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Jowar Samachar

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From the Director's desk....

This issue of *Jowar Samachar* places before the readers a glimpse of the sorghum research related activities during the past quarter and new breeding varieties and material developed in the national system. The futuristic goal-setting document "Vision 2030" of DSR and AICSIP was published during this quarter. Several new cultivars developed by DSR, AICSIP centres and private sector - were identified by the Varietal Identification Committee which are being submitted to the Central Varietal Release Committee for release notification.

The kharif season 2011 has begun with a cautious outlook as the rainfall has been less or delayed in most of the sorghum growing areas. In order to address the problems arising due to such situations, major thrust is being given for developing technologies to mitigate the adverse effects of climate change during the 12th plan. Our research initiatives for projecting sorghum as a commodity for alternate purposes and diversified food use are being given due emphasis to keep sorghum cultivation remunerative for our farming community.

(JV Patil)

41st Annual sorghum group meeting at UAS, Dharwad

The 41st Annual Group Meetings of the All India Coordinated Sorghum Improvement Project was held at the University of Agricultural Sciences, Dharwad from 15 to 17 April, 2011. The meeting was formally inaugurated by Dr. Swapan Kumar Datta, Deputy Director General (Crop Science), ICAR, New Delhi. Dr. RR Hanchinal, Vice-chancellor, University of Agricultural Sciences, Dharwad presided over the inaugural session. Dr. JV Patil, Director, Directorate of Sorghum Research (DSR), Hyderabad presented the research highlights and reviewed the work at AICSIP centres. A total of 250 participants belonging to the AICSIP centres, DSR, IGFRI, ICRISAT, private seed industry, and non-governmental organizations participated in this meet.

The dignitaries appreciated the sorghum research work on delivering improved cultivars and the technologies for the sorghum growing resource poor farmers in the dryland regions of the country through the All-India programme sponsored by the ICAR. They suggested that it is necessary to create a viable market for sorghum through enhancing alternate uses, and by developing new technologies. Dr. JV Patil, Director, DSR presented the achievements in the sorghum research and development. He emphasized that while the national sorghum program is well geared to meet the challenges and cater to the needs of sorghum farmers and sorghum-based industries, much more needs to be done on the fodder front. He reported progress in registration of varieties with PPV&FRA, and commercialization of improved cultivars and the preparations for setting goals for XII plan to make sorghum a more viable preposition.

During the meeting, the progress of the trials and activities at AICSIP centres during the past year were reviewed and new experiments and initiatives for the coming year were planned.

New sorghum varieties identified for release

The Varietal Identification Committee meeting was held at the College of Agriculture, University of Agricultural Sciences, Dharwad on 16 April, 2011 during the 41st Annual Sorghum Group Meeting. The members Dr. SK Datta, DDG (Crop Science), ICAR, Dr. PM Salimath, Director of Research, UAS, Dharwad, Dr. S Lingaraju, Prof. & Head, Dept. of Plant Pathology, UAS, Dharwad, Dr. BM Khadi, Dean (PG Studies), UAS, Dharwad, Dr. SA Farooqui, PC (Forages), IGFRI, Jhansi, Dr. Arvind Kapoor, Vice President, Rasi Seeds, Gurgaon and Dr. JV Patil, Director, DSR, Hyderabad participated in the meeting. The committee critically examined 11 proposals and The VIC after considerable deliberations identified following cultivars.

- **SPH 1644** - Kharif sorghum hybrid for Andhra Pradesh, Tamil Nadu, Uttar Pradesh, North Gujarat & Rajasthan (developed by DSR, Hyderabad)
- **SPH 1629** - Kharif sorghum hybrid for all kharif sorghum cultivating regions of India (developed by Devgen Seeds & Crop Tech. Pvt. Ltd, Secunderabad).
- **SPV 1870 -** Dual -purpose kharif variety for all dual-purpose sorghum cultivating regions of India (developed by DSR, Hyderabad)
- **SPV 1822 -** Dual -purpose kharif variety for all dual-purpose sorghum cultivating regions of India (developed by MPUA&T, Udaipur)
- **SPV 1829 -** Rabi sorghum variety for all rabi sorghum growing regions of India (developed by DSR, Hyderabad).

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.


AKSV 31 (SPV 1786)

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 traits[1]				
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 traits[2]				
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 (scale1-3)	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	55.124.84	
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. F_1s were raised at Udaipur and F_1 seed were distributed for evaluation to three centers. Fifty seven selections were made for drought resistance under natural conditions. These 57 F_3s were evaluated at three centers, Coimbatore, Kovilpatti and Udaipur, and 25 superior selections were made. These 25 derivatives in F_4 and F_5 (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 (F_4 and F_5), 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, íi nearing one and S^2Di 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, íi more than one and S2Di 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, íi less than one and S^2Di nearing zero and were adapted to unfavorable environments.

Stability analysis of grain yield and other traits across years and environments

	DF	Grain Yield	Stover Yield	Plant Height	No of roots / plant	Average root length	LRWC	Chlorophyll content	Stomatal conductance
Rep within Environment	8	0.14 ***	0.20 *	33.69	10.56	14.11	11.91	14.21	6.93
Genotypes	28	0.15 ***	0.45 ***	1676 ***	197.0 ***	121.9 ***	163.5 ***	203.2 ***	2050 ***
Env.+ (Geno.* Env.)	203	0.25 ***	0.89 ***	859.6 ***	84.5	337.3 ***	46.94	125.3 ***	428.2 **
Environments	7	5.96 ***	22.28 ***	16252 ***	597.1 ***	9169 ***	75.5	2002 ***	1775 ***
Genotypes x Environment	196	0.05 ***	0.12	309.9 ***	66.19	21.83 ***	45.93	58.33	380.1 *
Environments (Lin.)	1	41.75 ***	155.9 ***	113764 ***	4180 ***	64186 ***	528.5 ***	14011 ***	12428 ***
Genotypes x Environment (Lin.)	28	0.17 ***	0.23 ***	16287 ***	24.26	79.16 ***	81.54 **	93.61 **	935.0 ***
Pooled Deviation	174	0.03 ***	0.10 ***	87.12 ***	70.65 ***	11.85 ***	38.61 ***	50.64 ***	277.7 ***
Pooled Error	224	0.01	0.02	3.71	2.89	2.24	4.3	7.22	8.19
Total	231	0.24	0.83	958.6	98.14	311.2	61.07	134.8	624.9

