

CSV 44F - A NEW FORAGE SORGHUM VARIETY FOR SOUTH ZONE OF INDIA

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SUMMARY

An improved single-cut forage sorghum variety, “CSV 44F” was developed by pedigree method of breeding by Forage Section, Department of Genetics & Plant Breeding, CCS Haryana Agricultural University, Hisar. It was identified under AICRP on Sorghum and further released & notified for cultivation in *kharif* season in Zone II of India comprising states Maharashtra, Tamil Nadu and Karnataka. In the Zone II “CSV 44F” produced 407.0 q/ha green fodder yield (average of three years in Coordinated trials) which was 7.44% and 5.80% higher than the checks CSV 21F (378.8 q/ha) and CSV 30F (384.7 q/ha), respectively. Dry fodder yield of CSV 44F was 4.18 % and 2.27% higher than the checks CSV 21F (109.83 q/ha) and CSV 30F (111.87 q/ha), respectively in Zone II of India. As far as quality was concerned, it has high total soluble solids (TSS%) *i.e.* 10.96%; low HCN (79.82 µg/g on fresh wt. basis) which is less than permissible limit 200 µg/g; CP% was 7.45 and IVDMD% was 52.17 and was tolerant to stem borer and foliar diseases. CSV 44F showed 8.39% and 28.06% increase for green fodder yield over CSV 21F and CSV 30F at 100% recommended dose of fertilizer (RDF), respectively.

Key Words : CSV 44F, Forage sorghum, single-cut, green fodder, dry matter, quality, tolerance

Sorghum (*Sorghum bicolor* (L.) Moench) is the fifth most important cereal crop in the world. Sorghum is originated in Africa and belongs to family Poaceae and genus Sorghum. It is an important cereal crop in the semi-arid tropic due to its drought tolerance nature. It is mainly useful for food and fodder due to its grain and green biomass nutritional composition. Globally sorghum is grown all over the world in more than 86 countries having area around 38 million ha under cultivation having annual grain production about 58 million tones (FAO, 2018). India is an agricultural country and has the largest livestock population in the world. Availability of green fodder plays an important role in livestock security. As per the IPCC (2007) report, climate change negatively impact the agriculture and which in turn adversely affect livestock production in country. In India only 3.4% area under pasture and livestock's are generally maintained on poor quality grasses available in the pastures or are stall-fed, mainly on crop residues. India is already deficit in feed and fodder *viz.* dry fodder (22%), green fodder (62%) and concentrates (64%) (Ghosh *et al.*, 2015). These shortages will further continue to exist because according to Livestock census, 2019, India

supports 20% of the livestock population of the world on only 2.3% geographical area having highest numbers of livestock (67.8 million) in Uttar Pradesh.

The major constraint for low fodder production and productivity is the non availability of improved varieties of forage crops with good fodder quality to the farmers. For any dairy industry supply of nutritious fodder is a pre-requisite for its success. Forage sorghum is nutritive forage, more palatable with high dry matter production along with high dry matter digestibility as compared to other *kharif* and summer season fodder crops (Kumari *et al.*, 2018). As area for fodder production is decreasing continuously over the decades, in such situation cultivation of high biomass yielding varieties with better available nutrients is the sole way to overcome this shortage specially in *kharif* season.

The improved single-cut forage sorghum variety, CSV 44F, was developed under AICRP on sorghum and released and notified vide Gazette Notification Ministry of Agriculture and Farmers Welfare under Department of Agriculture, Cooperation and Farmers Welfare, GOI, New Delhi, vide **S.O.E. No. 3099(E) dated 07.10.2020** for cultivation in zone

II of India including Maharashtra, Karnataka and Tamil Nadu under timely sown, normal fertility and irrigated conditions in *kharif* season. The new variety was registered with NBPGR having IC No. 631386. The new variety CSV 44F was developed at Forage Section, Department of Genetics & Plant Breeding, CCS Haryana Agricultural University, Hisar by pedigree method of breeding from HC 308 × S 437-1-2 as given in Fig. 1.

