Susceptibility of St. Augustinegrass Germ Plasm to *Pyricularia grisea*

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ABSTRACT

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St. Augustinegrass (*Stenotaphrum secundatum*) was evaluated in field plots and pots for susceptibility to *Pyricularia grisea*, the causal organism of gray leaf spot. In the presence of repeated natural infestations, disease severity was moderately consistent ($r = 0.41$–0.73) among genotypes. High susceptibility was localized in blue-green triploid genotypes such as cultivars Bitterblue and Floratine and in certain collections from the U.S. Gulf Coast. Roselawn and two African introductions of *S. dimidiatum* were highly resistant.

Additional key words: breeding, turfgrass

Gray leaf spot of St. Augustinegrass, *Stenotaphrum secundatum* (Walt.) O. Ktze., is caused by *Pyricularia grisea* (Cke.) Sacc. and occurs throughout the southeastern United States. The disease is most damaging in regenerating sod fields and areas newly planted by plugs or sprigs because of the resultant decrease in coverage rate (5). Others (4,6) have suggested the occurrence of differences in susceptibility to gray leaf spot among limited samples of genotypes. St. Augustinegrass germ plasm at the Agricultural Research and Education Center, Ft. Lauderdale, FL, has been evaluated for selected characteristics important in the turfgrass breeding program. The purpose of this paper is to report the susceptibility to *P. grisea* of accessions and standard cultivars of St. Augustinegrass in research plots and pots at the Center.

MATERIALS AND METHODS

Stolon segments were collected from 146 genotypes of *Stenotaphrum*. Genotypes represented plant introductions from Tanzania, Republic of South Africa, Rhodesia, Madagascar, Barbados, and the Gulf Coast region of the United States. Advanced selections, hybrids, and mutants were obtained from several breeding programs at Texas A&M University, O. M. Scott & Sons, Inc. (8), North Carolina State University, and the University of Florida (3).

The grasses were planted in 7.6-L plastic pots containing an organic medium. Plants were maintained outdoors under full sunlight for up to 2.5 yr before increase for field planting. Two potted plants of each of 72 genotypes were arranged in a randomized complete block design. Early in the acquisition and maintenance period, a severe infestation of gray leaf spot occurred. Plants were rated for disease severity on 20 June 1977 by a scale of 1–10 where 1 = no leaf spots and 10 = leaf spots on most leaves and severely damaging. Plants were increased in a randomized block arrangement before field planting in plots 2 × 3 m in April 1979 in Hallandale fine sand. An augmented experimental design was used—26 genotypes of cultivars and promising selections were replicated four times and 117 genotypes (for which little preliminary information was available) were replicated twice.

Field plots were separated during the first year of growth by alleyways sprayed with a nonselective herbicide. Plots were mowed weekly to a height of 5–7 cm during the first year and biweekly thereafter. Fertilizer was applied according to recommendations to provide 32, 4, and 13 $g/m^2/yr$ of N, P, and K, respectively (10). Irrigation was provided nightly to field saturation. One application of asulam was made early in the test period to control weeds, but no other pesticides were used.

Genotypes were rated on 30 November 1979 for color of leaves, with 1 = yellow-green to 3 = blue-green with a conspicuous sheen. Genotypes with an average rating higher than 2.25 were classified as blue-green and those averaging less than 2.25 were classified as yellow-green.

Overall disease severity in each field plot was estimated by a scale of 1–10 where 1 = no leaf spots in the plot, 2 = 1–10% of leaves with spots, 3 = 11–30% of leaves with spots, 4 = 31–50% of leaves with spots, 5 = 51–70% of leaves with spots, 6 = 71–100% of leaves with spots, 7 = more than 70% of leaves with spots covering 10–30% of leaf area, 8 = more than 70% of leaves with spots covering 30–50% of leaf area, 9 = more than 70% of leaves with spots covering more than 50% of leaf area, and 10 = more than 70% of leaves with spots and leaves shriveling and dying.

Field evaluations for gray leaf spot were made on 13 June 1979 and 13 August 1981. Three independent ratings were made for each plot at the first evaluation and two independent ratings were made at the second evaluation. The ratings were averaged for each evaluation and subjected to the procedure General Linear Model (GLM) (9). Samples of leaves with symptoms were collected and fungi present in the leaf spots identified. Leaves with atypical lesions were treated for 0.5 min with a 0.05% sodium hypochlorite plus 10% ethanol solution and rinsed three times with sterile deionized water before plating diseased tissue on potato-dextrose agar (PDA) or acidified PDA (11) or incubation in a moist chamber.

RESULTS AND DISCUSSION

All diseased samples produced conidia of *P. grisea* in leaf lesions, occasionally accompanied by *Curvularia* spp. Lesions were typical of those described previously (7), with three exceptions. One susceptible genotype (PI 300128 from the Republic of South Africa, rating 7.0) had many small, very black lesions that did not develop a tan color in the center. Two resistant grasses (FL-2002 and FL-2091, ratings 3.0 and 3.3, respectively) developed reddish brown lesions without the tan center.

The disease was observed generally during the warm summer months, particularly after 2 or 3 days of cloudy skies and heavy rainfall. The disease severely damaged grasses, primarily during turf establishment on bare soil. In established turf plots, only highly susceptible genotypes showed severe damage that included withering of infected leaves and stolon dieback.

