

Successful example of breeding for nutritional quality: - National released sorghum hybrid CSH-35

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**All India Coordinated Sorghum Improvement Project, Akola Centre
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- Sorghum (*Sorghum bicolor* (L) Moench) is one of the **important food crops** of the world. Sorghum is the fifth most important cereal crop on the global level.
- In India sorghum is cultivated during both **rainy (kharif) and post rainy (rabi) season**. Maharashtra is the largest sorghum grower (54% area) and produces (49.5%) followed by Karnataka, Madhya Pradesh and Andhra Pradesh
- In the **world** sorghum is grown on the area of **39.97 million ha** while in **India** it is grown on **7.53 million ha**.
- In **Maharashtra** area under kharif sorghum is **8.82 lakh hecter** and under **rabi 32.20 lakh hecter**.
- Because of the dual purpose utility of the sorghum as **food and fodder crop** and with the increasing bovine population, the farmers of this region will continue to grow the sorghum. Further, this is the **most assured crop of the rainfed agriculture** with highest biomass production even under scarcity seasons.
- Being **C4 plant** it can utilize sunlight and water efficiently. It is unique to adopt to environmental extremes of a biotic and abiotic stresses.
- Over the decades **hybridization** has increased the yield levels of sorghum. **MS 296 A** is the most extensively used female for hybrid development. There is need to exploit superior hybrid combinations with diverse female lines other than MS 296 A.
- Keeping this fact in consideration, a superior **dual purpose new kharif sorghum hybrid CSH-35** has been developed by Sorghum Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth (Dr. PDKV), Akola (Maharashtra)
- This hybrid has been released for the **Zone-II (Maharashtra, Karnataka, Madhya Pradesh, South Gujarat and North Andhra Pradesh) of India at National Level** during the recently held Varietal Identification Committee Meeting on 19th August, 2014

Material and Methods

- The kharif sorghum hybrid **CSH-35 (SPH-1705)** has been developed by heterosis breeding method using a new diverse female line **AKMS 30 A** and the restorer **AKR 456**.
- This hybrid has been tested in All India Co-ordinated Sorghum Improvement Project (AICSIP) multilocation trials during-
2011 (IHT- Initial Hybrid Trial),
2012 (AHT Ist year- Advance Hybrid Trial) and
2013 (AHT IInd year- Advance Hybrid Trial) along with national released checks
- The hybrid has been tested for **grain yield, fodder yield, agronomic variables**, reaction to major **pest** and **diseases**. Similarly the grain and **stover quality** parameters as well as **organoleptic properties** of the roti have also been assessed in the AICSIP trials.
- AICSIP- Parental Line Trial (PLT)** was also conducted to test the synchronous maturity of the male and female parents of the hybrid.

Table : 1-a. Summery Grain yield (kg/ha) data of CSH-35 in Coordinated Hybrid Trials

Traits	Years of Testing	No. of Trials	Proposed hybrid CSH 35	Check Hybrids				CD 5%
				CSH 16	CSH 23	CSH 25	CSH 30	
Grain yield	2011	5	4469	4133	3942	-	-	632
	2012	13	4131	4004	2795	4809	-	459
	2013	11	4131	3625	3454	4267	3423	472
	Mean	29	4189.93	3883.10	3234.45			
% increase or decrease over the checks and qualifying hybrids	2011	5		8.13	13.37			
	2012	13		3.17	47.80			
	2013	11		13.96	4.95			
	Mean	29		7.90	29.54			
Frequency in the top 5 group pooled for 3 years			14/29	9/29	2/29			

Table : 1-b. Summery Fodder yield (kg/ha) data of CSH-35 in Coordinated Hybrid Trials

