

# Effect of *Sclerophthora macrospora* on Growth and Development of St. Augustinegrass

M. P. GRISHAM, Assistant Professor, and R. W. TOLER, Professor, Department of Plant Pathology and Microbiology, Texas A&M University, College Station 77843, and B. D. BRUTON, Research Plant Pathologist, USDA, ARS, Weslaco, TX 78596

## ABSTRACT

Grisham, M. P., Toler, R. W., and Bruton, B. D. 1985. Effect of *Sclerophthora macrospora* on growth and development of St. Augustinegrass. Plant Disease 69: 289-291.

Internodal lengths were reduced in 10 of 12 cultivars and accessions of St. Augustinegrass infected with *Sclerophthora macrospora* compared with healthy control plants. Length of leaves and width of leaves and internodes were also reduced in many of the diseased plants. Plant height and fresh shoot weight of St. Augustinegrass cultivar Scott 1081 infected with *S. macrospora* increased an average of 60 and 48%, respectively, when the fungus was eradicated with metalaxyl. Five-centimeter plugs of Texas Common and Seville sod, systemically infected with *S. macrospora*, were treated with metalaxyl at transplanting and 90 days later. Fresh and dry weights of roots and tops were greater in treated healthy Seville than in untreated infected controls 138 days after transplanting.

Additional key words: downy mildew, *Stenotaphrum secundatum*, turfgrass

St. Augustinegrass (*Stenotaphrum secundatum* (Walt.) Kuntze) is vegetatively propagated as sprigs, plugs, or sod and spreads by means of long, thick stolons. In commercial production fields, sod is reestablished vegetatively from strips (ribbons) of turf left after blocks of sod are harvested. Downy mildew caused by *Sclerophthora macrospora* (Sacc.) Thirum., Shaw, & Naras. (2,3) appears to affect regrowth of the sod in fields as well as in lawns and other areas that have been sprigged or plugged.

Downy mildew of St. Augustinegrass was reported in Florida and Texas in 1969 (6) and subsequently in Arkansas in 1972 (4), Louisiana in 1973 (5), and Mississippi in 1981 (1). Symptoms were described as white, raised, linear streaks developing parallel to the leaf venation. Little or no damage was ascribed to the disease when it was first observed (6); however, in the Bay City, TX, area in the spring of 1973 (9), severe symptoms including leaf yellowing and premature necrosis were noted. In 1983, Toler et al (8) evaluated 64 St. Augustinegrass accessions and cultivars for resistance to downy mildew. In field evaluations, the percentage of diseased leaves among accessions and cultivars ranged from 0 to 95%.

The purpose of this study was to determine the effects, if any, of *S. macrospora* on the growth and development of St. Augustinegrass. Cultivars that differed in disease incidence and severity were selected for study (8).

## MATERIALS AND METHODS

Twelve St. Augustinegrass cultivars and accessions were inoculated with *S. macrospora* using a modification of Semeniuk and Mankin's technique (7). Mature St. Augustinegrass turf (clipped to 3.8 cm high) in 1-L plastic pots was flooded with tap water to just cover the leaves. Five mature Floratam St. Augustinegrass leaf blades showing typical downy mildew symptoms were floated or submersed above each plant to be inoculated. Inoculum was restricted by

a plastic cylinder fitted inside each pot and extending above the water surface. Plants remained flooded in a dark environmental chamber at 20 C for 24 hr, then they were placed in a greenhouse. After 10 days, lengths of stems and widths of blades and internodes were measured on healthy and diseased plants of each cultivar and accession. Measurements were made of leaves on the second node. Leaf length was the distance from the collar to the tip of the blade; leaf width was determined at the widest point of the blade. The length of the second internode and the width at the midpoint were measured.

Diseased and healthy cultivar Scott 1081 St. Augustinegrass plants were sprayed with metalaxyl (28.4 g a.i./92 m<sup>2</sup>), a curative fungicide for downy mildew of St. Augustinegrass (B. D. Bruton, R. W. Toler, and M. P. Grisham, unpublished), and fenaminosulf (53.1 g a.i./92 m<sup>2</sup>). Six plants per treatment were grown in 15-cm-diameter plastic pots in the greenhouse. Plant height and green shoot clipping weight were determined 28 days after fungicide application.

