

Resistance of Sweet Sorghum Cultivars and Lines to Maize Dwarf Mosaic in Kentucky, Ohio, and Mississippi

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ABSTRACT

Zummo, N., Findley, W. R., Freeman, K. C., Bitzer, M. J., and Armstrong, G. 1981. Resistance of sweet sorghum cultivars and lines to maize dwarf mosaic in Kentucky, Ohio, and Mississippi. *Plant Disease* 65:241-242.

Sweet sorghum lines MN 960, Mer. 75-6, Mer. 76-1, Mer. 77-2, and Mer. 77-7 showed good levels of resistance to maize dwarf mosaic in the field over 10 yr when susceptible control varieties had more than 90% infection. However, when MN 960 was inoculated mechanically in the greenhouse with five strains of sugarcane mosaic virus, 70% of the inoculated plants became infected. Mer. lines 75-6, 76-1, 77-2, and 77-7 are all unreleased breeding lines with Brandes as one common parent.

Since its identification in 1965, maize dwarf mosaic virus (MDMV) (14), a strain of sugarcane mosaic virus (SCMV) (5,11,12), has become the most widespread virus of sweet sorghum (*Sorghum bicolor* (L) Moench) in the United States. Several strains of MDMV have been described (7,16).

Depending on the cultivar and environment, symptoms produced by the virus on sorghum vary from a mild mosaic that may pass unnoticed in the field (2) to brilliant red necrosis (2,4,8,15) and stunting and killing of young plants. Edmunds and Niblett (3) reported that MDMV may cause panicle necrosis and small seeds on otherwise symptomless grain sorghum plants. Control of maize

dwarf mosaic (MDM) has been difficult because resistant varieties have not been available. Sorghum cultivars IS 7596 of Nigerian origin (9) and Krish, a derivative of the cross *S. halepense* × *S. roxburghii* (10,13), have shown resistance in Queensland, Australia. Tolerant cultivars showing only mild mosaic symptoms have been reported from Italy (6) and the United States (1,2,17).

This paper reports the results of several years of screening sweet sorghum germ plasm for MDM resistance in fields with a high incidence of disease.

MATERIALS AND METHODS

Selected sweet sorghum lines from the World Sweet Sorghum Collection, commercial syrup and sugar cultivars, and promising unreleased breeding lines were planted in areas of high MDM incidence at Portsmouth, OH; Meridian, MS; and Barbourville, Frankfort, and Quicksand, KY. MDMV-infected johnsongrass growing nearby and in the plots served as the primary source of inoculum for insect vectors. At Meridian, every third row in the plots was planted

with MDMV-infected johnsongrass rhizomes to provide inoculum. Three grams of seed of each line and cultivar were planted in four replications, each containing about 50 plants, at each location in late May or early June.

Highly susceptible entries were dropped from subsequent tests; those that showed promise were tested further. Percent virus infection and effects on plant growth were determined in July.

Ten-day-old MN 960 sorghum seedlings were grown in the greenhouse in Houma, LA, and inoculated with strains A, B, D, H, and I of SCMV by rubbing expressed juice from diseased plants over Carborundum-dusted leaves. Disease determinations were made 14 days after inoculation.

RESULTS AND DISCUSSION

Although data from 1 yr are shown, they are typical of most years of testing. MN 960, Mer. 75-6, Mer. 76-1, Mer. 77-2, and Mer. 77-7 showed good levels of resistance to MDM in the field (Table 1). Only four MN 960 plants developed MDM in 10 yr, during which susceptible control cultivars (Honey, Collier 706-C) showed more than 90% infection.

When MN 960 was inoculated mechanically in the greenhouse with five strains of SCMV, 70% of the inoculated plants became infected. This indicates that MN 960 is not resistant to infection by SCMV but may have some resistance to aphid vectors. MN 960 was introduced from Equatorial Africa in 1945 as PI 152857. Most MN 960 plants infected

Cooperative investigations of the USDA, SEA-AR, U.S. Sugar Crops Field Station, Meridian, MS 39301, and Agricultural Experiment Stations, Kentucky, Mississippi, and Ohio.

