

Kharif sorghum genotype SPV 1786 with excellent quality characters and high yield.

V. V.Kalpande ,R. B. Ghorade, S.A.Bhongle, S.N.Kale, Seema Nemade and V.U.Sonalkar

**All India Coordinated Sorghum Improvement Project, Akola Centre
Sorghum Research Unit, Dr.Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS)**

- ❖ Sorghum is an **important cereal** crop in India.
- ❖ Sorghum **ranks fifth**, among the world cereal food crops (Rice, Wheat, Maize, and Barley).
- ❖ Besides India, the sorghum is grown extensively in the **countries** like Africa, America, Brazil, China, Russia and Peru.
- ❖ In India the sorghum is mainly cultivated in the **states** of Maharashtra, Karnataka, Madhya Pradesh, Andhra Pradesh and Rajasthan.
- ❖ Sorghum is **dual purpose** crop giving the grains for human consumption and fodder for the livestock.
- ❖ From human and live stock **nutrition point** of view, the quality of grain as well as fodder is equally important.
- ❖ Sorghum Research Unit, Dr.PDKV, Akola (MS) has developed one kharif sorghum genotype **SPV-1786** with excellent dough and roti making quality.
- ❖ In the present era of **nutritional security**, development of such quality rich genotypes is of significance

Material and Methods

- ❖ **SPV 1786** is developed from the **cross (Ms 70 B x GJ 40) 17.1** by **selection** method.
- ❖ **Ms 70 B** brought from ICRISAT in 1991 and reselected and stabilized at Akola .
- ❖ **GJ 40** is Dual purpose state released variety in the year 1997.
- ❖ This genotype has been tested in All India Co-ordinated Sorghum Improvement Project (AICSIP) multilocation trials-Zone-II during-
2006 (IVT- Initial Varietal Trial),
2007 (AVT Ist year- Advance Varietal Trial) and
2008 (AVT IInd year- Advance Varietal Trial) along with national released checks
- ❖ The genotype 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.

Table : 1-a. Summery of Grain yield (kg/ha) data of SPV -1786 in Coordinated Sorghum Varietal Trials.

Traits	Years of Testing	No. of Trials	Genotype SPV1786	Check Varieties				CD at 5%
				SPV - 1616	SPV- 462	CSV - 15	CSV- 17	
Grain yield	2006	3	3888	3613	2938	4158	2777	704
	2007	8	4241	4491	4749	3981	3845	763
	2008	10	3414	3395	3822	3521	2675	602
	Mean	21	3797	3844	4049	3787	3135	-
% increase or decrease over the checks and qualifying varieties	2006	3		+7.61	+32.33	-6.49	+40.01	
	2007	8		-5.56	-10.69	+6.53	+10.29	
	2008	10		+0.56	-10.69	-3.03	+27.62	
	Mean	21		-1.22	-6.22	0.26	21.11	

Table : 1-b. Summery of Fodder yield (kg/ha) data of SPV -1786 in Coordinated Sorghum Varietal Trials.

Traits	Years of Testing	No. of Trials	Genotype SPV1786	Check Varieties				CD at 5%
				SPV - 1616	SPV- 462	CSV - 15	CSV- 17	
Fodder yield	2006	3	14805	14079	13785	13391	8345	3097
	2007	8	12183	13014	12276	11390	7898	3028
	2008	9	13230	13046	13189	12460	8756	2090
	Mean	20	13047	13188	12913	12172	8351	-
% increase or decrease over the checks and qualifying varieties	2006			+5.15	+7.39	+10.55	+77.41	
	2007			-6.38	-0.75	+6.96	+54.25	
	2008			+1.41	0.31	+6.17	+51.09	
	Mean			-1.06	+1.04	+7.19	+56.24	

Table : 2. Adaptability to Agronomic variables for SPV-1786 in Coordinated Varietal Trials
Mean of five locations (Mean of five locations (Parbhani, Akola, Dharwad, Indore, Surat)

Name of Expt.	Item	Genotype SPV- 1786	Check Varieties		
			CSV- 17	SPV- 1616	CSV- 15
Fertilizer experiment					
Fertility level genotype interaction effect	Grain yield (q/h) under				
	i) Fert 3	3706	2716	3724	3409
	ii) Fert4	4058	3145	4208	3848
	iii) Fert2	3290	2285	3239	3088
	iv) Fert1	2626	1746	2427	2291
	Mean	3420	2473	3402	3159
	Percentage gain or loss under other doses				
	i) Fert 4- 150% RDF	-8.67	-13.64	-11.50	-11.40
	ii) Fert 2 – 50% RDF	+12.64	+18.86	+14.97	10.39
	iii) Fert 1 – Native fertility	+41.12	+55.55	+53.44	+48.79
	Fodder yield (q/ha) under				
	i) Fert 3	13110	8543	11847	12250
	ii) Fert4	14537	9589	13158	13650
	iii) Fert2	11894	7947	11431	11123
	iv) Fert1	10294	6851	9230	9261
	Mean	12459	8232	11416	11571
	Percentage gain or loss under other doses				
	i) Fert4	-9.81	-10.90	-9.96	-10.25
	ii) Fert2	+10.22	+7.49	+3.63	+10.13
	iii) Fert1	+27.35	+24.69	+28.35	+32.27

