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GJ 45 (SDAU JOWAR MOTI) – A NEW DUAL SORGHUM VARIETY FOR SEMI-ARID REGION OF GUJARAT INDIA

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ABSTRACT

The new dual sorghum variety GJ 45 (SDAU Jowar Moti) breed through pedigree selection method from the cross between CB 29 × SPV1616 at Centre for Millets Research, Sardarkrushinagar Dantiwada Agricultural University, Deesa, Gujarat. The variety GJ 45 (SDAU Jowar Moti) (DS 189) was tested in preliminary evaluation trial (PET) in *kharif* 2018. It was found promising and tested further in state multilocation trials from *kharif* 2019 to *kharif* 2022. It was also tested under AICRP grain sorghum- IVT trial in *Kharif* 2021 in sixteen locations (Zone I, II and III) nationwide. The released variety was tested under a total of 31 state trials against various check varieties *viz.*, GJ 43, GNJ 1, GJ 44 and CSV 20. The mean performance of GJ 45 (SDAU Jowar Moti) for grain yield over 31 locations, including the preliminary trial was 2467kg/ha. In the case of dry fodder yield, the mean performance over 35 locations, including the preliminary trial was 158.7 q/ha. In Gujarat, based on 31 testing trials GJ 45 (SDAU Jowar Moti) exhibited high grain yield (2467 kg/ha) with an increment of 12.8, 9.4, 7.4 and 13.3 per cent, over the years and locations against checks GJ 43, GNJ 1, GJ 44 and CSV 20 respectively and based on 35 location dry fodder (158.7 q/ha) with an increment of 26.4, 40.4 and 2.4per cent over the years and locations against checks GNJ 1, GJ 44 and CSV 20 respectively. It matures within 90-133 days, leaf contain long length of blade, small stem diameter (< 2 cm) and long neck of panicle (visible length above sheath). Grain is attractive Good lustrous, circular yellow-white with 12.40 per cent crude protein. Good roti making properties. Under field condition it was moderately resistance to leaf blight, anthracnose, grain mold and ergot disease. It also showed lesser infestation of shoot fly and stem borer.

Keywords : Dual grain sorghum, variety, dry fodder yield and morphological traits.

Introduction

Keeping view of the great importance of millets, India is celebrated —2018 as a “National year of millets”. United Nations Food and Agriculture Organization declared and celebrating the year 2023 as the “International year of millets”, this will be promoted cultivation by amending cropping patterns of areas especially susceptible to climate change.

Sorghum bicolor (L.) Moench is major millet and is the fifth most important crop of semi-arid tropics in Asia and Africa having use as food, feed, fodder, fuel and fertilizer. Besides this, it is also a moderately salt tolerant crop (Devi *et al.*, 2018). Sorghum grains are

important as food for human being and for livestock feed. The stem and foliage are used as a fodder, hay, silage and pasture. Though sorghum is known for its versatile use, hardiness, dependability, stability of yield and adaptability over wide range of climate, the edapho-climatic conditions in the sorghum growing areas of the world limit the crop production. In Gujarat, sorghum is grown as grain crop in South Gujarat, dual purpose in North Gujarat, Kutch and Saurashtra as fodder in dairy farming developed area. In the present the health awareness is increasing in the consumers. So, the sorghum has great potential due to its many health benefits like helps in improving digestive health,

cancer, heart disease and diabetic patient, protects against osteoporosis and arthritis because it is gluten free, high in fibre, good source of antioxidants, slowly digested and balance blood sugar. Due to cultivation of cash crop in *kharif* season and fast development of dairy industries, there is shortage of dry fodder. The sorghum has potential for cultivation after cash crop on account of high value of fodder and grain. Sorghum cultivars can catch the demand of nutritional grain for food as well as feed & dry fodder for animals. Sorghum is grown in almost all the districts of Gujarat to meet the grain and fodder requirement for maintaining the milch animals. At present, cultivars GJ 42, GNJ 1 and GJ 44 for grain, GJ 39 and GJ 43 for dual are under cultivation. The local varieties have demerits like high infestation of pest, late maturity and poor yields. Therefore, it is necessary to develop a variety with high grain and fodder yield potential with early maturity. The released variety GJ 45 (SDAU Jowar Moti) was developed from cross CB 29 × SPV 1616 followed by continuous evaluation and selection.