Traits	Years of Testing	No. of Trials	Proposed hybrid CSH-35	Check Hybrids				CD 5%
				CSH 16	CSH 23	CSH 25	CSH 30	
Fodder yield	2011	5	16534	14541	11292	-	-	2168
	2012	13	12185	10871	8952	14977	-	1553
	2013	12	11600	11224	9942	11489	9865	1287
	Mean	30	12681.4	11893.27	9818.27			
% increase or decrease over the checks and qualifyin g hybrids	2011			13.71	46.42			
	2012			12.09	36.11			
	2013			3.35	16.68			
	Mean			6.63	29.16			
Frequency in the top 5 group pooled for 3 years			14/30	8/30	2/30			

Table : 2. Adaptability to Agronomic variables for CSH-35 in Coordinated Hybrid Trials
Mean of three locations (Akola, Dharwad, Surat)

Name of Expt.	Item	Proposed hybrid CSH-35	Check Hybrids	
			CSH 16	CSH 23
Fertilizer experiment				
Fertility level genotype interaction effect	Grain yield (q/h) under			
	i) Fert 3	3898	4124	3784
	ii) Fert 2	3300	2988	3033
	iii) Fert 1	2371	2464	2640
	Mean	3189.67	3192.00	3152.33
	Percentage gain or loss under other doses			
	i) Fert 2- 75% RDF	18.12	38.02	24.76
	ii) Fert 1 – 50% RDF	64.40	67.37	43.33
	Fodder yield (q/ha) under			
	i) Fert 3	14896	12534	17524
	ii) Fert 2	11280	11097	15848
	iii) Fert 1	9754	10059	13814
	Mean	11976.67	11230.00	15728.67
	Percentage gain or loss under other doses			
	i) Fert 2- 75% RDF	32.06	12.95	10.58
	ii) Fert 1 – 50% RDF	52.72	24.60	26.86

Fert-1 – 50% Recommended dose of fertilizers. (RDF)

Fert- 2 - 75% Recommended dose of fertilizers. (RDF)

Fert- 3 - 100% Recommended dose of fertilizers. (RDF)

Table : 3. Reaction to major diseases in Coordinated Hybrid Trials

Name of disease	Years of Testing	No. of Trial	Proposed hybrid CSH-35	Check Hybrids			
				CSH 16	CSH 23	CSH 25	CSH 30
Grain mold field grade (1-9)	2011	3	3.8	3.2	4.2	-	-
	2012	4	3.5	4.3	4	3.3	-
	2013 (PGS)	4	4.9	2.9	4	4.1	4.5
	Overall mean	11	4.1	3.5	4.1		
Grain mold threshed grade (1-9)	2011	2	3.7	3.5	4.3	-	-
	2012	2	3.7	4.3	4.3	4	-
	2013 (TGS)	4	5.8	3.8	5.2	5.2	5.3
	Overall mean	8	4.7	3.9	4.7		
Fusarium (%)	2011	2	20.2	20.5	23.2	-	-
	2012	1	22	22	20	19	-
	2013	2	25	20.2	21.2	21.2	23.3
	Overall mean	5	22.46	20.66	21.74		
Curvularia (%)	2011	2	22.2	21.9	24.1	-	-
	2012	1	22	21	23	22	-
	2013	2	20	23	17.2	19.8	22.7
	Overall mean	5	21.26	17.96	21.08		
Other fungi (%)	2011	2	11.4	13.4	15.4	-	-
	2012	-	-	-	-	-	-
	2013	2	15	14	16	17	18
	Overall mean	4	13.0	13.9	15.9		
Ergot (%)	2011	1	2.7	3.3	3.3	-	-
	2012	1	6	6.3	5.7	5.3	-
	2013	1	13	17	21	21	21
	Overall mean	3	7.2	8.9	10.0		