Fert-1 – Native fertility (No external fertility input) ,
Fert- 3- 100% Recommended dose of fertilizers. (RDF) ,

Fert- 2- 50% Recommended dose of fertilizers. (RDF)
Fert- 4- 150% Recommended dose of fertilizers. (RDF)

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

Name of diseases	Years of Testing	No. of Trial	Genotype SPV 1786	Check Varieties			
				SPV - 1616	SPV- 462	CSV - 15	CSV- 17
Grain mold field grade	2006(1-5 scale)	2	2.3	2.00	2.6	2.0	2.7
	2007*(1-9 scale)	4	3.6	3.8	4.3	4.2	4.3
	2008*(1-9 scale)	2	3.10	3.23	3.20	3.0	3.42
	Overall mean	6	3.43	3.59	3.93	3.8	4.00
Grain mold threshed grade	2006 (1-5 scale)	1	1.5	1.2	1.3	1.8	1.5
	2007*(1-9 scale)	2	3.3	3.4	4.00	3.9	4.3
	2008*(1-9 scale)	-	-	-	-	-	-
	Overall mean	2	3.3	3.4	4.00	3.9	4.3
Grain affected (%)	2006	1	34.7	31.1	20.2	27.2	31.4
	2007	2	22.8	23.3	23.2	23.9	27.0
	2008	-	-	-	-	-	-
	Overall mean	3	26.76	25.93	22.23	25.03	28.43
Germination (%)	2006	1	36.5	53.6	70.1	67.2	73.9
	2007	2	64.5	59.6	66.9	66.4	67.4
	2008	-	-	-	-	-	-
	Overall mean	3	64.20	64.30	67.93	66.93	69.53

Table : 3- cont. Reaction to major diseases in Coordinated Varietal Trials

Name of diseases	Years of Testing	No. of Trial	Genotype SPV 1786	Check Varieties			
				SPV - 1616	SPV- 462	CSV - 15	CSV- 17
Anthrocnose	2006(1-5 scale)	3	1.78	1.78	1.78	1.67	1.67
	2007*(1-9 scale)	4	2.40	2.70	2.40	2.70	3.15
	2008*(1-9 scale)	3	1.56	1.33	1.67	1.44	1.67
	Overall mean	7	2.04	2.11	2.08	2.16	2.51
Leaf blight	2006(1-5 scale)		1.33	1.50	1.50	1.67	1.67
	2007*(1-9 scale)		2.00	2.40	2.60	2.30	2.70
	2008*(1-9 scale)		2.24	2.03	1.78	2.04	1.83
	Overall mean		2.12	2.21	2.19	2.17	2.26
Downy mildew systemic infection (%)	2006	1	7.61	4.05	5.63	5.29	7.38
	2007	1	4.99	5.01	5.99	5.93	5.22
	2008	1	19.3	20.7	22.2	18.6	14.8
	Overall mean	3	12.16	12.85	14.09	12.26	10.01
Ergot (%)	2006	1	29.62	40.99	42.40	31.22	24.21
	2007	2	4.90	4.90	4.90	4.90	4.90
	2008	1	20.2	21.9	18.9	26.5	11.9
	Overall mean	4	10.0	10.56	9.56	12.1	7.23