Material and Methods

The new dual sorghum variety GJ 45 (SDAU Jowar Moti) breed through pedigree selection method from the cross between CB 29 × SPV 1616 at Centre for Millets Research, Sardarkrushinagar Dantiwada Agricultural University, Deesa, Gujarat. The cross was made in 2009 followed by pedigree selection was done from *kharif*, 2010 to 2017. This variety has advanced with high grain and dry fodder yield objectives. The variety GJ 45 (SDAU Jowar Moti) (DS 189) was tested in preliminary evaluation trial (PET) in *kharif* 2018. It was found promising and tested further in state multilocation trials from *kharif* 2019 to *kharif* 2022. It was also tested under AICRP grain sorghum- IVT trial in *Kharif* 2021 in sixteen locations (Zone I, II and III) across the nation. The variety was also screened for disease and pest under field condition at state as well as in AICRP grain sorghum- IVT trials (Anonymous 2022-23). DNA fingerprinting of variety GJ 45 (SDAU Jowar Moti) along with 4 check varieties GJ 43, GJ 44, GNJ 1 and CSV 20 was performed using 10 SSR Markers (Table 1).

Table 1: List of primers used in fingerprinting

Sr. No.	Name of primer	Forward Primer	Reverse Primer
SSR1	msbCIR276	CCCCAATCTAACTATTTGGT	GAGGCTGAGATGCTCTGT
SSR2	msbCIR300	TTGAGAGCGGCGAGGTAA	AAAAGCCCAAGTCTCAGTGCTA
SSR3	Xcup14	TACATCACAGCAGGGACAGG	CTGGAAAGCCGAGCAGTATG
SSR4	Xcup53	GCAGGAGTATAGGCAGAGGC	CGACATGACAAGCTCAAACG
SSR5	Xtxp67	CCTGACGCTCGTGGCTACC	TCCACACAAGATTCAGGCTCC
SSR6	Xtxp265	GTCTACAGGCGTGCAAATAAAA	TTACCATGCTACCCCTAAAAGTGG
SSR7	msbCIR283	TCCCTTCTGAGCTTGTAAT	CAAGTCACTACCAAATGCAC
SSR8	msbCIR329	GCAGAACATCACTCAAAGAA	TACCTAAGGCAGGGATTG
SSR9	Xtxp358	CAAGGACAAGATTCATTTTAAGGG	TCACACCTCACAAAATAAAAAGTGC
SSR10	Xtxp57	GGAACTTTTGACGGGTAGTGC	CGATCGTGATGTCCCAATC

Results and Discussion

Grain and fodder yield

The dual sorghum variety GJ 45 (SDAU Jowar Moti) was evaluated in PET during *kharif* 2018 against various check varieties *viz.*, GJ 43 and GNJ 1. The tested entry exhibit significantly high grain yield (4078 kg/ha) with increment of 19.2 and 25.6 per cent over checks GJ 43 and GNJ 1, respectively (Table 2). Similarly, in the case of dry fodder yield, the variety the variety GJ 45 (SDAU Jowar Moti) exhibited significantly high dry fodder yield (208.83 q/ha) with an increment of 1.9 and 60.6 per cent over checks GJ 43 and GNJ 1, respectively (Table 3). The new variety was tested under a total of 31 state trial against various checks varieties *viz.*, GJ 43, GNJ 1, GJ 44 and CSV 20.

The mean performance of GJ 45 (SDAU Jowar Moti) for grain yield over 31 locations, including the preliminary trial was 2467 kg/ha. In the case of dry fodder yield, the mean performance over 35 locations, including the preliminary trial was 158.7 q/ha. In Gujarat, based on 31 testing trials, it exhibited high grain yield (2467 kg/ha) with an increment of 12.8, 9.4, 7.4 and 13.3 per cent over the years and locations against checks GJ 43, GNJ 1, GJ 44 and CSV 20 respectively (Table 2) and based on 35 location dry fodder (158.7 q/ha) with an increment of 26.4, 40.4 and 2.4 per cent over the years and locations against checks GNJ 1, GJ 44 and CSV 20 respectively (Table 3). It was also tested under AICRP grain sorghum- IVT trial in *Kharif* 2021 in sixteen locations (Zone I, II and III) across the nation. The mean performance of grain yield

of GJ 45 (SDAU Jowar Moti) among sixteen location trials of AICRP grain sorghum- IVT trial showed 30.3 and 0.7 percent grain yield advancement against checks CSV 17 and CSV 37 respectively in Zone I, II and III of the nation (Table 4). For dry fodder yield, 47 percent of the advancement against check CSV 17 was achieved in Zones I, II, and III across the nation, respectively (Table 5).

