

SPV 1862-A DUAL PURPOSE SORGHUM VARIETY

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ABSTRACT

SPV 1862 is a kharif sorghum variety developed from derivative x derivative cross at AICSIP, College of Agriculture, Indore. It was found superior in grain and fodder yield over three national checks viz; CSV 23, CSV 15 and CSV21F (for fodder). Over all mean of three years (19 AICSIP trials), it yielded 3036 kg ha<sup>-1</sup> against 2715 kg ha<sup>-1</sup>, 2510 kg ha<sup>-1</sup> and 1917 kg ha<sup>-1</sup> grain of CSV 15, CSV 23 and CSV21, respectively and which was 11.8, 20.9 and 58.37% superior than CSV15, CSV23 and CSV21(Checks), respectively. SPV 1862 also recorded fodder yield of 176 q ha<sup>-1</sup> and total biomass of 201q ha<sup>-1</sup> which was at par with CSV 23 for fodder (186 q ha<sup>-1</sup>) and total biomass (202q ha<sup>-1</sup>). Considering its higher yield, grain and roti making quality (water requirement for dough 68ml/100g, rolling of dough 11.50 cm diameter of roti) was also found good. Fodder quality was also superior with respect to IVDMD% (44%) against CSV 23(43%) and CSV21 (38% and crude protein (8.33%) at par with CSV23 (8.37%). The variety SPV 1862 is moderately resistant to shoot fly, stem borer and grain mould disease.

**Key words:** Sorghum variety, dual purpose, stem borer, yields, Madhya Pradesh

INTRODUCTION

Sorghum (*Sorghum bicolor* (L.) Moench) is fourth important rainfed food, feed and fodder crop cultivated over 9.4 million hectares in India. It has substantial popularity amongst farmers due to its greater adaptability and various form of utilization like green fodder and stover. It is also an important staple food grain after rice and wheat for millions of poor in India. Sorghum also offers great potential to supplement fodder requirement of the growing dairy industry in India because of its drought tolerance, wide adaptation, rapid growth, high biomass and good fodder yield and quality (Belum Reddy *et al.* 2010). In Madhya Pradesh, the major contributing districts are Chhindwara, Khargone, Barwani, Khandwa, Shajapur, Rajgarh, Betul, Alirajpur, Dhar and Rewa which accounts for more than 75 % of total area under this crop in the state with the productivity of 1400 kg ha<sup>-1</sup>. In Madhya Pradesh, sorghum is truly a dual purpose crop where both grain and stover are highly valued outputs. It is therefore of paramount importance that technological developments are extended to increase the productivity and sustainability of sorghum production. Varietal development programme was initiated in Madhya Pradesh Agriculture University by utilizing derivatives lines developed at DSR and ICRISAT and exotic germplasm lines. Varietal sorghum breeding programme was initiated to develop dual purpose sorghum variety with resistance to stem borer and grain mold, suitable for grain and stover for growing in kharif season.

MATERIALS AND METHODS

Sorghum variety SPV 1862 was developed at AICSIP, College of Agriculture, Indore by pedigree selection from the cross SPV 1328 x RS 673 (derivative x derivative). SPV 1328, (SPV 462 x SPV 526) a high yielding genotype developed at DSR, was tested in coordinated trials. RS 673 is a male parent of CSH17 and also developed at DSR, Hyderabad. The F6 selections of this cross was tested in station varietal trial during 2005 to 2011 along with checks CSV15 (National check) and JJ 1022 (State checks). Front line demonstrations were conducted in farmer's fields during three kharif seasons from 2009 to 2011. It was also tested in six different locations of Zone I and Zone II across the country under All India Coordinated Sorghum Improvement Project during 2008, four locations during 2009 and nine locations during 2010 in the name of SPV 1862 along with the national checks CSV15, CSV23 and CSV21F. Screening was done against important pests and diseases during kharif 2008 to 2010 at national level. Grain samples were analyzed for their quality parameter by Manual of food analysis, Stover samples of five locations across the country were analyzed for their quality parameters viz: crude protein, IVDMD, Ash, ADF and NDF by following standard procedures.

RESULTS AND DISCUSSION

Sorghum Variety SPV 1862 (a cross between SPV 1328 and RS 673) a dual purpose variety, matures in 110-114 days and takes 75-78 days to attain 50 % flowering. Like many other improved

sorghum varieties, it has a plant with tan colour foliage and remains green at maturity. The grains are pearly white, medium bold and lustrous. Ear heads are semi loose with elliptical shape. The results of the six trials conducted during kharif seasons of 2006 to 2011 revealed that the variety SPV 1862 registered a

mean grain yield of 4069 kg ha<sup>-1</sup> as against 2564 and 3402 kg ha<sup>-1</sup> by the check varieties CSV15 and JJ1022, respectively. An increase in grain yield was found in this variety to the tune of 58.7 and 19.6 % over check varieties CSV15 and JJ 1022, respectively (Table 1).

