Combined Resistance in St. Augustinegrass to the Southern Chinch Bug and the St. Augustine Decline Strain of Panicum Mosaic Virus

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ABSTRACT

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Chinch bug resistant St. Augustinegrass accessions were evaluated for resistance to the St. Augustine decline strain of Panicum mosaic virus (PMV-SAD). Accessions FA-38, FA-82, FA-217, and FA-236 were symptomless carriers of PMV-SAD, as determined by bioassay on German Strain R millet; FA-46, FA-64, FA-108, FA-118, FA-121, and FA-243 exhibited combined resistance to chinch bugs and PMV-SAD. Combined resistance equal to that of the cultivar Floratam was found in FA-108 and FA-118. There was no apparent correlation between resistance to PMV-SAD or chinch bug and pigment of stolons or stigmas.

Additional key words: *Blissus insularis, Stenotaphrum secundatum*

St. Augustinegrass, *Stenotaphrum secundatum* (Walt.) Kuntze, is used extensively for lawns throughout the southern coastal states, and is vulnerable to a number of diseases and insect pests. St. Augustine decline caused by the St. Augustine decline strain of Panicum mosaic virus (PMV-SAD) (4,5,8) occurs throughout the St. Augustinegrass-growing area of Texas (14), and Louisiana (2). Damage to St. Augustinegrass lawns from PMV-SAD during 1970 in Texas was estimated to exceed $100 million (3).

The southern chinch bug, *Blissus insularis* Barber, is the most destructive insect pest of St. Augustinegrass, and can severely damage or kill entire lawns. Aggregates of chinch bugs numbering 500–1,000/0.1 m^2 are not uncommon (12). In 1971, an estimated $25 million was spent to control southern chinch bugs in Florida (13). Several Florida accessions of St. Augustinegrass have shown resistance to chinch bugs in the field (9). Laboratory studies have established that resistance is by antibiosis (10,11).

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Combined resistance to both PMV-SAD and southern chinch bugs was found in accession FA-110, which was named "Floratam" and released jointly by the Florida and Texas Agricultural Experiment Stations in 1973 (3).

The purpose of this investigation was to: 1) screen southern chinch bug resistant St. Augustinegrass accessions for resistance to PMV-SAD, and 2) determine the relationship of pigment of stolons or stigmas to resistance.

MATERIALS AND METHODS

Seventeen St. Augustinegrass accessions and two cultivars were transplanted to 15-cm-diameter plastic pots and placed in the greenhouse. After the plants were established, the grasses were clipped and allowed to grow to approximately 10 cm

Table 1. Phenotypic characteristics and resistance of St. Augustinegrass cultivars and accessions to the St. Augustine decline strain of Panicum mosaic virus (PMV-SAD) and southern chinch bug

Cultivar or accession	Color		PMV-SAD rating[b]	Resistance	
	Stigma	Stolon[a]		PMV-SAD[c]	Chinch bug[d]
Floratam	Purple	Purple	1.00	HR	HR
FA-46	Purple	Purple	1.00	HR	R
FA-64	Purple	Purple	1.00	HR	MR
FA-108	Purple	Purple	1.00	HR	HR
FA-118	Purple	Purple	1.00	HR	HR
FA-121	White	Green	1.00	HR	R
FA-243	Purple	Purple	1.00	HR	R
FA-38	Purple	Purple	1.00	R	MR
FA-82	Purple	Purple	1.00	R	MR
FA-217	Purple	Purple	1.00	R	MR
FA-236	Purple	Purple	1.00	R	MR
Florida Common	Purple	Purple	2.00	MR	S
FA-73	White	Green	2.75	S	R
FA-107	White	Green	3.03	S	MR
FA-87	White	Green	3.28	S	MR
FA-131	White	Green	3.48	S	R
FA-222	White	Green	3.57	HS	MR
FA-145	White	Green	3.75	HS	R
FA-80	White	Green	3.80	HS	R

[a] As observed under field conditions in full sunlight.
[b] On a scale of 1–5: 1 = no symptoms, 5 = severe chlorosis. Grass in each pot was rated 21 days after symptom expression.
[c] HR = highly resistant or immune (rating, 1.00); R = symptomless carrier (rating, 1.00); MR = moderately resistant (rating, 1.10–2.50); S = susceptible (rating, 2.51–3.50); HS = highly susceptible (rating, 3.51–5.00).
[d] HR = highly resistant (chinchbug mortality, >50%); R = resistant (mortality, 30–49%); MR = moderately resistant (mortality, 20–29%); S = susceptible (mortality, 0–19%). Based on mortality after 4 days of confined feeding. Taken in part from Reinert (10) and Reinert and Dudeck (11).

for inoculation. Virus inoculum was prepared by grinding 1 g of PMV-SAD-infected St. Augustinegrass leaf tissue per milliliter of phosphate buffer (pH 7.2) and 2% Carborundum (600 mesh). Each cultivar and accession, replicated six times in two studies for a total of 12 replicates, was inoculated using an artist's airbrush (14). The virus was introduced into the plants using 100 lb/in.^{2} with a flow rate of 10 ml/min, and held about 6 cm from the leaves.

Plants were rated for PMV-SAD 21 days after initial symptom expression in each individual pot. Cultivars and accessions that did not display symptoms 42 days after inoculation were assayed on German Strain R millet to test for symptomless carriers. Using PMV-SAD ratings, categories of disease resistance were assigned as follows: HR = highly resistant or immune (rating, 1.00); R = symptomless carrier (rating, 1.00); MR = moderately resistant (rating, 1.10–2.50); S = susceptible (rating, 2.51–3.50); HS = highly susceptible (rating, 3.51–5.00).

RESULTS AND DISCUSSION

FA-46, FA-64, FA-108, FA-118, FA-121, and FA-243 were highly resistant to PMV-SAD (Table 1). Bruton et al (1) previously reported FA-82 as highly resistant to PMV-SAD; however, our study showed it to be a symptomless carrier along with FA-38, FA-217, and FA-236. Florida Common was rated as moderately resistant; FA-73, FA-107, FA-87, and FA-131 were susceptible; and FA-222, FA-145, and FA-80 were highly susceptible. Symptoms appeared within 9–15 days postinoculation using the artist airbrush technique, compared with 21–60 days reported by earlier workers using the hand-rub technique (6,15).

Combined SAD-PMV and southern chinch bug resistance. FA-46, FA-64, FA-108, FA-118, FA-121, and FA-243 exhibited combined resistance to chinch bugs and PMV-SAD (Table 1). Combined resistance equal to that of the cultivar Floratam was found in FA-108 and FA-118. There appeared to be no direct correlation (corr. coef. = 0.24) between chinch bug and PMV-SAD resistance; in fact, Florida Common, which is highly susceptible to chinch bug, was less susceptible to PMV-SAD than seven of the other selections. In similar studies, McCoy (6) and McCoy et al (7) tested a number of St. Augustinegrass cultivars and accessions and found resistance to PMV-SAD in the purple stolon type only. Our data (Table 1) indicated no correlation between stolon and stigma color and resistance to either PMV-SAD or chinch bugs. All the highly PMV-SAD resistant selections, except FA-121, were purple stigma and stolon forms. Both color forms were present among the moderately resistant types. These data also indicate that there is sufficient variability in the gene pool of the St. Augustinegrass accessions to accommodate selection for multiple resistance. These materials may serve as new sources of breeding stock for resistance and some have potential as new cultivars.

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