Phenotypically grain is attractive good lustrous, circular yellow white with 12.40 per cent crude protein and other quality parameters which was at par to checks cultivars (Table 6).

Morphological attributes

In contents of morphological attributes, the released cultivar GJ 45 (SDAU Jowar Moti) has medium in flowering, tall plant with long and broad leaves, very short neck with symmetric, medium and semi compact panicle with medium branches, short glume length, small stem diameter (< 2 cm) and long neck of panicle (visible length above sheath) (Table 7).

Disease and pest reaction

The released cultivar tested in various locations in AICRP trials as well as an in-state trial for evaluating reaction toward major disease and pest. Under field condition it showed moderately resistance to leaf blight, anthracnose, grain mold and ergot disease. It also exhibited lesser infestation of shoot fly (24.58%) and stem borer (29.32 %) (Table. 8, 9 & 10a & b).

DNA fingerprinting

DNA fingerprinting of released variety GJ 45 (SDAU Jowar Moti) along with 4 check varieties GJ 43, GJ 44, GNJ 1 and CSV 20 was performed using 10 SSR Markers. All the markers amplified properly across the genotypes. Marker **msbCIR300** and **msbCIR283** were found polymorphic. Polymorphic

alleles were demonstrated using arrow symbol in Figure 1.

Summary

In Gujarat, based on 31 testing trials GJ 45 (SDAU Jowar Moti) exhibited high grain yield (2467 kg/ha) with an increment of 12.8, 9.4, 7.4 and 13.3 per cent over the years and locations against checks GJ 43, GNJ 1, GJ 44 and CSV 20 respectively and based on 35 location dry fodder (158.7 q/ha) with an increment of 26.4, 40.4 and 2.4 per cent over the years and locations against checks GNJ 1, GJ 44 and CSV 20 respectively. Grain is attractive Good lustrous, circular yellow white with 12.40 per cent crude protein. Good roti making properties. Under field condition it was moderately resistance to leaf blight, anthracnose, grain mold and ergot disease. It also showed lesser infestation of shoot fly and stem borer.

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Table 2: Grain yield performance of released sorghum variety GJ 45 (SDAU Jowar Moti) (DS 189) in comparison with check varieties in the Gujarat state