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Table 1. Incidence and severity of maize dwarf mosaic on 50 sweet sorghum cultivars and lines in Mississippi, Kentucky, and Ohio in 1978^a

Entry	Mississippi		Kentucky		Ohio	
	Incidence (%)	Rating ^b	Incidence (%)	Rating ^b	Incidence (%)	Rating ^b
Brandes	1	2	1	2	1	4
Collier 706-C	90	4	93	4	100	4
Dale	15	4	1	4	2	3
Honey	100	1	95	1	93	1
Keller	34	4	8	4	11	4
Mer. 56-12	38	4	12	3	16	3
Mer. 61-1	9	4	8	4	4	4
Mer. 63-7	4	4	12	3	6	4
Mer. 69-5	14	2	18	3	8	2
Mer. 69-7	18	4	6	4	1	4
Mer. 70-14	2	3	2	4	1	4
Mer. 73-4	4	4	2	1	1	4
Mer. 73-7	4	3	0	0	0	0
Mer. 73-10	8	3	0	0	4	4
Mer. 73-12	34	4	30	4	20	4
Mer. 74-2	8	4	5	4	6	4
Mer. 74-8	39	4	19	4	16	4
Mer. 74-10	12	3	11	4	1	4
Mer. 75-4	5	3	4	3	1	4
Mer. 75-6	1	3	0	0	0	0
Mer. 75-10	9	4	0	0	5	2
Mer. 75-11	24	4	0	0	0	0
Mer. 76-1	0	0	0	0	0	0
Mer. 76-2	9	3	1	2	1	4
Mer. 76-3	8	4	1	3	4	4
Mer. 76-4	10	3	11	4	15	4
Mer. 76-5	8	3	0	0	6	4
Mer. 76-6	26	4	9	4	20	4
Mer. 76-7	13	2	5	2	8	3
Mer. 76-8	10	3	1	1	5	4
Mer. 77-1	12	4	10	4	5	4
Mer. 77-2	4	4	1	2	0	0
Mer. 77-3	18	4	15	4	1	4
Mer. 77-4	9	4	0	0	2	4
Mer. 77-5	2	4	1	1	4	4
Mer. 77-6	5	4	0	0	0	0
Mer. 77-7	1	2	0	0	1	4
Mer. 77-8	4	3	5	4	2	4
MN 10	36	4	14	4	5	4
MN 14	29	3	24	2	28	4
MN 28	44	4	21	4	14	4
MN 30	45	4	9	4	14	4
MN 34	35	4	31	4	25	4
MN 51	60	4	24	4	24	4
MN 55	8	3	0	0	11	3
MN 242	35	4	8	4	8	4
MN 960	0	0	0	0	0	0
MN 1426	25	4	0	0	15	3
Rio	8	4	1	4	8	4
Sugar Drip	54	4	24	4	25	4
Theis	8	3	2	1	1	4
Wray	2	4	2	4	4	4

^a Approximately 200 plants at each location.

^b 0 = no apparent differences in height between diseased and healthy plants; 1 = diseased plants, 10–24% shorter than healthy plants; 2 = diseased plants, 25–49% shorter than healthy plants; 3 = diseased plants, 50–79% shorter than healthy plants; 4 = diseased plants, 80% or more shorter than healthy plants, or dead plants.

with SCMV-1 showed mild symptoms such as those described by Dean and Coleman (2); however, one infected plant developed severe or necrotic symptoms. The four MN 960 plants infected naturally in the field also showed severe or necrotic symptoms.

Mer. 75-6, Mer. 76-1, Mer. 77-2, and Mer. 77-7 are unreleased breeding lines

that all have Brandes as a parent. Brandes normally shows good resistance in the field (1–5% infection), but in 1971, a year of exceptionally high MDM incidence, 30% of the Brandes plants at Portsmouth became infected. Brandes is a selection from a cross of Collier 706C × MN 1500, both of which are susceptible to high levels of infection by MDMV in the field.

In Kentucky, syrup production declined after MDM became widespread on johnsongrass throughout the syrup areas because the leading cultivars Sugar Drip and Williams were highly susceptible to the disease. With the introduction of MDM-tolerant cultivars Dale and Theis, syrup production was restored to original levels. With the current interest in sweet sorghum for alcohol production in the United States and many other countries, it is important to identify sources of resistance to MDM and make them available to sorghum breeders.

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