Midge-Resistant Sorghum Lines

ICSV 692, ICSV 729, ICSV 730, ICSV 731, ICSV 736, ICSV 739, ICSV 745, and ICSV 748

- **Highly resistant to sorghum midge, *Contarinia sorghicola***
- **Combine resistance to sorghum midge with improved and acceptable plant type**
- **ICSV 745 and ICSV 739 have a yield potential comparable to that of commercial cultivars**
- **Some of the lines are less susceptible to leaf diseases, ergot, and downy mildew, than are commercial cultivars**

ICRISAT
Plant Material Description no. 37

International Crops Research Institute for the Semi-Arid Tropics
Patancheru, Andhra Pradesh 502 324, India

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Purpose of Description

ICSV 692, ICSV 729, ICSV 730, ICSV 731, ICSV 736, ICSV 739, ICSV 744, ICSV 745, and ICSV 748 are midge-resistant sorghum lines developed at ICRISAT Center. These lines can be used in sorghum improvement programs in different countries, or adapted per se for cultivation by farmers in areas endemic to sorghum midge.

Origin and Development

These lines were derived by pedigree breeding. Midge-resistant lines DJ 6514, IS 2579 C, PM 7348, and ICSV 197 (PM 11344) were crossed with agronomically elite lines Diallel-50-1-1 ALS, IS 3443, SPV 351, SPV 394, and A 6250. The segregating material has been selected for agronomic desirability and midge resistance under natural midge infestation and under no-choice headcage screening (Sharma et al. 1992). Their origins, pedigrees, and reactions to sorghum midge are given in Tables 1 and 2.

Plant Characters

These lines are diverse in plant height (74—279 cm), days to 50% flowering (59-81 days), and 1000-grain mass (18-31 g 1000 grains^{-1}). Plant color is tan except in ICSV 729, which is pigmented. Leaves are broad, thick, and drooping, except in ICSV 730, ICSV 731, and ICSV 745, which have short and erect leaves. Panicle is compact and elliptic, except in ICSV 692 and ICSV 745, in which the panicle is compact at the base and loose at the apex. Grains are creamy-white and endosperm is white. Glumes are red in ICSV 729, ICSV 731, ICSV 736, and ICSV 739; brown in ICSV 744, and ICSV 745, and straw-colored in ICSV 692 and ICSV 730.

Performance

In yield trials conducted over several seasons and locations, these lines showed a yield potential of 1.73-4 t ha^{-1} compared with the commercial cultivars CSV 13 (3.77 t ha^{-1}), CSH 11 (4.5 t ha^{-1}), and CSH 1 (2.87 t ha^{-1}). These lines suffered a midge damage rating (DR) of 2.9-3.8 under natural infestation (where 1 = <10% spikelets with midge damage, and 9 = >80% spikelets with midge damage) (Sharma et al. 1992), and 2.2-4.3 under no-choice headcage testing, compared with a DR of 8.4 for the commercial cultivar, CSH 1 under natural infestation and 9 under headcage testing. These lines showed stability of resistance to midge across locations and seasons in India (Table 2), Africa (except Kenya), Australia, and Central America.

Susceptibility to Other Insects and Diseases

These lines are as susceptible to shoot fly *(Atherigona soccata)* and stem borer *(Chilo partellus)* as is the commercial cultivar, CSH 1. ICSV 745 is less susceptible to the sugarcane aphid, *Melanaphis sacchari,* than CSH 1. ICSV 692, ICSV 739, and ICS 745 are

less susceptible than M 35-1 to rust and leaf blight. Compared with M 35-1, all lines except ICSV 744 and ICSV 748, are less susceptible to zonate leaf spot; ICSV 739 and ICSV 745 are less susceptible to ergot than M 35-1; and ICSV 692, ICSV 729, ICSV 730, ICSV 739, and ICSV 745 showed <25% downy mildew incidence compared with 90% incidence in CSH 1.

Reference

Sharma, H.C., Taneja, S.L., Leuschner, K., and Nwanze, K.F. 1992. Techniques to screen sorghums for resistance to insect pests. Information Bulletin no. 32. Patancheru, Andhra Pradesh 502 324, India: International Crops Research Institute for the Semi-Arid Tropics. 48 pp.

Table 1. Origin, pedigree, agronomic characteristics, yield potential, and percentage of midge damage of sorghum lines resistant to sorghum midge, ICRISAT Center, India.

Origin	Pedigree	Plant height (cm)	Time to 50% flowering (days)	1000-grain mass (g)	Overall grain yield (t ha^{-1})	Midge damage under natural infestation (%)	Midge damage under headcage (%)
ICSV 692	(DIALLEL-50-1-1 ALS 7 x DJ 6514)12-1-1-1-1	199	59	19	2.53	21	18
ICSV 729	(IS 3443 x IS 2579C)-2-1-2-1	74	66	28	1.79	21	16
ICSV 730	(PM 7348 x SPV 351)-2-6-l-l	130	78	23	2.38	18	15
ICSV 731	(PM 7348 x SPV 351)-4-l-l-l	140	72	29	3.05	22	27
ICV 736	(PM 11344 x SPV 350-10-1-1-1-7	239	76	20	2.02	18	13
ICSV 739	(PM 11344 x SPV 394)-3-l-1-l-6	241	70	18	3.56	22	28
ICSV 744	(PM 11344 x A 6250)-3-2-2-4	282	77	22	2.97	22	8
ICSV 745	(PM 11344 x A 6250)-4-l-l-l	215	71	31	4.00	18	22
ICSV 748	(PM 11344 x A 6250)-8-5-6-l	279	81	24	1.73	12	15
Susceptible control CSH 1		152	58	26	2.87	90	94

Table 2. Midge damage ratings of nine sorghum lines resistant to midge across four locations, 1989-90.

Origin	Damage rating[1]					
		Patancheru				
	Dharwad	Rainy season	Postrainy season	Bhavani-sagar	Warangal	Mean
ICSV 692	3	3.5	2.0	5	6	3.9
ICSV 729	2	2.5	2.0	3	4	2.7
ICSV 730	2	2.0	2.0	5	5	3.2
ICSV 731	3	4.0	3.0	5	5	4.0
ICSV 736	3	3.0	3.0	6	4	3.8
ICSV 739	1	2.5	1.0	3	4	2.3
ICSV 744	3	3.0	3.5	3	5	3.5
ICSV 745	2	1.0	1.5	5	3	2.5
ICSV 748	4	2.5	2.5	5	3	3.4
Resistant control						
DJ 6514	2	1.0	1.5	2	1	1.5
Susceptible control						
CSH 1	9	8.0	9.0	8	8	8.4

1. Damage rating: 1 = <10%, 2 = 11-20%, 3 = 21-30%, 4 = 31-40%, 5 = 41-50%, 6 = 51-60%, 7 = 61-70%, 8 = 71-80%, and 9 = >80% midge damage.

Plant Material Descriptions from ICRISAT

Leaflets in this series provide brief descriptions of crop genotypes identified or developed by ICRISAT, including:

- germplasm accessions with important agronomic or resistance attributes;
- breeding materials, both segregating and stabilized, with unique character combinations; and
- cultivars that have been released for cultivation.

These descriptions announce the availability of plant material, primarily for the benefit of the Institute's cooperators. Their purpose is to facilitate the identification of cultivars and lines and to promote their wide utilization. Requests should be addressed to the Director General, ICRISAT, or to appropriate seed suppliers. Stocks for research use issued by ICRISAT are sent to cooperators and other users free of charge.

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