Name of Trial	Locations	Grain Yield (kg/ha)					S. Em. (±)	C. D. at 5%	CV%
		GJ 45 (DS 189)	GJ 43 (LC) a	GNJ 1 (LC) b	GJ 44 (LC) c	CSV 20 (NC) d			
PET	Deesa	4078 ^b	3421	3247			268	765	16.7
	% inc. over the checks		19.2	25.6					
SSVT	Deesa	1858 ^{bd}	1678	1225		1399	107	311	13.1
	Surat	3098 ^{abd}	1974	2583		2118	171	494	15.4
	Mangrol	3245 ^a	2593	3333		2860	208	602	13.4
	Achhalia	1154	1504	2612		1206	156	451	15.1
	SKNagar (CCI)#	1181	1076	1246		752	71	206	13.6
	Viramgam #	629	756	1127		433	47	137	10.6
	Mean (04)	2339	1937	2438		1896			
	% inc. over the checks		20.7	-		23.4			
LSVT	Surat	2269 ^a	1817	1987		1878	153	441	14.3
	Waghai	1878	1903	2315		1672	166	478	13.7
	Mangrol	2184	1803	2050		1839	211	609	17.5
	Achhalia	3598	2962	3209		3101	283	818	16.0
	Deesa	3554 ^{abd}	2896	2762		2775	193	557	11.5
	Aseda	2135	2469	2366		2135	148	429	11.0
	Bhiloda	1008	1386	1340		1258	97	280	14.6
	Kukada	1209	1195	1190		1119	69	199	10.5
	Dediapada @	1060	1111	823		1245	176	509	27.4
	Viramgam #	736	718	778		689	57	105	12.8
	Mean (08)	2229	2054	2152		1972			
% inc. over the checks		8.5	3.6		13.0				
LSVT	Surat	3596 ^{ad}	2014	3063	3189	2482	294	867	17.8
	Waghai	3899	3530	3175	3690	3804	362	1068	17.5
	Dediapada	2312	3030	2016	2163	2775	251	741	17.6
	Achhalia	3015	2494	3471	3210	3390	298	881	17.6
	Deesa	2046 ^d	2100	2573	2583	1381	162	477	14.6
	Aseda	1618 ^{ad}	1123	1533	1337	1159	153	453	16.1
	Bhiloda	3171 ^b	2966	2351	2654	3040	221	651	12.3
	Viramgam	913 ^d	745	867	919	724	61	181	10.3
	Mean (08)	2571	2250	2381	2468	2344			
% inc. over the checks		14.3	8.0	4.2	9.7				
LSVT	Surat	4394 ^{abcd}	3058	3423	3454	3447	306	889	15.8
	Waghai	2140	2749	1532	2697	2691	270	783	18.6
	Dediapada	1826	1533	1660	1686	1577	199	578	17.5
	Mangrol	2206 ^a	1209	2414	1786	1863	219	636	18.1
	Achhalia	3337	3037	3269	3498	3234	230	668	12.2
	Deesa	2576 ^b	2732	833	2324	2460	162	471	13.3
	Aseda	1743 ^{cd}	1612	1530	843	874	230	349	14.7
	Bhiloda	1525	1376	1330	1409	1379	95	277	13.5
	Viramgam	1631	1821	1430	1504	1392	111	323	11.3
	Ratiya	3251	3042	3182	3120	2875	165	479	9.3
	Mean (10)	2463	2217	2060	2232	2179			
% inc. over the checks		11.1	19.5	10.3	13.0				
Overall Mean (31)		2467							
Over all mean (31) Vs GJ 43 and GNJ 1		2467		2186		2254			
Over all mean (18) Vs GJ 44		2511				2337			
Over all mean (30) Vs CSV 20		2413				2130			
Overall % increase over the checks				12.8		9.4		7.4	
Frequency in top none significant group		6/31		1/31		1/31		1/18	
						0/30			

Data was not included in pooled analysis due to below average yield; @ high CV%

Table 3: Dry fodder yield performance of released sorghum variety GJ 45 (SDAU Jowar Moti) (DS 189) in comparison with check varieties in the Gujarat state