Table : 3- cont. Reaction to major diseases CSH-35 in Coordinated Hybrid Trials

Name of disease	Years of Testing	No. of Trial	Proposed hybrid CSH-35	Check Hybrids			
				CSH 16	CSH 23	CSH 25	CSH 30
Sooty stripe (1-9)	2012	-	-	-	-	-	-
	2013	1	1.8	1.8	1.7	1.3	1.8
	Overall mean	2	2.55	1.75	1.35		
Anthracnose (1-9)	2011	2	3.8	3.35	2.85		
	2012	1	1.7	1.7	1.5	1.6	-
	2013	1	3.3	3.7	3.7	3.3	4
	Overall mean	4	3.15	3.03	2.73		
Zonate leaf spot (1-9)	2011	1	4.7	2.7	3.3	-	-
	2012	2	1.5	1.5	1.7	1.8	-
	2013	1	2.9	2.9	3	3	2.9
	Overall mean	4	2.7	2.2	2.4		
Rust (1-9)	2011	2	2	2.5	3	-	-
	2012	1	2.3	2	2.3	2.3	-
	2013	1	2.3	2.3	2.3	2	2
	Overall mean	4	2.2	2.3	2.7		
Leaf blight (1-9)	2011	2	4	3.85	4		
	2012	1	2.3	2	1.8	2.1	-
	2013	2	1.9	1.9	1.9	1.8	1.8
	Overall mean	5	2.82	2.68	2.72		
Grain affected (%)	2011	1	34.2	31.3	28.3	-	-
	2012	2	20	27	26	21	-
	Overall mean	3	25.1	28.8	26.8		
Germination (%)	2011	2	57.7	58.5	58.4	-	-
	2012	2	72	71	72	74	-
	2013	2	61	62	64	60	55
	Overall mean	6	63.55	63.82	64.63		

Table : 4. Reaction to major Insect Pests in Coordinated Hybrid Trials

Name of Pest	Years of Testing	No. of Trials	Proposed hybrid CSH-35	Check Hybrids			
				CSH 16	CSH 23	CSH 25	CSH 30
Shoot fly pest (dead heart % at 28 DAE)	2011	6	65.61	70.12	69.06	-	-
	2012	5	62.2	63.6	62.3	65.4	-
	Overall mean	11	64.07	67.14	65.99	-	-
Shoot fly pest (dead heart % at peak time)	2013	6	73.05	78.01	71.07	77.19	75.66
	Overall mean	6	73.05	78.01	71.07	77.19	75.66
HB-PDR (1-9)	2011	1	2.7	2.7	2.3	-	-
	2012	2	2.5	2.67	2.17	3.33	-
	2013	2	4.5	4.5	4	3.83	3.5
	Overall mean	5	3.34	3.40	2.92	-	-
Stem borer leaf injury rating at 35 DAE (1-9)	2011	-	-	-	-	-	-
	2012	2	2.67	5.33	3.83	4	-
	2013	4	4.33	3.67	4.67	4.58	4.08
	Overall mean	6	3.78	4.22	4.45	4.39	

Table : 4- cont. Reaction to major Insect Pests in Coordinated Hybrid Trials

Name of Pest	Years of Testing	No. of Trials	Proposed hybrid CSH-35	Check Hybrids			
				CSH 16	CSH 23	CSH 25	CSH 30
Stem borer dead hearts (%) 45 DAE	2011	3	13.15	14.99	14.25	-	-
	2012	2	19.08	16.26	16.85	16.61	-
	2013	4	7.96	8.99	8.24	11.1	7.63
	Overall mean	9	12.16	12.60	12.16	-	-
Stem borer stem tunneling (%)	2012	1	4.8	7.8	7.6	5.4	-
	2013	1	5.87	6.2	6.93	7.57	6.87
	Overall mean	2	5.33	7	7.26	6.48	-
Stem borer peduncle tunneling (%)	2011	1	6.3	5.2	4.7	-	-
	Overall mean	1	6.3	5.2	4.7	-	-
Overall resistance rating (1-9)	2012	2	6.5	6.67	7	6	-
	2013	3	5.51	5.11	5.96	4.89	5.47
	Overall mean	5	5.91	5.73	6.44	5.33	
MTDR (1-9)	2012	3	1.67	1	1.33	-	1
	2013	2	2.33	2.67	2	2	2
	Overall mean	5	2	1.83	1.66	-	1.5