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

Name of	Years of Testing	No. of Trials	Genotype SPV- 1786	Check Varieties			
				SPV - 1616	SPV- 462	CSV - 15	CSV- 17
Shoot fly pest (dead heart % at 28 DAE)	2006	3	70.00	68.01	71.9	67.4	71.1
	2007	4	43.00	41.06	41.4	35.8	44.8
	2008	4	69.5	67.5	72.3	68.4	69.2
	Overall mean	11	60.02	58.22	60.96	56.27	60.89
Stem borer dead hearts (%) 45 DAS	2006	1	8.2	9.3	5.3	5.4	2.8
	2007	4	15.1	11.9	14.7	12.9	16.6
	2008	2	6.4	14.7	8.6	7.8	3.1
	Overall mean	7	11.03	12.4	11.08	9.95	9.76
Stem borer leaf injury plants (%)	2006	2	11.5	11.0	13.1	13.8	8.2
	2007	4	19.9	26.1	29.0	24.	25.6
	2008	2	6.4	14.7	8.6	7.8	3.1
	Overall mean	8	14.42	19.47	19.92	17.38	15.62
Midge spikelet damage %	2006	1	12.00	12.70	9.30	14.0	13.0
	2007	2	24.67	25.33	22.67	28.67	39.67
	2008	-	-	-	-	-	-
	Overall mean	3	18.33	19.01	15.98	21.33	26.33
Head bug population per panicle (No)	2006	1	22.2	27.4	22.8	21.5	17.3
	2007	2	9.9	7.6	7.5	7.7	9.9
	2008	1	4.67	4.67	4.00	3.00	4.00
	Overall mean	4	11.64	11.84	10.45	10..0	10.07

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

Quality characteristic	No. of Locations (Dharwad & Akola)	Genotype SPV 1786	Check Varieties			
			SPV - 1616	SPV- 462	CSV - 15	CSV- 17
Fat %	2	2.55	2.86	2.56	2.68	2.75
Protein%	2	9.88	10.03	9.64	9.80	9.90
Starch %	2	69.55	68.36	65.86	67.11	68.12
Water activity	2	0.36	0.37	0.37	0.37	0.36

Table:5- b Data on Stover quality in Coordinated Varietal Trials

Quality characteristic	No. of Locations (Parbhani, Dharwad & Akola)	Genotype SPV 1786	Check Varieties			
			SPV - 1616	SPV- 462	CSV - 15	CSV- 17
Crude Protein %	3	4.29	3.49	3.41	4.22	4.21
ASH %	3	10.34	10.57	10.66	10.32	10.47
NDF %	3	68.1	68.2	69.9	67.2	69.1
ADF %	3	43.5	44.8	46.1	43.6	45.3
IVOMD (%)	3	51.6	51.80	50.00	51.6	49.9

IVOMD- Invitro Organic Matter Digestibility ,

NDF- Neuter Detergent Fiber ,

ADF- Acid Detergent Fiber

Table: 5 c- Data on Nutritional constituents responsible for roti quality in Coordinated Varietal Trials

Parameters	Genotype	Check Varieties			
	SPV 1786	SPV - 1616	SPV- 462	CSV – 15	CSV-17
Dough quality					
Water requirement (ml)	120.57	111.67	100.57	113.33	99.43
Water absorbance (ml)	161.03	157.00	149.47	161.77	140.33
Kneading quality (scale 1-3)	1	1	1.3	1.1	1.3
Spreading quality (scale 1-3)	1	1.1	1.7	1	1.3
Hectoliter weight (kg/hl)	79.54	77.70	76.21	78.06	77.70
Soluble protein (%)	1.03	1.25	1.08	1.21	0.91
Crude protein (%)	9.96	9.29	8.55	9.57	9.15
Free amino acids (mg/100 g meal)	68.10	75.32	72.41	55.12	70.57
Total soluble sugars (%)	2.15	2.02	1.00	2.13	1.10
Starch (%)	70.32	69.86	62.39	68.56	65.04

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

Parameter	Year	No. of trials	Genotype SPV 1786	Check Varieties			
				SPV - 1616	SPV- 462	CSV - 15	CSV- 17
Days to 50% flowering.	2006	4	77	78	78	78	69
	2007	12	75	75	76	76	63
	2008	10	73	71	73	72	63
	Overall mean	26	75	74	75	75	64
Days to maturity (Days)	2006	4	121	122	123	122	116
	2007	11	112	112	111	112	103
	2008	10	114	113	115	114	105
	Overall mean	25	114	114	114	114	106
Plant height (cm)	2006	4	229	218	222	214	159
	2007	12	234	248	228	223	145
	2008	11	234	234	225	224	143
	Over all mean	27	233	238	226	222	146
1000 Seed weight (gm)	2006	4	26.2	26.0	26.7	25.7	22.3
	2007	9	23.0	26.8	25.4	25.0	23.9
	2008	8	24.9	30.3	28.4	28.4	26.2
	Over all mean	21	24.3	27.9	26.7	26.4	24.4

