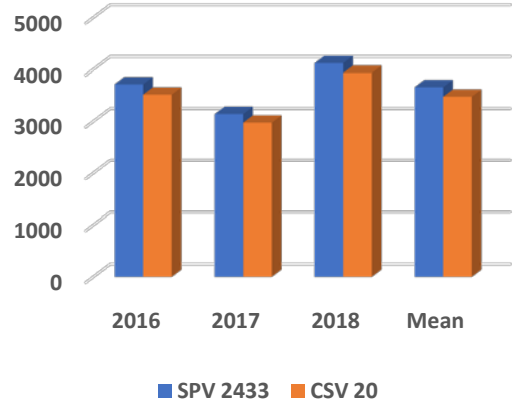
Zone I



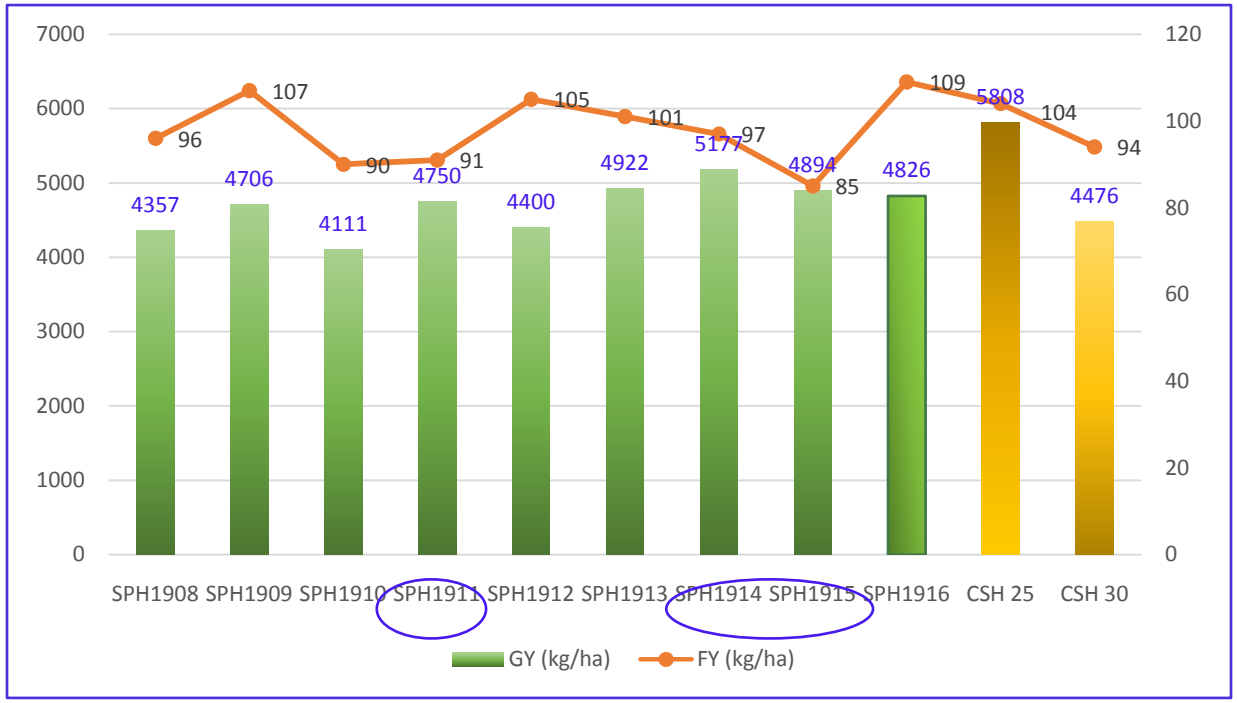


Zone II





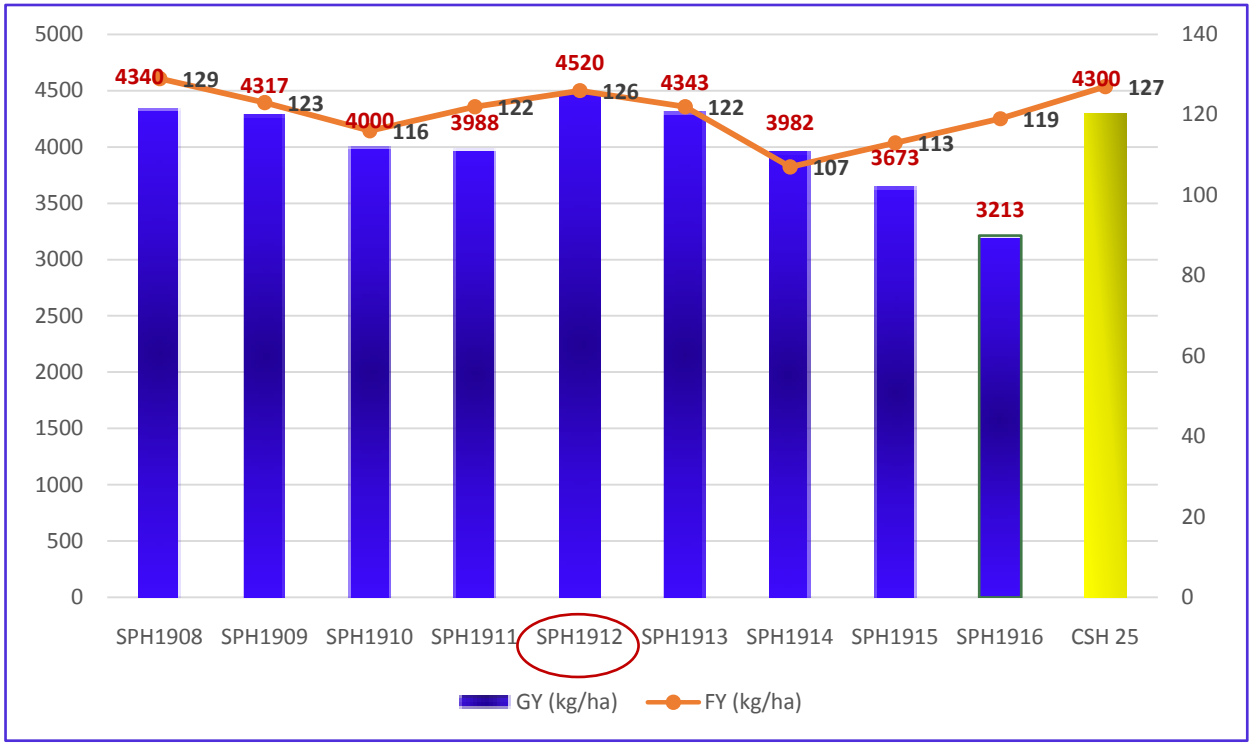
Performance of Hybrids in IHT- Zone I



Entries-9
Checks- 4
Locations-6

- **SPH 1911, SPH 1914 and SPH 1915 are early maturing with 6-15% grain yield advantage over CSH 30**
- **SPH 1912 and SPH 1913 had better level of resistance to grain molds compared to CSH 30 (4.3 TGS vs 5.0 of CSH 30)**