Table : 5 a- Data on Grain quality parameters in Coordinated Hybrid Trials

Name of Parameter	Years of Testing	No. of Trials	Proposed hybrid CSH-35	Check Hybrids			
				CSH 16	CSH 23	CSH 25	CSH 27
Water activity	2012	4	0.478	0.476	0.465	0.488	0.465
	2013	3	0.420	0.440	0.415	0.431	
	Overall mean	7	0.453	0.461	0.444	0.463	
Percent Fat	2012	4	3.0	3.22	2.91	2.75	2.89
	2013	-	-	-	-	-	-
	Overall mean	4	3.0	3.22	2.91	2.75	
Percent Starch	2012	4	59.70	60.64	60.90	61.61	61.33
	2013	3	58.35	59.30	59.73	59.98	
	Overall mean	7	59.12	60.06	60.40	60.91	
Percent Amylose	2012	4	21.47	21.15	21.49	21.05	21.03
	2013	2	16.73	16.47	17.21	15.52	
	Overall mean	6	19.89	19.59	20.06	19.21	
Percent Protein	2012	4	10.10	10.12	10.10	10.27	10.11
	2013	3	11.28	11.49	11.85	11.11	
	Overall mean	7	10.60	10.70	10.85	10.63	

Table: 5 b- Data on Nutritional constituents responsible for roti quality in Coordinated Hybrid Trials

Location –Dharwad- 2012, 2013

Name of Parameter	Years of Testing	No. of Trials	Proposed hybrid CSH-35	Check Hybrids			
				CSH 16	CSH 23	CSH 25	CSH 30
Colour of grain	2012	1	DW	DW	DW	DW	-
	2013	1	DB	DB	DB	DB	DB
	Overall mean	2					
Appearance/ shape of grain	2012	1	R	R	R	R	-
	2013	1	RO	RO	RO	RO	RO
	Overall mean	2					
Hectoliter weight (kg/hl)	2012	1	79.23	81.08	79.87	79.21	-
	2013	1	74.3	74.23	70.79	72.2	70.78
	Overall mean	2	76.765	77.655	75.33	75.705	
Water absorption (ml/100g)	2012	1	112	108	108	102	-
	2013	1	-	-	-	-	-
	Overall mean	2	112	108	108	102	-
Crude protein (%)	2012	1	9.12	9.43	9.25	8.97	-
	2013	1	10.25	8.65	8.07	8.81	8.76
	Overall mean	2	9.68	9.04	8.66	8.89	

DW- Dull White , DB- Dull Brown, R-Round , RO-Round Oval

Table: 5 b- cont- Data on Nutritional constituents responsible for roti quality in Coordinated Hybrid Trials

Location –Dharwad- 2012, 2013

Name of Parameter	Years of Testing	No. of Trials	Proposed hybrid CSH-35	Check Hybrids			
				CSH 16	CSH 23	CSH 25	CSH 30
Soluble proteins (%)	2012	1	1.38	2.09	2	2.04	-
	2013	1	1.05	1.26	1.16	1.08	1.13
	Overall mean	2	1.215	1.675	1.58	1.56	
Total sugars (%)	2012	1	2.01	2	2.06	1.91	-
	2013	1	1.31	1.08	1.39	1.12	1.19
	Overall mean	2	1.66	1.54	1.725	1.515	
Starch (%)	2012	1	42.91	47.98	50.59	48.54	-
	2013	1	43.34	47.52	50.62	47.03	5.026
	Overall mean	2	43.125	47.75	50.605	47.785	
Free amino acids (mg/100g)	2012	1	97	83.75	89.28	84.56	-
	2013	1	71.52	68.74	63.55	70.21	66.13
	Overall mean	2	84.26	76.245	76.415	77.385	
Phenolics (%)	2012	1	1.91	1.92	2.16	1.81	-
	2013	1	2.81	2.35	2.76	2.17	2.83
	Overall mean	2	2.36	2.135	2.46	1.99	