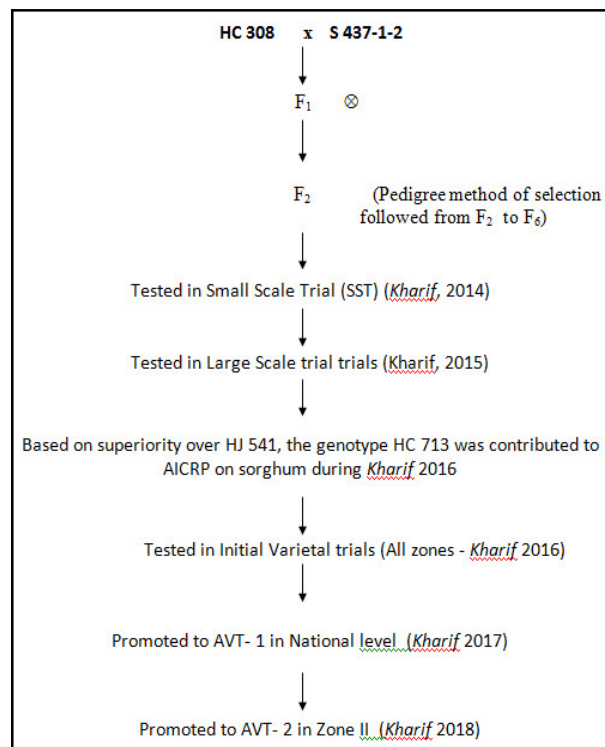


Fig. 1. Pedigree selection method used for development of CSV 44F.

Fodder yield performance of CSV 44F : Green fodder yield of this variety was (average of three years in Coordinated trials) 407.0 q/ha green fodder yield which was 7.44% and 5.80% more than the checks CSV 21F (378.8 q/ha) and CSV 30F (384.7 q/ha), respectively (Table 1). Similarly, dry fodder yield was 114.33 q/ha dry fodder (average of three years in Coordinated trials) which is 4.18% and 2.27% higher than the checks CSV 21F (109.83 q/ha) and CSV 30F (111.87 q/ha), respectively in Zone II of India (Table 2). The CSV 44F variety was on par with checks for seed yield (13.58 q/ha) (Table 3). Field view of CSV 44F is shown in Fig. 2.

Quality attributes of CSV44F : As far quality of CSV 44F is concerned it has high total soluble solids (TSS%) *i.e.* 10.96% which is higher than



Fig. 2. Field view of CSV 44F.

both the checks CSV 21F (9.99%) and CSV 30F (9.60%) at 100% RDF. HCN content in this variety was 79.82 µg/g (on fresh wt. basis) which is less than permissible limit 200 µg/g. Crude protein (CP%) was 7.45 and IVDMD% was 52.17 which are comparable to both checks (Table 4).

Performance against major foliar diseases and insect pests : It is tolerant to stem borer having only 17.63 % dead hearts as against 21.36% in best national check CSV 21F. It is tolerant to major foliar diseases like anthracnose, grey leaf spot, zonate leaf spot and also have tolerance to midge, having 2.03% DR as against national check CSV 21F (2.23%) (Table 4).

Agronomy and physiology : The single-cut forage sorghum variety, CSV 44F released and notified for cultivation in zone II of India including Maharashtra, Karnataka and Tamil Nadu under timely sown, normal fertility level and irrigated conditions in *kharif* season. Data presented in Table 5 reveal that CSV 44F (SPV 2445) has shown 8.39% and 28.06% for green fodder yield over CSV 21F and CSV 30F at 100% recommended dose of fertilizer (RDF), respectively. CSV 44F is resistant to lodging. CSV 44F is tolerant to salinity upto 8 ds/m salinity level and performed better than CSV 21F (National Check I) for GFY and DFY at 50% flowering at 8 ds/m salinity level. CSV 44F showed 8.39% and 28.06% increase for green fodder yield over CSV 21F and CSV 30F at F_1 fertility level *i.e.* 100% RDF, respectively. CSV 44F also showed 87.34% increase for GFY and 92.74% increase for DFY at 50% flowering stage and 82.31% increase for GFY and 58.36% increase for DFY at physiological maturity stage over the national check CSV 21F at 8 ds/m salinity level.