Year/ Season	Name of Trial	Locations	Fodder Yield (qt/ha)					S. Em. (±)	C.D. at 5%	CV %
			GJ 45 (DS 189)	GJ 43 (LC) a	GNJ 1 (LC) b	GJ 44 (LC) c	CSV 20 (NC) d			
Kharif- 2018	PET	Deesa	208.83 ^b	204.9	130.0			18.8	53.8	15.8
		% inc. over the checks		1.9	60.6					
Kharif- 2019	SSVT	Deesa	165.9 ^{bd}	154.3	81.0		123.5	7.9	22.9	10.5
		SKNagar (CCI)	180.6 ^{bd}	167.8	89.1		135.0	9.2	26.6	11.0
		Surat	208.3 ^b	185.2	110.0		175.5	13.5	39.2	17.4
		Mangrol	103.1	129.1	111.3		107.7	8.7	25.2	14.3
		Achhalia	211.0	185.6	184.0		208.7	12.2	35.3	12.4
		Viramgam	138.4	133.8	129.9		123.1	10.7	31.0	13.0
		Mean (06)	167.9	159.3	117.6		145.6			
		% inc. over the checks		5.4	42.8		15.3			
		Kharif- 2020	LSVT	Surat	123.5	126.0	95.9		136.1	13.2
Waghai	97.2			107.8	132.3		94.2	12.6	36.5	18.5
Dediapada	47.3			43.0	48.1		36.0	6.8	19.5	21.3
Mangrol	76.3			90.2	94.4		76.8	13.5	39.0	25.2
Achhalia	103.6			96.0	111.5		119.1	12.6	36.3	19.5
Deesa	239.2 ^b			234.1	151.8		203.2	14.0	40.3	12.6
Aseda	171.0 ^b			172.6	125.5		185.2	13.8	40.0	14.3
Bhiloda	131.2			172.3	131.2		167.2	6.8	19.8	8.1
Kukada	105.5 ^b			97.7	79.7		113.2	7.5	21.7	12.7
Viramgam	131.0			179.0	151.7		159.3	14.6	42.1	15.1
Mean (10)	122.6			131.9	112.2		129.0			
% inc. over the checks				-	9.2		-			
Kharif- 2021	LSVT	Surat	353.9 ^{cd}	380.7	288.4	182.6	266.9	23.5	69.3	14.5
		Waghai	90.8	97.5	79.5	71.2	90.5	7.4	21.7	14.4
		Dediapada	168.0	164.1	133.2	136.6	204.9	18.2	53.8	17.6
		Achhalia	140.2	100.6	120.1	103.1	119.1	14.2	42.0	19.4
		Deesa	169.8 ^{bc}	154.3	115.7	113.2	151.8	8.5	25.0	10.1
		Aseda	205.9 ^{abcd}	153.7	143.0	126.5	135.7	13.4	39.4	16.1
		Bhiloda	312.5 ^{bc}	313.8	212.2	216.1	347.2	11.5	34.0	7.1
		Viramgam	135.0	123.5	147.9	127.3	239.2	14.2	42.0	14.7
		Mean (08)	197.0	186.0	155.0	134.6	194.4			
% inc. over the checks		5.9	27.1	46.4	1.3					
Kharif- 2022	LSVT	Surat	160.2 ^{bc}	166.4	117.8	120.1	158.2	9.0	26.3	15.8
		Waghai	105.2 ^b	111.1	77.9	88.0	134.0	7.4	21.5	12.4
		Dediapada	132.5	167.7	113.4	108.8	138.1	11.4	33.2	13.3
		Mangrol	132.5 ^d	121.1	107.5	107.0	101.6	9.2	26.7	14.1
		Achhalia	191.4	187.0	154.6	184.9	164.9	15.4	44.8	15.1
		Deesa	151.8 ^{bcd}	149.2	69.4	69.4	123.5	6.0	17.4	9.8
		Aseda	181.8 ^{bc}	166.7	142.0	144.6	169.2	10.0	29.2	11.8
		Bhiloda	126.3 ^{bc}	110.6	91.6	86.9	135.0	5.6	16.4	9.4
		Viramgam	221.2 ^c	290.6	205.8	141.5	226.3	10.1	29.4	8.7
		Ratiya	132.5 ^c	150.2	117.0	88.0	150.7	10.8	31.3	15.2
		Mean (10)	153.5	162.1	119.7	113.9	150.2			
% inc. over the checks		-	28.3	34.8	2.2					
Overall Mean (35)			158.7							
Over all mean (35) Vs GJ 43 and GNJ 1			158.7	159.7	125.6					
Over all mean (18) Vs GJ 44			172.8			123.1				
Over all mean (34) Vs CSV 20			157.2			153.5				
Overall % increase over the checks				-	26.4	40.4	2.4			
Frequency in top none significant group			10/35	8/35	0/35	0/18	6/34			

a, b, c, d = Statistically superior than GJ 43, GNJ 1, GJ 44 and CSV 20, respectively

Table 4: Grain Yield performance of released sorghum variety GJ 45 (SDAU Jowar Moti) (DS 189) in initial varietal trial (IVT) in the year *Kharif* 2021 at different Zones of India

Zone	Locations	Grain yield (kg/ha)					CD at 5%	CV%
		GJ 45 (DS 189)	CSV 17 a	CSV 27 b	CSV 37 c	CSV 41 d		
Zone I	Chamrajanagar	5779 ^a	4424	7014	6570	7090	1285	13.2
	Coimbatore	3610	2983	3652	3524	3318	699	12.8
	Dharwad	4217	3489	4216	6097	4007	1015	14.6
	Hagari	3520	3818	4563	3357	3161	1359	21.7
	Palem	5304 ^{acd}	2896	5956	4283	5054	199	2.5
	Nandyal	2211	2556	2237	2037	2315	905	22.7
	Mean (6)	4107	3361	4606	4311	4158	911	14.6
% Increase over the checks			22.2	-	-	-		
Zone II	Akola	3404	3100	3378	3352	3622	475	8.3
	Bhulandnagar	3467	3182	3341	3570	3633	564	9.7
	Indore	4267 ^{ab}	1882	2848	3852	4682	1277	24.4
	Parbhani	3193 ^a	1963	3256	2504	3700	904	18.4
	Washim	3407	2915	3367	3356	3556	629	11.1
	Mean (5)	3547	2608	3238	3327	3839	770	14.4
% Increase over the checks			36.0	9.6	6.6	-		
Zone III	Deesa	2111 ^{abcd}	1126	1429	1344	1607	437	17.9
	Surat	4515 ^{ab}	1504	3061	3965	3933	801	15.2
	Viramgam#	1212	856	933	1572	1450	542	27.1
	Udaipur	3810	3924	4756	4464	4937	939	13.2
	Pali	2774	2896	2900	2904	3130	856	18
	Mean (4)	2884	2061	2616	2850	3012	715	18.3
% Increase over the checks			39.8	8.8	4.2	-		
All India Mean (15)		2844	3731	3679	3850	3850	418.9	15.2
% Increase over			30.3	-	0.7	-		