Table: 5 c- Data on Organoleptic quality of roti in Coordinated Hybrid Trials

Location –Dharwad- 2012

Quality characteristic	Proposed hybrid CSH-35	Check Hybrids		
		CSH 16	CSH 23	CSH 25
Water required for dough (ml/100g)	110	110	100	90
Kneading quality	1	1	1	1
Spreading quality	1	1	1	1
Organoleptic quality parameters				
Colour and appearance	8.6	7.0	6.6	8.2
Flavour	8.0	7.6	6.8	8.2
Texture	8.2	7.6	7.2	7.8
Taste	8.4	7.4	7.2	7.6
Overall acceptability	8.30	7.40	6.95	7.95
Rank by DMRT	1	6	10	4

Kneading quality of dough, score: Good=1 , Fair= 2, Poor= 3.

Spreading quality of roti, score: Easy spreading without cracks=1,
Slightly difficult to spread with minute cracks=2,
Difficult to spread with cracks=3.

Sensory score : Like extremely (Excellent)-9, Like very much (Very good)-8, Like moderately -7,
Like slightly-6, Neither like nor dislike-5, Dislike slightly-4,
Dislike moderately-3, Dislike very much-2, Dislike extremely-1.

Table:5- d- Data on Stover quality in Coordinated Hybrid Trials

Name of Parameter	Years of Testing	No. of Trials	Proposed hybrid CSH-35	Check Hybrids		
				CSH 16	CSH 23	CSH 25
Crude Protein (%)	2012	3	6.81	6.76	7.11	7.27
	2013	3	8.04	8.03	8.32	8.19
	Overall mean	6	7.43	7.40	7.71	7.73
IVOMD (%)	2012	3	46.28	45.63	46.26	45.97
	2013	3	43.99	44.08	45.54	44.36
	Overall mean	6	45.14	44.86	45.90	45.16
NDF%	2012	2	58.57	59.05	57.39	58.93
	2013	3	60.30	60.04	60.29	59.72
	Overall mean	5	59.61	60.24	59.13	59.40
ADF%	2012	2	44.22	45.17	43.25	44.92
	2013	3	46.06	45.40	44.88	45.82
	Overall mean	5	45.32	45.31	44.23	45.46

IVOMD- Invitro Organic Matter Digestibility ,

NDF- Neuter Detergent Fiber ,

ADF- Acid Detergent Fiber

Table:5- d- cont.- Data on Stover quality in Coordinated Hybrid Trials

Name of Parameter	Years of Testing	No. of Trials	Proposed hybrid CSH-35	Check Hybrids		
				CSH 16	CSH 23	CSH 25
Dry matter (%)	2012	2	91.14	91.86	91.71	92.02
	2013	-	-	-	-	-
	Overall mean	2	91.14	91.86	91.71	92.02
Ash content (%)	2012	2	8.10	9.14	8.76	9.09
	2013	3	9.69	9.71	9.40	9.89
	Overall mean	5	9.06	9.48	9.14	9.57
Metabolizable energy (ml/kg)	2012	2	6.78	6.49	6.75	6.71
	2013	3	6.17	6.23	6.44	6.21
	Overall mean	5	6.42	6.33	6.56	6.41
Lignin (%)	2012	2	5.05	5.21	5.06	5.09
	2013	3	5.36	5.21	5.17	5.33
	Overall mean	5	5.24	5.21	5.12	5.24