Research Advisory Committee Meeting of DSR

The XII Research Advisory Committee Meeting, of DSR was held at DSR on 4 May 2011 under the chairmanship of Dr. RB Deshmukh. The RAC members present were: Dr. Sain Dass, Dr. PM Salimath, Dr. BN Narkhede, Dr. RP Dua and Dr JV Patil and Dr. Vilas A Tonapi (member-secretary). The RAC Chairman in his opening remarks highlighted the importance of sorghum as an important food, feed and fodder. The member-secretary presented the action-taken report (ATR) on recommendations of the previous RAC meeting. The research theme leaders of DSR presented the progress and achievements in their research area. Dr. JV Patil, Director, DSR presented an overview of sorghum R&D and issues being addressed in XII plan. During the discussions, the members suggested the approaches for improving research activities for better product delivery to enhance production and profitability of



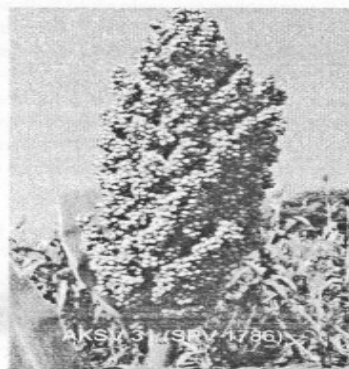
the farmers' cultivating sorghum in dry regions of semi-arid tropics. After the meeting, the RAC members visited the research fields and laboratories of DSR.

Research News

A newly developed kharif sorghum genotype AKSV 31 (SPV 1786) for yield and quality

Sorghum is one of the food and feed crop of Maharashtra state and it is mainly produced and consumed by poor farmers. Research on sorghum improvement is being carried out at Sorghum Research Unit, PDKV, Akola with the objectives of higher grain and fodder yield along with acceptable quality. This centre has identified new dual purpose kharif (rainfed) genotype AKSV 31 derived from the cross MS 70 B x GJ 40 which performed well in the university multi-location trials from 2005-06 to 2008-09. It was also tested under AICSIP trials under the ID "SPV 1786" for three consecutive years i.e., from 2006-07 to 2008-09.

The newly developed sorghum genotype SPV 1786 recorded grain yield (37.97 q/ha) which was comparable with the checks SPV 1616 (38.44 q/ha) SPV 462 (40.49 q/ha) and CSV 15 (37.87 q/ha). As it require 75 days for 50% flowering and 114 days for maturity the genotype SPV 1786 may be categorized under mid late group maturity. It has 233 cm plant height and 24.3 gm weight of 1000 seed. It has further recorded higher fodder yield (130.47 q/ha) over the checks SPV 462 (129.13 q/ha) and CSV 15 (121.72 q/ha) and comparable with check SPV 1616 (131.88 q/ha) during the year 2006 to 2008 under zone II of AICSIP trials.



Grain and fodder yield of SPV 1786 in AICSIP trials (Zone II) during 2006-08

Years	No. of Trials	SPV-1786	SPV-1616 (C)	SPV-462 (C)	CSV-15 (C)	CD at 5%
Grain yield (q/ha)						
2006	3	38.88	36.13	29.38	41.58	7.0
2007	8	42.41	44.91	47.49	39.81	7.6
2008	10	34.14	33.95	38.22	35.21	6.0
Mean	21	37.97	38.44	40.49	37.87	-
Fodder yield (q/ha)						
2006	3	148.05	140.79	137.85	133.91	40.0
2007	8	121.83	130.14	122.76	113.90	30.3
2008	9	132.30	130.46	131.89	124.60	20.9
Mean	20	130.47	131.88	129.13	121.72	-

The grain and stover quality characters were evaluated in zone II trials during 2008. The grains of SPV 1786 recorded higher value of starch content (69.55%) than checks and comparable values of fat, protein and water. The stover of SPV 1786 was low in lignin (5.76%) than checks with comparable values of crude protein, ash, ADF and in vitro organic matter digestibility (IVDMD)

Grain and fodder quality traits of SPV 1786

Trait	Genotypes			
	SPV 1786	SPV 1616 (C)	SPV 462 (C)	CSV 15 (C)
Grain quality traits¹				
Fat. %	2.55	2.86	2.56	2.68
Protein %	9.88	10.03	9.64	9.80
Starch %	69.55	68.36	65.86	67.11
Water activity Mean%	0.36	0.37	0.37	0.37

Trait	Genotypes			
	SPV 1786	SPV 1616 (C)	SPV 462 (C)	CSV 15 (C)
Stover quality traits²				
Crude Protein%	5.33	6.34	5.36	5.51
ASH%	9.60	9.50	8.70	9.60
NDF%	69.50	70.80	71.80	71.90
ADF%	45.40	46.50	47.30	47.90
IVDMD%	49.60	49.70	49.40	49.80
Lignin%	5.79	6.05	6.04	5.96

¹ mean of 2 locations; ² mean of 3 locations (c)- check

The ten dough quality and six roti quality parameters were evaluated in trials of zone II during the year 2008. The dough and roti making quality of SPV 1786 was found to be excellent over the checks SPV 1616, SPV 462 and CSV 15.