Table 1: Mean yield performance of SPV 1862 in Station trials (2006-2011)

Variety	Grain yield (kg ha <sup>-1</sup> )	Per cent increase/or decrease over checks		Productivity of GY (kg/ha /day)	Fodder yield (kg ha <sup>-1</sup> )	Per cent increase/or decrease over checks		Productivity of FY(kg/ha /day)
		Mean	CSV 15			JJ 1022	Mean	
SPV 1862	4069	58.7	19.6	36.33	11891	22.4	94	106.16
CSV 15	2564	-	-	24.41	9714			92.5
JJ 1022	3402	-	-	33.0	6125			59.46

SPV 1862 registered its superiority in fodder yield production per day (106.16 kg ha<sup>-1</sup> per day) as against 92.5 and 59.46 kg ha<sup>-1</sup> per day by check varieties CSV15 and JJ 1022, respectively. Mean dry fodder yield of the variety was 11891 kg ha<sup>-1</sup> which was 22.4 and 94 % over the checks CSV15 and JJ 1022, respectively (Table 1). These results indicated the superior performance of the variety under rainfed condition as compared to the national and state checks in Madhya Pradesh. Being a dual purpose variety, SPV 1862 was evaluated at national level during 3 years at 19 locations under All India Coordinated Sorghum Improvement project's Initial Varietal Trial conducted during kharif 2008, Initial Advanced Varietal Trial (I year) during kharif 2009 and in Initial Advanced varietal trial (II year) during

kharif 2010. This variety registered a grain yield of 3096 kg ha<sup>-1</sup>, which was 11.8, 20.1 and 58.4 % higher over the national checks viz; CSV15, CSV23 and CSV21F (Table 2). This variety had also produced a dry fodder yield of 16712 kg ha<sup>-1</sup> which was at par with checks CSV15 (16544 kg ha<sup>-1</sup>). The variety (SPV 1862) was tested in the farmer's fields under front line demonstrations during kharif seasons of 2010, 2011 and 2012 in Jhabua, Shajajpur and Badwani districts of Madhya Pradesh. This variety registered a mean grain yield of 2260 kg ha<sup>-1</sup> during kharif with an yield increase of 24.5 and 34.5 % over the checks CSV23 and JJ 1041, respectively. The mean stover yield of the variety was 5730 as against 4725 and 4900 kg ha<sup>-1</sup> respectively by the checks CSV23 and JJ 1041.

Table 2: Performance of sorghum variety SPV 1862 in AICSIP trials (2008- 2010)

Variety/Years	Grain yield (kg ha <sup>-1</sup> )				Per cent increase/or decrease over checks			Days to maturity	Grain yield (kg ha <sup>-1</sup> day <sup>-1</sup> )
	2008	2009	2010	Mean	CSV 15	CSV23	CSV 21		
SPV 1862	3092	3170	2847	3036	11.8	20.9	58.37	114	26.63
CSV 15	2403	3027	-	2715	-	-	-	110	24.68
CSV23	2175	2671	2685	2510	-	-	-	118	21.2
CSV 21	-	-	1917	1917	-	-	-	114	16.81
Name of trial	IVT-DP	IAVT-DP	IAVT-DP						
No. of trials (19)	6	4	9						

Overall performance of a variety and its adaptability to different regions of the state are the basic criterion for its identification and release as a variety in a state (Ganesamurthy *et al.* 2012). Accordingly, the assessment of overall performance of the variety SPV 1862 under station trials,

Coordinated trails and FLDs revealed that SPV 1862 was superior and registered an overall mean grain yield of 3141.6 kg ha<sup>-1</sup> as against national checks CSV15 (2639 kg ha<sup>-1</sup>), CSV23 (2163 kg ha<sup>-1</sup>) and state check JJ 1022 (2820 kg ha<sup>-1</sup>) by 35.7%, 45.2% and 11.1% respectively (Table 3). The dry fodder

yield of the SPV 1862 had also shown improvement by 8.9 and 59.8%, respectively (% increase over over existing sorghum variety CSV15 and JJ 1022 checks in common experiments) (Table 3).

Table 3: Mean performance of sorghum variety SPV 1862 for grain and stover yield

Experiment	No. of trials	SPV 1862	CSV 15	CSV 23	JJ1022/ JJ 1041	% increase/or decrease over checks in common experiment		
						% over CSV15	% over CSV23	% over JJ 022/ JJ1041 State Checks
Mean Grain yield Kg ha <sup>-1</sup>								
Station trials	6	4069	2564	-	3402	58.7	-	19.6
AICSIP trials	19	3096	2715	2510	-	14.0	23.24	-
FLDs	12	2260	-	1813	2238	-	24.48	34.45
Mean	37	3141.6	2639.5	2163	2820	35.72	23.8	12.2
Mean Stover yield Kg ha <sup>-1</sup>								
Station trials	4	11891	9714	-	6125	22.4	-	94.13
AICSIP trials	19	16712	16544	19205	-	1.05	-13	-
FLDs	12	5730	-	4725	4900	-	21.2	16.9
Mean		11390	13129	11780	5512.5	8.9	-5.5	59.84

The variety SPV 1862 was screened for their reaction to major insect pest along with checks (Table 4). This variety showed moderate level of resistance against shoot fly and stem borer In Madhya Pradesh, sorghum is mainly grown in kharif season hence, grain mold is found to be predominant and there is no incidence of ergot, rust, leaf blight. Sorghum variety

with loose panicle is generally found to be resistant to grain mould (Thakur *et al.* 2006). The variety SPV 1862 with loose panicle registered low incidence of grain mold than checks CSV15 and CSV23 under both field grade and threshed grade and it was categorized as moderately resistant.