Source: AICSIP Annual Report 2021-22
Data not considered due to high CV %,
a, b,c and b indicate significantly superior than respective check variety

Table 5: Dry fodder yield performance of released sorghum variety GJ 45 (SDAU Jowar Moti) (DS 189) in initial varietal trial (IVT) in the year *Kharif* 2021 at different Zones of India

	Locations	Dry fodder Yield (q/ha)					CD at 5%	CV%
		GJ 45 (DS 189)	CSV 17 a	CSV 27 b	CSV 37 c	CSV 41 d		
Zone I	Chamrajanagar	109.4	89.7	138.9	130.3	121.5	20.8	10.8
	Coimbatore	81 ^a	55.4	80	72.4	75.1	17.3	14.2
	Dharwad	97.7 ^a	61.2	118.3	119.1	110.6	21.4	14.7
	Hagari	194.4 ^a	108.1	216.1	203.7	268.5	61.8	19.3
	Nandyal	155.6	137	120.4	164.8	138.1	59.6	23.9
	Palem	103.4 ^a	64.9	117.3	107.8	115.5	3.5	2.1
	Mean (6)	123.6	86.1	131.8	133.0	138.2	30.7	14.2
% Increase over the checks			43.6	-	-	-		
Zone II	Akola	126.2 ^a	100.7	129.3	123.5	127.9	6.6	3.2
	Bhulandnagar	126.3 ^a	102.4	127.9	123.1	127.2	6.0	2.9
	Indore	214.8 ^a	100	218.5	222.2	174.1	56.9	18.0

	Parbhani	114.8	88.9	144.4	114.8	125.9	36.3	17.2
	Washim	127.9 ^a	101.4	128.1	124.3	126.9	6.2	3.0
	Mean (5)	142.0	98.7	149.6	141.6	136.4	22.4	8.9
	% Increase over the checks	43.9	-	0.3	4.1			
Zone III	Deesa	222.2 ^a	100	177.8	188.9	222.2	49.7	16.7
	Surat	207.5 ^{ab}	94	144.7	166.4	195	44.2	17.2
	Viramgam	200 ^a	70.7	251.9	196.3	290.7	44.3	12.4
	Udaipur	188.4	213.4	281.7	223.8	242.7	78.0	21.2
	Pali	182.2	180.1	184.1	180.9	185	35.8	12.0
	Mean (5)	200.1	131.6	208.0	191.3	227.1	50.4	15.9
	% Increase over the checks	52.0	-	4.6	-			
	All India Mean (16)	153.2	104.2	161.2	153.9	165.4		
	% Increase over the checks	47.0	-	-	-			

Source: AICSIP Annual Report 2021-22
a, b,c and b indicate significantly superior than respective check variety

Table 6: Biochemical parameters of released variety GJ 45 (SDAU Jowar Moti) (DS 189) with checks for grain and dry fodder

Sr. No.	Quality parameters	GJ 45 (DS 189)	GJ 43 (C)	GJ 44 (C)
Grain				
1	Moisture (%)	9.89	9.9	9.75
2	Crude Protein (%)	12.40	12.35	12.36
3	Soluble Protein (%)	8.99	9.06	9.16
4.	Crude fiber (%)	1.87	1.82	1.88
Dry Fodder				
1	Ash (%)	5.62	5.67	
2	Crude fiber (%)	20.40	20.19	
3	Crude Protein (%)	5.08	5.78	

Table 7: Important morphological attributes of variety GJ 45 (SDAU Jowar Moti) (DS 189) (As per DUS guidelines)