Table: 6- Data on other important characters in Coordinated Hybrid Trials

Parameter	Year	No. of trials	Proposed hybrid SPH 1705	Check Hybrids			
				CSH 16	CSH 23	CSH 25	CSH 30
Plant height (cm)	2011	4	222	213	215	-	-
	2012	13	209	196	185	228	-
	2013	13	197	193	176	213	179
	Over all mean	30	205.33	197.10	184.73		
Days to 50% flowering.	2011	5	71	69	67	-	-
	2012	13	70	67	66	71	-
	2013	13	72	73	70	78	71
	Over all mean	31	70.81	69.94	67.84		
Days to maturity	2011	4	108	108	105	-	-
	2012	11	105	105	103	107	-
	2013	12	110	111	108	116	109
	Over all mean	27	107.70	108.19	105.22		
1000 Seed weight (gm)	2011	5	29.3	32.9	30.7	-	-
	2012	11	29.5	33.8	32.0	27.3	-
	2013	13	28.4	31.6	30.4	27.6	30.7
	Over all mean	29	29.1	33.0	31.2		

Table: 7- Parental line trial (PLT) of parents of proposed hybrid CSH-35 (AKMS 30 A x AKR 504) in Coordinated Trials

Year – Rabi 2012-2013

Locations- Nandyal, Parbhani and Hagari

SN	Parent	Days to 50% flowering
1	AKMS 30 A-Female Parent	67
2	AKR 504-Male Parent	66



ज्वार अनुसंधान निदेशालय
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(Indian Council of Agricultural Research)



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Date: 21st August, 2014

Sub: Forwardal of Varietal Identification Committee proceedings - Reg.

Sir,

Please find attached the proceedings of the Varietal Identification Committee meeting held at Directorate of Sorghum Research, Hyderabad on 19th August, 2014. In this regard, I am pleased to inform you that the varietal release proposal (**SPH 1705 for Zone II**) submitted by you has been recommended for release by the committee. Hence, please adhere to the following points while submitting the final CVRC proposal.

1. The proposed CSH Number for your hybrid / variety is **CSH 35**.
2. One page highlights of the entry.
3. Good photographs after the highlights portion as given in proforma.
4. A4 size solo crop photo is also a must.
5. Signature of all contributors mentioned in the proforma (Item 4b) for development of the entry along with contribution percentage to be incorporated immediately after the signatures of Centre I/c. and Breeder.
6. Certificate from NBPGR after depositing the seed.
7. SSR Marker based DNA fingerprinting report.
8. A page on package of practices.
9. DUS test report of the entry.

One draft copy (hard and soft) of the proposal may be submitted to the undersigned for verification. Proforma for submission of release proposal to the Central Varietal Recommendation Committee is available in our website: http://www.sorghum.res.in/aicsip_proformas/cvrc.doc. After verification, we will issue a forwardal letter to the CVRC, New Delhi which you have to enclose along with the 70 copies of the proposal and post it to CVRC, New Delhi, directly.

With warm regards,

Yours sincerely,


(**JV Patil**)

Proceedings of the Varietal Identification Committee meeting held on 19th August, 2014 at Directorate of Sorghum Research, Hyderabad

The Varietal Identification Committee meeting was held at Directorate of Sorghum Research, Hyderabad on 19th August, 2014. The following members were present:

S.No.	Proposed name	Position
1	Dr. RP Dua, Assistant Director General (FFC), ICAR, New Delhi	Chairman
2	Dr. D Loknath Reddy, Principal Scientist (Research), ANGRAU, Hyd. - <i>Director of Research - Nominee</i>	Member
3	Dr. MV Sudhakar, Manager (Production), National Seeds Corpn., Hyd. - <i>Representative of Seed Division (DAC)</i>	Member
4	Dr. KS Varaprasad, Director, DOR, Hyderabad - <i>Director of crop development programme (GOI)</i>	Member
5	Dr. LV Subba Rao, Principal Scientist, DRR, Hyderabad - <i>Eminent scientist not associated with proposed varieties</i>	Member
6	Dr. AV Kini, Syngenta India Limited, Hyderabad - <i>Representative of private seed sector</i>	Member
7	Dr. JV Patil, Director, DSR	Member Secretary
Invitees:		
	Dr. Prabhakar	Plant Breeding
	Dr. SS Rao	Physiology
	Dr. JS Mishra	Agronomy
	Dr. VR Bhagwat	Entomology
	Dr. IK Das	Pathology
	Dr. AV Umakanth	Sweet Sorghum
	Dr. C Aruna	Forage Sorghum