Table 4: Reaction of sorghum variety SPV 1862 to grain mold and major pest incidence

Source	Year of testing	SPV 1862	Check-1 CSV-15	Check 2 CSV23
Grain Mold Field grade (1-5)	2008	4.48	4.67	4.33
	2009	2.05	3.0	3.1
	Mean (9Trials)	3.26	3.83	3.71
Grain Mold Threshed Grade (1-5)	2008	2.6	2.73	2.9
	2009	2.7	4.5	-
	Mean	2.65	3.61	2.9
Shem borer DH% 45 days after emergence	2008	14.5	17.1	14.2
	2009	16.4	14.9	19.7
	Mean (10 trials)	15.45	16.0	16.95
Shoot fly DH% 28 days after emergence	2008	66.1	63.2	63.9
	2009	66.2	62.3	71
	Mean (13trials)	66.15	62.75	67.45

The nutritive analysis of grain revealed that the variety SPV 1862 was rich in potassium (225.96mg/100g), phosphorus (375.32 mg/100g); iron

(6.69mg/100g), manganese (1.91 mg/100g) and magnesium (7.55 mg/100g) Crude protein and total sugar % are also at par with checks (Table 5).

Table 5: Nutritive quality of grains of sorghum variety SPV 1862

S.N	Characters	SPV 1862	JJ1041	JJ1022	CSV 23
1	Folic acid (mg/100g)	12.9	13.08	13.14	12.85
2	Hectolitre WLkg /hl	79.82	79.78	78.96	78.00
3	Water required for dough ml/100g	68.00	66.0	68.0	67.20
4	Crude protein (%)	9.84	9.73	10.24	10.01
5	Soluble protein (%)	0.89	1.31	1.10	1.09
6	Total sugar (%)	1.90	1.84	1.81	1.97
7	Starch (%)	63.60	64.45	66.23	66.09
8	Calcium as Ca (mg/100g)	23.77	25.58	24.38	22.50
9	Potassium as K (mg/100g)	225.96	217.28	218.49	209.36
10	Phosphorus as P (mg/100g)	373.32	350.65	356.50	361.37
11	Sodium as N a(mg/100g)	11.21	9.90	8.46	13.74
12	Iron as Fe (mg/100g)	6.69	5.22	6.11	6.43
13	Zinc as Zn (mg/100g)	2.42	2.26	2.59	2.76
14	Copper as Cu (mg/100g)	0.27	0.23	0.25	0.28
15	Manganese as Mn (mg/100g)	1.91	1.56	1.68	1.73
16	Magnesium as Mg ( mg/100g)	7.55	6.90	7.07	7.92
17	Vitamin B1 (mcg/100g)	67.0	180.0	60.0	138
18	Vitamin B2 (mcg/100g)	7.0	9.0	8.0	8.0
19	Vitamin B3 (mcg/100g)	1860.0	3880.0	1600	1860.0

The fodder quality is always determined by the important traits namely, protein dry matter digestibility (Blummel and Rao, 2006). The dry fodder samples of SPV 1862 registered high value for in vitro dry matter digestibility ( 44.2% ) as compared to check CSV21F ( 38.4%) and CSV23 ( 44%) . the protein content of the stover sample was 8.33%.(Table 6).

Table 6: Nutritive quality of dry stover of sorghum variety SPV 1862

S.N	Characters	SPV 1862	CSV23	CSV21F
1	Crude Protein (%)	8.33	8.37	10.0
2	IVDMD (%)	44.2	44.0	38.45
3	ASH (%)	9.94	10.0	10.8
4	ADF (%)	46.41	46.83	48.02
5	NDF (%)	64.6	65.7	59.7

Identification of superior dual purpose variety (grain and fodder) is need of the farmers as it is the

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only way to meet the ever growing food, feed and fodder demands of the country (Blummel and Reddy 2006). The variety SPV 1862 owing to its superiority in grain and fodder yields than the check Varieties CSV 15, CSV23 and JJ 1022 under rainfed kharif ecosystem and showing moderately resistant to shoot fly and stem borer and grain mold and superiority in grain and fodder nutritive qualities over the checks, release proposal of this is submitted to SVRC as a dual purpose sorghum variety for Madhya Pradesh under the Name RVJ1862. Besides being higher yielder, SPV 1862 is characterized as medium maturing (112-114 days), mid tall (235-245cm) having medium round, pearly white lustrous grain has good tolerance to grain mold with threshed grade score of 3.4 against 3.9 and 6.7 of the checks CSV23 and CSV21 respectively. It also shows moderate resistance to major insect pest of sorghum.