TABLE 1
Green fodder yield (q/ha) : Mean performance of CSV 44F in Zone II of India

	Year of testing	No. of trials/ locations	Proposed variety (CSV 44F)	National Check 1 (CSV 21F)	Zonal Check 2 (CSV 30F)	Local Check 3
Mean yield (q/ha)	2016-2017	7	406.6	361.8	377.1	390.0
a) Zonal	2017-2018	7	429.5	402.3	379.8	439.3
b) across Zones	2018-2019	7	384.9	372.4	397.4	373.3
(If applicable)	Weighted Mean		407.0	378.8	384.7	400.7

TABLE 2
Dry fodder yield (q/ha) : Mean performance of CSV 44F in Zone II of India

	Year of testing	No. of trials/ locations	Proposed variety (CSV 44F)	National Check 1 (CSV 21F)	Zonal Check 2 (CSV 30F)	Local Check 3
Mean yield (Q/ha)	2016-2017	7	115.3	106.1	112.9	110.9
a) Zonal	2017-2018	7	113.3	110.0	107.7	118.8
b) across Zones	2018-2019	7	114.4	113.4	115.0	115.7
(If applicable)	Weighted Mean	-	114.33	109.83	111.87	115.13

TABLE 3
Seed yield (q/ha): Mean performance of CSV 44F in Zone II of India

	Year of testing	No. of trials/ locations	Proposed variety	National Check 1	Zonal Check 2
			(CSV 44F)	(CSV 21F)	(CSV 30F)
Mean yield (q/ha)	2017-2018	5	13.58	13.84	13.89

TABLE 4
Mean of three years of CSV 44F for quality parameters, insect pest incidence and foliar disease (*kharif* 2016, 2017 and 2018)

Trait	Proposed Variety CSV 44F	National Check 1 (CSV21F)	Zonal Check 2 (CSV 30F)	Local check 3
TSS%	10.96	9.99	9.60	9.31
HCN	79.82	76.31	82.41	80.46
CP%	7.45	7.49	7.42	7.68
IVDMD%	52.17	53.0	52.5	52.0
Shoot fly dead hearts (%)	37.90	35.63	33.57	43.07
Stem borer dead hearts (%)	17.63	21.36	19.89	20.06
Stem Tunneling (%)	31.37	26.87	29.07	25.67
Midge-DR	2.03	2.23	3.09	1.91
Anthracnose	3.8	4.3	5.4	4.8
Zonate Leaf Spot	3.8	4.0	3.8	4.2
Grey Leaf Spot	2.4	2.5	2.3	2.6

Economics

Data presented in Table 6 reveal that in case of CSV 44F maximum net returns and BC ratio (Rs. 49807 and 2.47 respectively) were fetched at 125% RDF followed by 100% RDF.

CONCLUSION

The new variety CSV 44F exhibited superiority over the over the best check varieties and qualifying strain. This new variety produced 407.0 q/ha green fodder yield which is 7.44% and 5.80% more

TABLE 5
Adaptability to Agronomic Variables for green fodder yield during *Kharif* 2018

Name of proposed variety CSV 44F Nature of Experiment		Item	Adaptability Zone: Zone II		
			CSV 44F	National Check 1 CSV 21F	Zonal Check 2 CSV 30F
Agronomy trial	Green fodder yield (q/ha) at 75% RDF		448.7	494.6	359.2
	Green fodder yield (q/ha) at 100% RDF		538.6	496.9	420.6
	Green fodder yield (q/ha) at 125% RDF		534.2	522.5	421.7
	Percentage gain or loss under other doses	i) F1	-	-9.28	24.92
		ii) F2	-	8.39	28.06
iii) F3		-	2.24	26.68	

TABLE 6
Economics of CSV 44F at different fertility levels

Treatment	Net Return (Rs./ha)	B : C ratio	Net Return (Rs./ha)	B : C ratio	Net Return (Rs./ha)	B : C ratio
	75% RDF		100% RDF		125% RDF	
CSV 44F	30887	1.85	44137	2.32	49807	2.47
CSV 21F	40686	2.28	34979	1.92	42419	2.17
CSV 30F	17272	1.26	24141	1.51	28111	1.60

than the checks CSV 21F (378.8 q/ha) and CSV 30F (384.7 q/ha), respectively and 114.33 q/ha dry fodder yield which is 4.18% and 2.27% higher than the checks CSV 21F (109.83 q/ha) and CSV 30F (111.87 q/ha), respectively in Zone II of India.

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