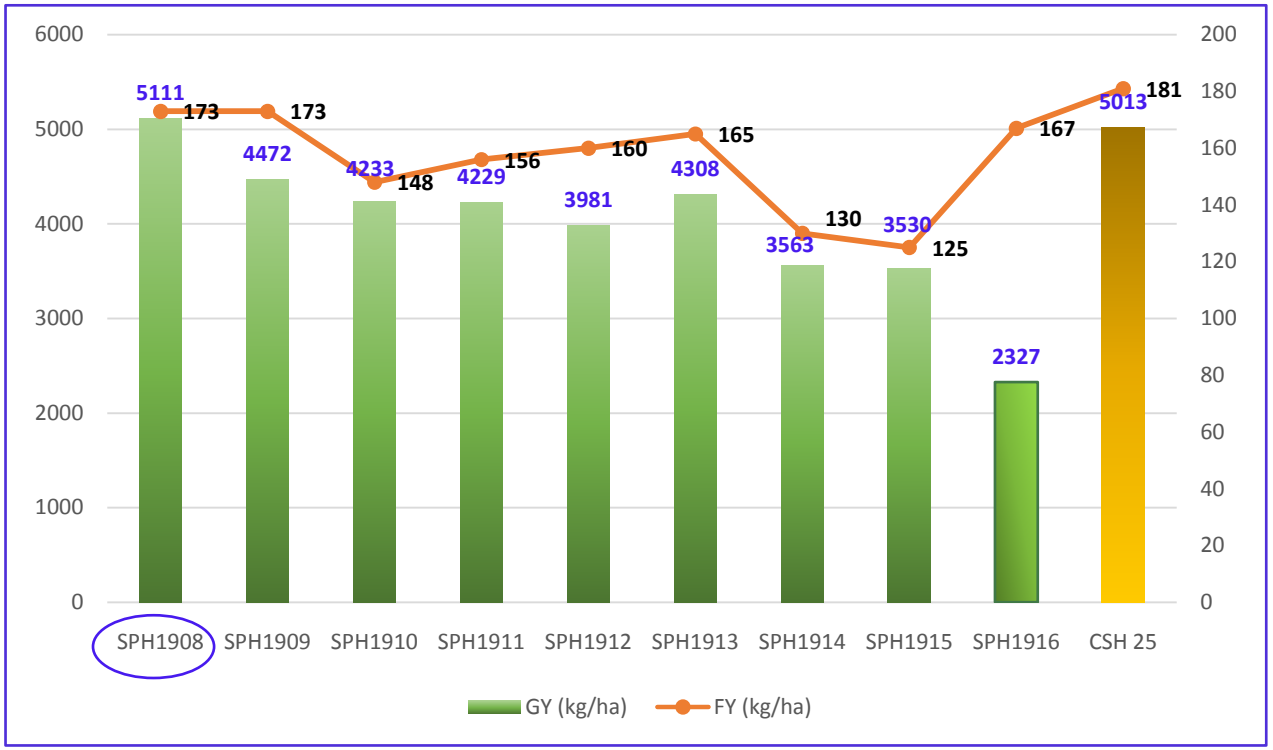
Performance of Hybrids in IHT- Zone II



Entries-9
Checks- 4
Locations-5

- SPH 1912 recorded >5% grain yield advantage over CSH 25
- SPH 1913, SPH 1908 and SPH 1909 yielded grain on par with CSH 25
- SPH 1911 and SPH 1912 had bold seed (100 seed weight >3g)

Performance of Hybrids in IHT- Zone III



Entries-9
Checks- 4
Locations-4

- **SPH 1908 was marginally superior to CSH 25 for grain yield and on par for fodder yield**
- **SPH 1911 and SPH 1915 had bold seed (100 seed weight >3.5g)**

Performance of varieties in IVT

Zone I

Genotype	GY (kg/ha)	% > over check	DFY (q/ha)	% > over check
SPV 2569	4642	6.7	106.7	-8.04
SPV 2573	4640	6.7	106.2	-8.5
CSV 27	4350	-	116	
Cd 5%	1010		24.3	

Zone II

Genotype	GFY (q/ha)	% > over check	DFY (q/ha)	% > over check
SPV 2570	3687	11.2	131.3	2.77
SPV 2571	3669	10.6	134.1	4.94
CSV20	3317	-	127.8	-
Cd 5%	502		16.9	

Zone III

Genotype	GFY (q/ha)	% > over check	DFY (q/ha)	% > over check
SPV 2566	3724	13.3	158.1	19.4
SPV 2567	3457	5.16	143.4	8.3
CSV31	3287	-	132.4	-
Cd 5%	1028		46.9	-

Entries- 15
Checks- 5
Locations-6, 5, 4

Initial early hybrid trial (IEHT)

Sl. No.	Hybrid	GY	FY	DTF	DTM	PH	GW
1	SPH 1921	4212	124	71	112	207	2.77
2	SPH 1923	4033	113	70	112	171	2.88
3	SPH 1926	3936	121	73	113	194	2.60
4	SPH 1927	3930	135	73	115	250	2.75
5	SPH 1924	3909	110	70	111	182	2.87
	CSH 30	3625	110	65	105	189	2.91
	CSH 14	3335	115	67	106	180	3.02
	Mean	3770	117.3	69.2	110	195	2.9
	CD(5%)	604.5	13.1	3.2	4.5	18.3	0.38
	CV (%)	14.6	6.7	2.5	2.8	9.0	9.11

GY: grain yield (kg/ha), FY: Fodder yield (q/ha), DTM: days to maturity; PH: plant height (cm), GW: 100 grain weight (g)

11 hybrids contributed by 5 centers along with 2 checks tested across 4 locations

Initial specialty sorghum trial (ISSVT)