S. N.	Characters	GJ 45 (DS 189)
1	Leaf midrib color	Yellow green
2	Plant: time of panicle emergence (50% of the plants with 50% anthesis)	Medium 73 (59-89 days)
3	Lemma arista formation	Absent
4	Plant total height	Long 260 (169-320)
5	Stem diameter (girth)	Small (< 2 cm)
6	Leaf : length of blade	Long 79.7 (60-96 cm)
7	Leaf : width of blade	Broad 7.8 (4-13.0)
8	Panicle length (without peduncle)	Medium 23.6 (14.4-30.3)
9	Ear head compactness	Semi compact
10	Panicle shape	Symmetric
11	Neck of panicle (visible length above sheath)	Very short (< 5 cm)
12	Glume length (% grain covered)	Short (50%)
13	Grain shape (dorsal view)	Circular
14	Caryopsis color after threshing	Lustrous Yellow white
15	Grain weight (1000 grain wt. in g)	Medium 27.2 (23.4 - 32g)

Table 8: Rating of incidence of diseases at Surat and Deesa centre in Gujarat

i. Anthracnose (Scale 1-9)								
Trial	Year	Locations	GJ 45 (DS 189)	GJ 43 (LC)	GNJ 1 (LC)	CSV 20 (NC)	B 58586 (RC)	Bulky Y (SC)
LSVT	Kharif- 2020 to 22	Mean Range	3.3-4.8	3.7-4.8	4.0-4.7	3.3-4.9	2.0-4.2	7.0-6.5
ii. Leaf Blight (Scale 1 - 9)								
LSVT	Kharif- 2020 to 22	Mean Range	4.3-6.4	4.7-5.3	4.0-5.7	4.7-5.7	3.0-4.2	6.0-6.8
iii. Grain mold disease score (Scale 1 - 9)								
LSVT	Kharif- 2020 to 22	Mean Range	4.7-5.3	4.8-5.0	4.4-5.1	4.7-5.1	3.3-4.3	6.1-6.3
iv. Erglot disease score (Scale 1 - 9)								
LSVT	Kharif- 2020 to 22	Mean Range	4.7-5.3	4.9-5.2	4.6-5.5	4.7-5.2	3.7-5.0	6.0-6.7

Where MR= moderately resistant

Grade classification:

0.0 - 1.0 = Highly Resistant (HR); 1.1 - 3.0 = Resistant (R); 3.1 - 5.0 = Moderately Resistant (MR); 5.1 - 7.0 = Susceptible (S); 7.1 - 9.0 = Highly Susceptible (HS).

Table 9: Rating of incidence of insect-pests at Surat and Deesa centres under field condition

i. Shoot fly dead heart %								
Trial	Year	Locations	GJ 45 (DS 189)	GJ 43 (LC)	GNJ 1 (LC)	CSV 20 (NC)	IS 2205 (RC)	SWARNA (SC)
LSVT	Kharif- 2020 to 22	Mean Range	19.13-32.72	15.02-33.43	17.17-30.59	22.99-37.91	7.05-23.32	32.21- 63.49
ii. Stem borer dead heart %								
LSVT	Kharif- 2020 to 22	Mean Range	19.88-39.20	21.37-37.67	17.65-30.91	26.7-43.72	13.24-24.68	30.37- 58.62

Table 10a: Rating of incidence of diseases in initial varietal trial (IVT) in the year *Kharif* 2021 at different Zones of India

i. Leaf blight (1-9)					
Trial	Year	Locations	GJ 45 (SPV 2876)	B 58586 (RC)	Bulky Y (SC)
IVT	K-2021	Mean Range	2.3-4.3	2.0-4.0	1.0-7.0
ii. Anthracnose (1-9)					
IVT	K-2021	Mean Range	3-4.3	1-2.3	1-7.7
iii. Grain mold disease score (1-9)					
IVT	K-2021	Mean Range	3.3-8	2.0-8.0	4.0-9.0

Table 10b: Rating of incidence of insect-pests in initial varietal trial (IVT) in the year *Kharif* 2021 at different Zones of India

i. Shoot fly dead heart (%)					
Trial	Year	Locations	GJ 45 (SPV 2876)	IS 2205 (RC)	SWARNA (SC)
IVT	K-2021	Mean Range	29.9-77.9	18.1-73.7	41-94.7
ii. Stem borer dead heart (%)					
Trial	Year	Locations	GJ 45 (SPV 2876)	IS 2205 (RC)	SWARNA (SC)
IVT	K-2021	Mean	4.3-42.7	3-26.8	4.4-71.7

