# Evaluation of St. Augustinegrass Accessions and Cultivars for Resistance to *Sclerophthora macrospora*

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**ABSTRACT**

Toler, R. W., Bruton, B. D., and Grisham, M. P. 1983. Evaluation of St. Augustinegrass accessions and cultivars for resistance to *Sclerophthora macrospora*. Plant Disease 67: 1008-1010.

Sixty-four St. Augustinegrass accessions and cultivars were tested for resistance to downy mildew in the field and laboratory in 1981 and 1982, and 47 of these showed from a trace to 95% infection. In 1982, 15 accessions and cultivars had ratings of 25% or greater and 23 had ratings from a trace to 25%. The fact that infection of artificially inoculated plants ranged from 14.5 to 36.3% suggests that the inoculum potential was too high to detect low levels of resistance. A Floratam mutant, Mut 10, was rated as uninfected in the field, whereas artificial inoculation resulted in 21% infection. Two accessions, Tx 33 and PI 410355, which were rated as 90 and 64% infected, respectively, under conditions of natural inoculum in 1982, were rated as only 27 and 30% infected when artificially inoculated. Artificial inoculation with *Sclerophthora macrospora* by current techniques does not provide adequate discrimination among resistant and susceptible St. Augustinegrass accessions and cultivars, but reaction to natural infections provides a more reliable means of evaluation.

Additional key words: *Stenotaphrum secundatum*, turfgrass

The turfgrass industry is a major business in Texas and the demand for high-quality turf is increasing. There are about 7.75 million hectares of turf in Texas (P. F. Colbaugh, *personal communication*), with the total state *annual* cost for turfgrass maintenance exceeding $600 million (J. B. Beard, *personal communication*). St. Augustinegrass (*Stenotaphrum secundatum* (Walt.) Kuntze) comprises 56% of Texas turfgrass hectarage (6). Downy mildew of St. Augustinegrass was first reported by Jones and Amador (7) in 1969. It was found simultaneously in Florida and Texas, but initial identification of the pathogen was only to genus (*Sclerophthora sp.*). The downy-mildew pathogen of St. Augustinegrass was subsequently identified by Bruton et al (2,3) as *Sclerophthora macrospora* (Sacc.) Thirum., Shaw, & Naras. The disease has now been reported from five states: Florida and Texas in 1969 (7), Arkansas in 1972 (4), Louisiana in 1973 (5), and Mississippi in 1981 (1).

Downy mildew symptoms appear as white, raised, linear streaks that develop

Accepted for publication 18 March 1983.

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**Table 1.** Comparative host resistance to the downy mildew fungus in 12 St. Augustinegrass cultivars and accessions inoculated artificially

| Cultivar or accession | Leaves infected[x] (%) |
|---|---|
| Floratine | 14.3 a[y] |
| Scott 516 | 15.3 ab |
| Florida Common | 20.0 abc |
| Texas Common | 21.0 bcd |
| Floratam Mut 10 | 21.2 bcd |
| Bitter Blue | 22.0 cde |
| NCSA-21 | 23.5 cde |
| Garrett 141 | 24.7 cdef |
| TX 33 | 26.8 def |
| Floratam | 27.8 ef |
| PI 410355 | 29.8 f |
| New Zealand Red Leaf | 36.3 g |

[x] Percentage of leaves infected 30 days after inoculation, mean of six replicates.

[y] Values followed by the same letter are not significantly different ($P = 0.05$) according to Duncan's multiple range test.

parallel to the leaf midvein. Severe symptoms include leaf yellowing and premature necrosis and reduction of internode length. Infection with *S. macrospora* reduces plant height as much as 54%. Damage by this fungus is more severe on St. Augustinegrass growing in flood plains or other areas where water retention is high.

Downy mildew on St. Augustinegrass has been difficult to control with commercially available fungicides. Control of turf diseases by using host resistance and tolerance contributes significantly to maintaining a high-quality turf at minimum cost. Some host plants are immune to infection but others are susceptible with varying degrees of resistance to pathogen development. In the field, the rate and final level of development of a specific fungal pathogen on a given host genotype is influenced by such factors as degree of penetration, rate and amount of mycelial growth, incubation period, number and size of lesions, and rate and amount of sporulation. This article describes an inoculation and disease evaluation technique for screening St. Augustinegrass plants for resistance to *S. macrospora*.

## MATERIALS AND METHODS

Plants to be inoculated were grown in 1-L plastic pots and clipped at 3.8 cm height. Plants were immersed in a large tank of tap water after being restricted in the flooded container by a cylinder fitted inside the plastic pots. The water just covered the leaves, with the cylinder extending above the water surface. With this technique, the inoculum was restricted to the immediate area of each plant to be inoculated. St. Augustinegrass leaf blades showing typical downy mildew symptoms were used as the source of inoculum. Five such leaves were floated or submerged inside each cylinder. The inoculation procedure was performed over 24 hr in a dark environmental chamber at 20 C, after which water was drained and plants were removed to a greenhouse bench for subsequent disease development and evaluation. The percentage of infected leaves was evaluated 30 days after inoculation. Twelve cultivars and accessions of St. Augustinegrass were evaluated with this technique. Each cultivar and accession was replicated six times.