S. No.	Hybrid	Seed color	GY (g/pl)	DTF	DTM	PH	GW	Protein %	Tannin
1	SPV 2612	Red	4762	73	119	200	2.99	9.88	4.48
2	SPV 2621	Yellow	4454	68	113	216	3.02	9.72	1.65
3	SPV 2633	Red	4313	75	120	276	2.95	10.6	2.36
4	SPV 2619	Red	4233	68	112	253	2.68	11.5	3.00
5	SPV 2622	Red	4204	70	115	230	2.80	11.8	2.01
	Paiyur 2		4251	77	125	240	2.74	12.3	2.56
	CSV 20		4597	72	117	231	3.01	8.99	0.86
	Mean		3846	72.5	116	235	2.73	11.4	3.33
	CD(5%)		1188	8.0	10.2	31.4	0.38	1.76	7.14
	CV (%)		16.7	6.8	5.1	11.6	9.97	7.54	105.5

Genotypes : 24 (9 red, 9 yellow, 6 specialty types from 8 centers)
Checks : 1 red; 2 white checks
Locations : 5

Grain mold Trial

- 165 Population breeding derivatives along with 4 checks were evaluated in augmented design during K18
- 33 derivatives which recorded <5GMS were evaluated during K19
- Centres- Akola, Dharwad, Hyderabad and Parbhani
- Five entries recorded grain weight >2.5g/ 100 seed

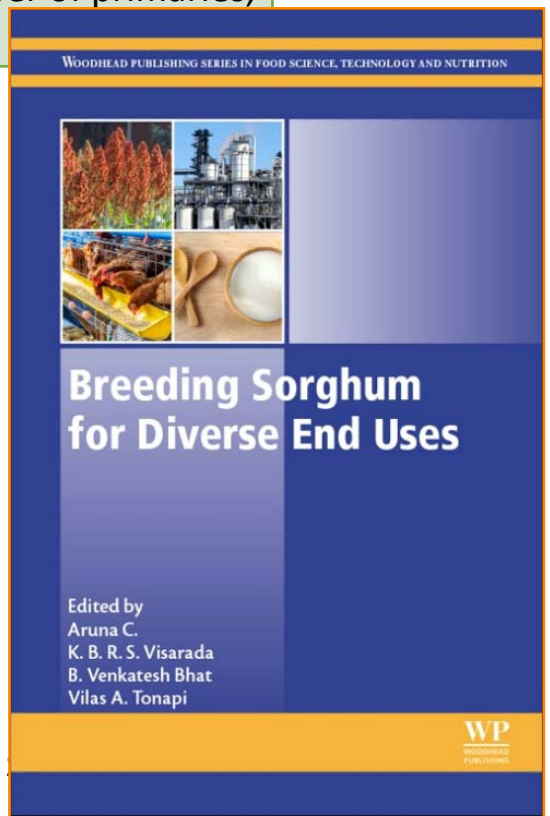
Entry	PGS	TGS	DF	100 seed wt	Plant ht (cm)	Panicle shape	Glume cover	Glume color
GM 017	3.13	2.78	72	2.30	198	SL	1/2	Red
GM 030	3.33	3.41	70	2.58	166	SC	1/2	Straw
GM 084	3.47	3.82	77	2.36	174	SL	1/2	L brown
GM 093	2.85	3.61	77	1.89	180	SC	1/4	L red
GM 123	3.68	3.31	75	2.39	158	SL	>1/2	L brown
GM 146	3.29	2.93	76	2.02	156	SC	3/4	Dark brown
296 B	5.64	5.61	75	2.29	169	SC	1/4	Straw
B 58586	2.97	2.67	79	1.78	202	Lax	Full	Straw
Cd (5%)	1.89	2.81	5	0.49	32	-	-	-
CV (%)	26.5	27.8	4.5	15.1	13.6			

Inter-institutional breeding program- contd..

Centre	No. F_2 pop.	No. of selections	Main selection criteria
Chamarajnagar	3	54	Compact panicle with good grain filling
Akola	6	26	Higher Grain yield, better grain qualities earliness etc.
Palem	11	185	Earliness and better agronomy
Deesa	6	101	Dual purpose types with compact panicle
Parbhani	6	60	Higher grain yield, more number of primaries, grain mold score

Publications from the group

- **Journal publications- 44**
- **Conference papers- 36**
- **Popular/Technical articles- 44**



Future plans

- Inter-institutional hybrid trial with early hybrids
- Trial on colored sorghum lines
- The segregating lines from the shared F_2s will be advanced a generation at different centers
- Stable resistance sources from pest/disease nursery will be used in crossing program
- Multi-location trials

Thank you