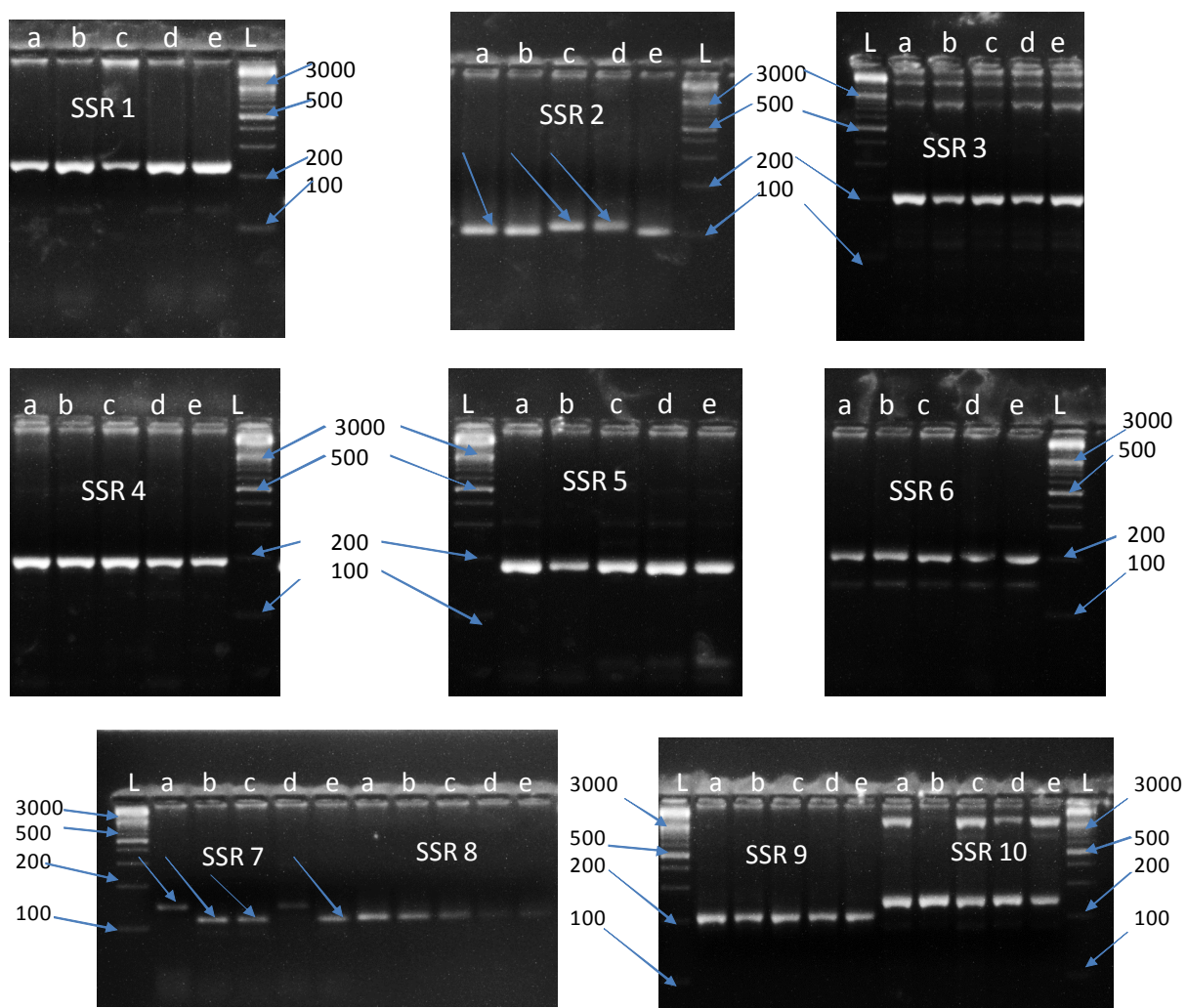


Fig. 1: DNA profiling of Sorghum genotypes.
 L: Ladder; a: GJ 45 (DS-189), b: GJ 43, c: GJ 44, d: GNJ 1 e: CSV 20
 SSR number representing to serial number of markers.