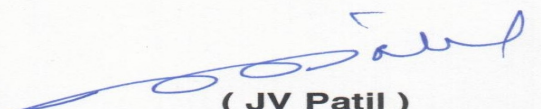
The committee critically examined 7 proposals for different zones consisting of: 4 - *kharif hybrids*, 1 - *dual-purpose kharif variety*, 1 - *multi-cut forage hybrid* and 1 - *single-cut forage variety*. The VIC after considerable deliberations made the following recommendations.

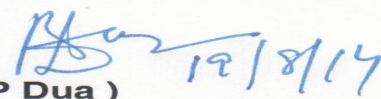
S. No	Tested Number	Variety description	Centre / Company Proposed	Regions proposed for identification	Recommendations of the committee
1	SPH 1703 (NSH 55) Zone I	<i>Kharif</i> sorghum hybrid	Nuziveedu Seeds Limited	Zone I (Rajasthan, Uttar Pradesh, North Gujarat, South Andhra Pradesh & Tamil Nadu)	It was found that the hybrid was early and performed better over the checks for grain and fodder yields and was at par with checks for resistance to diseases and pests. Therefore, the hybrid is recommended for release for Zone I.
2	SPH 1703 (NSH 55) Zone II	<i>Kharif</i> sorghum hybrid	Nuziveedu Seeds Limited	Zone II (Maharashtra, Karnataka, Madhya Pradesh, South Gujarat and North Andhra Pradesh)	The hybrid was not early and was inferior to the other qualifying hybrids in respect to yield over the years. Hence, the hybrid is not identified.

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S. No	Tested Number	Variety description	Centre / Company Proposed	Regions proposed for identification	Recommendations of the committee
3	SPH 1702 (HTGS 3201) Zone II	<i>Kharif</i> sorghum hybrid	Hytech Seed India Private Limited	Zone II (Maharashtra, Karnataka, Madhya Pradesh, South Gujarat and North Andhra Pradesh)	Based on the superior performance of the hybrid over the checks for grain and fodder yields and on par with resistance to insect pests and diseases, the hybrid is recommended for release for Zone II.
4	SPH 1705	<i>Kharif</i> sorghum hybrid	AICSIP, PDKV, Akola	Zone II (Maharashtra, Karnataka, Madhya Pradesh, South Gujarat and North Andhra Pradesh)	The performance of the hybrid was better than the checks for grain and fodder yields and on par with resistance to insect pests and diseases with better quality parameters, the hybrid is recommended for release for Zone II.
5	SPV 2122 (Palamuru Jonna)	Dual purpose <i>kharif</i> sorghum variety	AICSIP, ANGRAU, Palem	All India	The variety did not show superiority at all India level. However, the variety was distinctly superior to the checks for grain and fodder yield in Zone I. Hence, the variety has been identified and recommended for release for Zone I only.
6	SPH 1697 (UTMCH 1310)	Multi-cut forage sorghum hybrid	AICSIP, GBPUA&T, Pantnagar	All India	The performance of the hybrid was not distinctly superior over the checks over the years. Hence, not identified.
7	SPV 2128	Single-cut forage sorghum variety	DSR, Hyderabad	Zone II (Maharashtra, Karnataka, Madhya Pradesh, South Gujarat and North Andhra Pradesh)	The variety consistently exhibited superiority over the checks for green and dry fodder yields over the years. Hence, identified for release for Zone II.


(JV Patil)
Director DSR, Hyderabad


(RP Dua)
Asst. Director General (CS), ICAR, New Delhi

Cob, grains and roti of kharif sorghum hybrid CSH-35 (SPH 1705)





Thank You