Dough and roti quality of SPV 1786

Quality trait	Genotypes				
	SPV 1786	SPV 1616 (C)	SPV 462 (C)	CSV 15 (C)	CD at 5%
Dough quality parameters					
Water requirement (ml)	120.6	111.7	100.6	113.3	23.1
Water absorbance(ml)	161.0	157.0	149.5	161.8	2.8
Kneading quality (scale 1-3)	1	1	1.3	1.1	0.1
Spreading quality (scale 1-3)	1	1.1	1.7	1	0.1
Hectolitre weight (kg/hl)	79.54	77.70	76.21	78.06	1.32
Soluble protein (%)	1.03	1.25	1.08	1.21	0.08
Crude protein (%)	9.96	9.29	8.55	9.57	0.09
Free amino acids (mg/100 g meal)	68.10	75.32	72.41	55.124	3.84
Total soluble sugars (%)	2.15	2.02	1.00	2.13	0.10
Starch (%)	70.32	69.86	62.39	68.56	2.11
Organoleptic properties of roti					
Colour (scale 1 – 10)	1.40	4.00	5.87	2.53	1.35
Texture (scale 1 – 5)	1.47	3.80	5.53	3.07	1.28
Taste (scale 1 – 5)	1.20	3.80	5.13	2.67	1.47
Flavor (scale 1 – 5)	2.00	3.93	5.67	2.73	1.36
Acceptability (scale 1 – 5)	1.33	3.73	5.60	2.73	1.31
Storage study (scale 1 – 10)					
a) 4 hrs	1.37	1.83	2.05	1.85	0.35
b) 8 hrs	2.11	2.38	3.49	2.43	0.36
c) 24 hrs	4.18	4.30	5.48	4.78	0.28

Hence, it holds promise for farming community and for further use in breeding programme.

RB Ghorade, DT Deshmukh and VV Kalpande
Sorghum Research Unit, PDKV, Akola, Maharashtra
S. Audilakshmi
Directorate of Sorghum Research, Hyderabad

Stability analysis for grain yield over stress at various growth stages in rainy-season sorghum

Improvement in drought tolerance has become equally important for rainy season crop as in post-rainy season since dry spells can occur any time during the growing season and moisture stress at crucial growth stages may become a major constraint to sorghum production. A strategy was developed for breeding for drought tolerance in rainy season.

Three crosses, namely SPV 772 x S-35, SPV 772 x ICSV 272, and S-35 x SU 663 were developed at Udaipur center. F₂s were raised at Udaipur and F₁ seed were distributed for evaluation to three centers. Fifty seven selections were made for drought resistance under natural conditions. These 57 F₂s were evaluated at three centers, Coimbatore, Kovilpatti and Udaipur, and 25 superior selections were made. These 25 derivatives in F₂ and F₃ (selected over the locations) and C43 and CSV 17, as checks were screened for drought tolerance during the rain-free months of April to June of 2007 and 2008 respectively at ARS, TNAU, Kovilpatti. The experiment was laid-out in factorial randomized block design with three replications. In each generation (F₂ and F₃), four trials were conducted to induce four levels of water stress during different phases of crop growth [viz., vegetative (GS1), pre-flowering (GS2) and post-flowering (GS3)] along with the control (no-stress i.e. normal irrigation). Treatments of different water stresses were imposed by withholding irrigation during different growth stages during both years. Data collected over eight environments were analyzed using the model of Eberhart and Russell (1966) to study the stability.

The derivatives studied were significantly different for grain yield, stover yield, plant height, average root length, number of roots/plant, LRWC, chlorophyll content, and stomatal conductance. Significant G x E interaction for grain yield indicated that stable genotype could be identified for stresses at all stages i.e. GS1, GS2, GS3 and control without any stress. In the present study the derivatives showing high to moderate mean performance than the population mean for grain yield, β_i nearing one and S^2D_i nearing zero were DSR-D32, DSR-D73, and DSR-D3 and were most stable over all the three stress environments and control conditions. The derivatives showing high to moderate mean performance than the population mean, β_i more than one and S^2D_i nearing zero were

DSR-D5, DSR-D15, DSR-D21, DSR-D28, DSR-D29, DSR-D38, DSR-D39, DSR-D64, and DSR-D71 and were specifically adapted to favorable environments. However, derivatives DSR-D45, DSR-D54, DSR-D56, and DSR-D65 showed high to moderate mean performance than the population mean, β_i less than one and S^2D_i nearing zero and were adapted to unfavorable environments.



Thank You