St. Augustinegrass genotypes differed from one another ($P \leqslant 0.001$) in each of the three gray leaf spot ratings spanning a 4-yr period. Correlation coefficients ranging between 0.41 and 0.73 indicated the results from different evaluations were moderately consistent. When results from separate evaluations were combined, with genotype × evaluation interaction

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Table 1. Gray leaf spot ratings of representative St. Augustinegrass (*Stenotaphrum* sp.) genotypes

Genotype	Evaluation			
	Pots[v]	Field plots[w]		
	June 1977	June 1979	August 1981	Mean[x]
PI 365031[y]	1.3 a[z]	1.8 a	1.3 a	1.4 a
PI 289729[y]	1.0 a	1.3 a	2.3 ab	1.5 a
Roselawn	1.4 a	1.5 a	2.5 ab	1.8 a
Florida Common	2.3 ab	2.8 ab	2.0 ab	2.3 ab
Scotts 1081	3.3 ab	2.9 ab	2.5 ab	2.9 ab
Seville	···	5.3 c	2.3 ab	3.8 b
Floratam	3.5 ab	5.0 bc	3.0 b	3.8 b
Raleigh	···	4.1 bcd	3.7 bc	3.9 b
Floratine	6.0 bcd	7.8 d	6.3 d	6.7 c
PI 300128	4.5 bc	6.5 cd	10.0 e	7.0 c
Bitterblue	8.0 d	8.0 d	5.3 cd	7.1 c
Population mean	4.2	4.7	4.0	4.4

[v] Means of two replicates.
[w] Means of four replicates except for PI 300128 (two replicates).
[x] Mean separations based on genotype × evaluation interaction as error variance.
[y] *S. dimidiatum*; all others are *S. secundatum*.
[z] Means with a letter in common are not significantly different by the LSD test ($P \leq 0.05$).

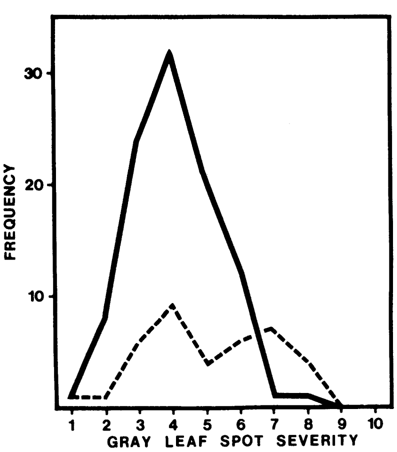

Fig. 1. Frequency distribution of gray leaf spot severity ratings in non-blue-green St. Augustinegrasses (solid line) and blue-green St. Augustinegrasses (dashed line). The severity ratings ranged from 1 = no disease to 10 = severe damage.

serving as error variance, the broad-sense heritability of gray leaf spot severity was 69%. This estimate predicts the recoverable gain from clonal selection for reduced gray leaf spot severity evaluated across a sample of years, genotypes, and environmental conditions at one location. Our data indicate gray leaf spot resistance can be readily selected for in a breeding program provided repeated evaluations are made. The means of three evaluations (Table 1) were consistent with the ranking by Horn et al (6) of five genotypes (Roselawn, Scotts 1081, Floratam, Floratine, and Bitterblue) except for the reversal of Floratine and Bitterblue.

Blue-green genotypes included the majority (17 of 31) of susceptible genotypes (mean rating >5.5) even though the blue-greens were a minority of the total population. This is a potential problem in turf improvement because the blue-green leaf color trait provides darker, more uniform appearance, thus reducing the esthetic rationale for N fertilization.

Highly susceptible genotypes included the blue-green cultivars Bitterblue and Floratine (Table 1), which constitute about 30% of the St. Augustinegrass turf in Florida (2). The blue-green leaf color is associated with higher ploidy level (3). Blue-green genotypes were apparently bimodally distributed for gray leaf spot severity (Fig. 1). Blue-green genotypes resistant to gray leaf spot (ratings ≤5.5) included Floratam and its relatives: siblings, mutant derivatives, and open-pollinated offspring. Twelve of 13 mutants of Floratam were resistant. Other blue-green genotypes resistant to gray leaf spot included plant introductions from Africa and Barbados.

The diploid ($2n = 18$) non-blue-green genotypes were evidently unimodal in their distribution for gray leaf spot rating (Fig. 1), but other discrete patterns of distribution existed. Genotypes with white stigmas of western origin (Gulf Coast collections from Texas to Mississippi) had significantly ($P \leq 0.001$) higher disease ratings (mean rating 5.1) than did Florida collections and breeding lines with purple stigmas (mean 3.8). Susceptibility to gray leaf spot in diploids was not strictly a function of white stigmas—the white stigma irradiation-induced mutant FL-2002a (rating 3.0) was derived from the purple stigma genotype FA-243 (rating 2.7) (1). Cultivars Roselawn and Florida Common had very low disease ratings (Table 1) consistent with observations of these cultivars in urban plantings.

Disease severity (rating 5.0–7.5) was higher for an open-pollinated and probably inbred offspring of a Gulf Coast accession (FL-1933, rating 3.8) than for the parent. In contrast, three confirmed crosses (stigmas were purple compared with white on the female parent) had low disease ratings (2.5–3.5).

Two highly resistant introductions, PI-289729 (Malagasy) and PI-365031 (Republic of South Africa) were identified as *S. dimidiatum* (J. D. Sauer, *personal communication*). These genotypes appear to be of a higher ploidy level than all available genotypes of *S. secundatum*, and they have failed to intercross with the latter.

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