Field plot evaluations of downy mildew resistance were conducted at the Texas A&M Turfgrass Field Laboratory at College Station and included 64 St. Augustinegrass cultivars and accessions. The plots were 1.2 × 1.2 m and randomized, with two replicates. Plots were evaluated for downy mildew on 19 June 1981 and 31 May 1982. Readings consisted of the percentage of infected leaves in a 100-cm$^2$ area of each plot.

## RESULTS AND DISCUSSION

All 12 cultivars and accessions tested were susceptible to infection after artificial inoculation (Table 1). Floratine showed the lowest and New Zealand Red Leaf the highest percentages of infection, respectively. Infections ranged from 14.3 to 36.3% (Table 1). In the field evaluation under natural conditions, infection levels ranged from 0 to 95% (Table 2). Tx 104 and Scott 1081 were two of the most susceptible accessions, with 1982 infection

**Table 2.** Reaction of St. Augustinegrass accessions and cultivars to *Sclerophthora macrospora* under field and laboratory inoculations

| | Leaves infected (%) | | |
|---|---|---|---|
| | Field | | |
| Cultivar or accession | 19 June 1981 | 31 May 1982 | Laboratory |
| TX 104 | 20 | 95 | ... |
| Scott 1081 | 20 | 93 | ... |
| TX 33 | 10 | 90 | 27 |
| PI 410357 | 20 | 89 | ... |
| FA 243 | 15 | 72 | ... |
| TX 111 | 15 | 54 | ... |
| PI 410355 | 0 | 64 | 30 |
| Floratam Mut 12 | 30 | 45 | ... |
| PI 410360 | 25 | 35 | ... |
| New Zealand RL | 10 | 35 | 36 |
| TX 103 | 25 | 34 | ... |
| Bitterblue | 30 | 26 | 22 |
| Floratam | 10 | 25 | 28 |
| Scott 516 | 35 | 27 | 15 |
| TX 112 | 5 | 35 | ... |
| FA 118 | 5 | 18 | ... |
| Floratam Mut 3 | 10 | 17 | ... |
| FA 231 | 5 | 16 | ... |
| Floratam Mut 7 | 3 | 16 | ... |
| FA 46 | 15 | 15 | ... |
| GA 141 | 10 | 15 | 25 |
| PI 410356 | 5 | 14 | ... |
| FA 87 | 30 | 11 | ... |
| TX 106 | 0 | 9 | ... |
| FA 69 | 0 | 9 | ... |
| Florida Common | 5 | 8 | 21 |
| TX 108 | 8 | 7 | ... |
| FA 108 | 0 | 7 | ... |
| FA 64 | 0 | 6 | ... |
| FA 201 | 0 | 5 | ... |
| FA 121 | 5 | 3 | ... |
| PI 410364 | 15 | 3 | ... |
| TX Common | 17 | 2 | 21 |
| FA 83 | 3 | 2 | ... |
| FA 26 | 5 | 2 | ... |
| FA 38 | 5 | 1 | ... |
| FA 107 | 0 | 1 | ... |
| TX 102 | 0 | Trace | ... |
| Floratine | 20 | 0 | 15 |
| NCSA-21 | 13 | 0 | 24 |
| FA 131 | 15 | 0 | ... |
| TX 101 | 10 | 0 | ... |
| FA 82 | 13 | 0 | ... |
| TX 107 | Trace | 0 | ... |
| New Zealand | 10 | 0 | ... |
| FA 121 | Trace | ... | ... |
| FA 80 | Trace | ... | ... |
| Floratam Mut 10 | 0 | 0 | 21 |
| Floratam Mut 5 | 0 | 0 | ... |
| Floratam Mut 13 | 0 | 0 | ... |
| Floratam Mut 8 | 0 | 0 | ... |
| TX 105 | 0 | 0 | ... |
| Floratam Mut 6 | 0 | 0 | ... |
| FA 271 | 0 | 0 | ... |
| Roselawn | 0 | 0 | ... |
| FA 223 | 0 | 0 | ... |
| FA 34 | 0 | 0 | ... |
| FA 7 | ... | 0 | ... |
| Gar 72-101 | 0 | 0 | ... |
| FA 73 | 0 | 0 | ... |
| TX 109 | 0 | 0 | ... |
| FA 48 | 0 | 0 | ... |
| FA 159 | 0 | 0 | ... |
| FA 145 | 0 | 0 | ... |

percentages of 95 and 93%, respectively. Seventeen accessions had 0% disease in the field. The rankings of St. Augustinegrass plants for resistance in the field and comparative results of field and laboratory inoculations are shown in Table 2.

Results of artificial inoculations of St. Augustinegrass with *S. macrospora* in the greenhouse were not consistent with field results. The higher percentage of infection via artificial inoculation (26.8–36.3%) was correlated with higher field levels of susceptibility (25–90%). Garrett 141 (GA 141), however, showed resistance of 15.0% under natural and 25% under artificial inoculation. In the artificially inoculated material, the inoculum potential proved to be too high to select against some tolerant material, as shown by Floratam Mutant 10 (Mut 10). In the field, Mut 10 had 0% infection, but when artificially inoculated, 21%. The artificial inoculation technique must be refined further to differentiate resistant, intermediate, and susceptible plants.

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