* P < 0.05; ** P < 0.01, and *** P < 0.001

Stability parameters for grain and stover yields and morphological traits across four environments

Genotypes	Grain yield(kg/plant)			Fodder yield(kg/plant)			Plant height (cm)		
	Mean	bi	S²Di	Mean	bi	S²Di	Mean	bi	S²Di
DSR-D3	0.95	1.1	0.025**	3.06	1.27*	0.02	173	1.39	114.0 ***
DSR-D5	1.03	1.237*	0	2.67	1.11	0	169	0.82	20.5 ***
DSR-D7	0.87	0.435*	0.01	2.7	1.4	0.38***	144	0.86*	3.2
DSR-D15	1.22	1.432*	0.03 **	2.91	0.93	0	184	0.87*	5.4 *
DSR-D21	1.24	1.36	0.02 *	2.8	1.14	0.04*	162	0.97	-2
DSR-D24	0.83	1.22	0	2.61	0.89	0.07**	181	1.09	1.7
DSR-D27	0.96	0.87	0	2.87	1.11	0.05 *	170	0.86	33.1 ***
DSR-D28	0.99	1.24	0.01	2.89	1	0.03 *	176	0.59*	21.5 ***
DSR-D29	1.23	1.519*	0.01	3.04	1.32*	0.02	173	0.68	75.7 ***
DSR-D32	0.99	0.95	0	2.78	0.83	0.05 *	155	1.63*	113.4 ***
DSR-D38	1.01	1.255*	0	2.73	0.99	0.07**	159	0.62*	15.7 ***
DSR-D39	1.07	1.24	0.03 **	2.91	1.07	0.08***	168	0.89	13.7 **
DSR-D45	1.07	0.87	0.01	2.5	0.52	0.33***	176	1.24	58.6 ***
DSR-D49	0.85	0.668*	0.01	2.54	0.69*	0.04*	159	1.48*	44.1 ***
DSR-D52	0.91	1.491*	0.01	2.3	1.11	0	139	0	149.0 ***
DSR-D53	0.85	0.48	0.07***	2.47	0.8	0.29***	176	1.27*	15.8 ***
DSR-D54	1.03	0.431*	0.01	2.81	1	0	168	0.78*	9.8 **
DSR-D56	1.06	0.69	0.03**	2.9	0.89	0	180	1.14	131.0 ***
DSR-D59	0.87	0.81	0.01	2.72	0.7	0.09***	178	2.29*	179.7 ***
DSR-D63	0.99	0.67	0.05***	2.38	0.61	0.11***	175	1.37*	18.0 ***
DSR-D64	1.07	1.26	0	2.85	1.03	1.0***	176	1.28*	20.1 ***
DSR-D65	1.05	0.368*	0.04***	2.96	1.13	0.04*	164	1.84*	114.3 ***
DSR-D71	1.24	1.387*	0	2.8	1.15	0.05**	166	0.44*	42.3 ***
DSR-D73	0.98	1.03	0.018*	2.4	0.86	0.01	150	1.38*	17.1 ***
DSR-D80	0.92	1.02	0	2.77	1.1	0.08**	167	0.7	182.3 ***
C 43-81	0.93	0.94	0.02 *	3.02	1.09	0.02	171	1.24	32.9 ***
CSV 17 (C)	0.76	0.635*	0.01	2.32	1.1	0.03	139	-0.6	489.9 ***
Population Mean	1.01			2.75			167		

The studies showed that derivatives DSR-D32, DSR-D73, and DSR-D3 were superior to the check for grain yield and were stable across all the drought stages i.e. drought at vegetative, pre-flowering and post-flowering stages.

R. Sankarapandian
AICSIP, TNAU, Kovilpatti, Tamil Nadu-628501
S Audilakshmi, HS Talwar and JV Patil
Directorate of Sorghum Research, Hyderabad-500030
V Sharma
AICSIP unit, MPUA&T, Udaipur-313001
K Ganesamurthy
AICSIP, TNAU, Coimbatore - 641003

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Editorial by: **Drs.B Venkatesh Bhat, KV Raghavendra Rao, Sh.K Sanath Kumar & HS Gawali**

Directorate of Sorghum Research (DSR)

Rajendranagar, Hyderabad - 500 030 (A.P.), Tel: 040-24015349, 24018651, Fax: 040-24016378, Email: nrcshyd@ap.nic.in, website: www.sorghum.res.in

Sorghum sub-station (DSR)
Krishi School, Marathwada Agricultural University (MAU)
Jalna-431 203, Maharashtra., Tel: 9440498352

Centre on Rabi Sorghum (DSR)
NH 9 Bypass, Shelgi, Solapur-413 006 (MS), Tel: 0217-2373456
Telfax : 0217-2373456, Email: raut@sorghum.res.in

AICSIP Centres: Coimbatore, Palem, Akola, Hisar, Bijapur, Rahuri, Kovilpatti, Tandur, Surat, Mauranipur, Meerut, Phaltan, Dharwad, Parbhani, Deesa, Pantnagar, Udapur, Indore