Plugs 5 cm in diameter of St. Augustinegrass cultivars Texas Common and Seville systemically infected with *S. macrospora* were transplanted to 3.8-L plastic pots. Six pots of each cultivar were treated with a foliar application of metalaxyl (28.4 g a.i./92 m<sup>2</sup>) to produce pathogen-free plants, and six pots of each were untreated. Plants were maintained under an overhead misting system (40 sec

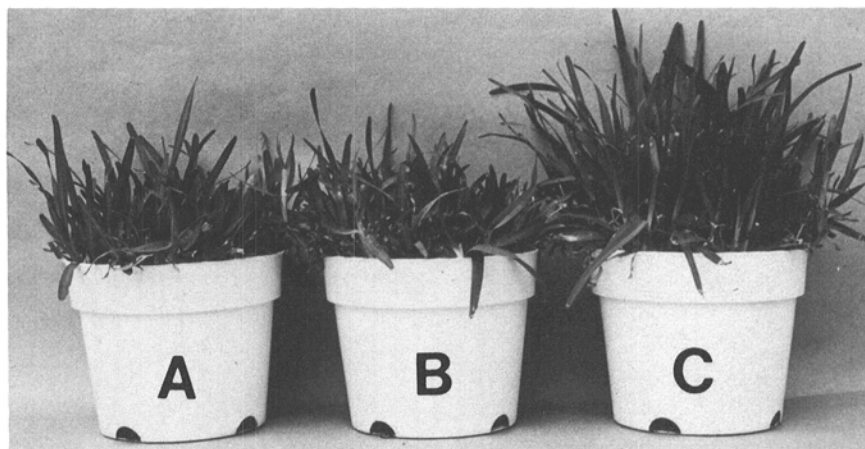


Fig. 1. Increased plant growth of St. Augustinegrass cultivar Scott 1081 after eradication of *Sclerophthora macrospora* with metalaxyl. (A) Control, (B) fenaminosulf-treated, and (C) metalaxyl-treated.

Accepted for publication 2 October 1984 (submitted for electronic processing).

The publication costs of this article were defrayed in part by page charge payment. This article must therefore be hereby marked "advertisement" in accordance with 18 U.S.C. § 1734 solely to indicate this fact.

**Table 1.** Effect of *Sclerophthora macrospora* on the growth of St. Augustinegrass selections

| Cultivar or accession | Internodes  |          |            |          | Leaves      |          |            |          |
|-----------------------|-------------|----------|------------|----------|-------------|----------|------------|----------|
|                       | Length (cm) |          | Width (cm) |          | Length (cm) |          | Width (cm) |          |
|                       | Healthy     | Diseased | Healthy    | Diseased | Healthy     | Diseased | Healthy    | Diseased |
| Bitter Blue           | 3.94        | 3.93     | 0.39       | 0.31     | 3.82        | 3.34*    | 0.78       | 0.74     |
| PI 410355             | 5.10        | 4.82     | 0.20       | 0.21     | 5.65        | 3.72     | 0.59       | 0.58     |
| Texas Common          | 4.26        | 3.54**   | 0.37       | 0.38     | 4.09        | 3.45*    | 0.75       | 0.75     |
| Floratine             | 5.04        | 3.98*    | 0.29       | 0.29     | 4.04        | 4.97*    | 0.72       | 0.84*    |
| Garrett 141           | 3.40        | 2.17*    | 0.19       | 0.17*    | 2.49        | 2.07*    | 0.54       | 0.53     |
| TX-33                 | 5.74        | 4.51*    | 0.34       | 0.31*    | 5.39        | 5.07     | 0.83       | 0.79     |
| Raleigh               | 4.59        | 3.20*    | 0.40       | 0.38*    | 3.96        | 3.83     | 0.77       | 0.72*    |
| Floritam Mutant #10   | 4.55        | 3.14*    | 0.38       | 0.34*    | 4.55        | 5.11*    | 0.82       | 0.81     |
| Seville               | 4.54        | 2.84*    | 0.27       | 0.24*    | 3.75        | 3.66     | 0.70       | 0.69     |
| Floritam              | 5.01        | 2.92*    | 0.40       | 0.33*    | 3.66        | 3.40     | 0.75       | 0.67*    |
| New Zealand Red Leaf  | 5.67        | 3.36*    | 0.35       | 0.33*    | 4.32        | 3.24*    | 0.76       | 0.64*    |
| Florida Common        | 6.23        | 4.02*    | 0.29       | 0.28     | 4.44        | 3.57*    | 0.72       | 0.72     |

\* Means of 50 measurements. \* = Significantly less than healthy control at  $P = 0.05$  according to a  $t$  test.

**Table 2.** Mean fresh shoot weight and plant height of plants infected with *Sclerophthora macrospora* and healthy plants of St. Augustinegrass cultivar Scotts 1081 after fungicide application

| Fungicide treatment | Application rate <sup>a</sup> | Plant height (cm)  |         | Fresh shoot wt (g) <sup>b</sup> |         |
|---------------------|-------------------------------|--------------------|---------|---------------------------------|---------|
|                     |                               | Diseased           | Healthy | Diseased                        | Healthy |
| Control             | ...                           | 8.1 a <sup>c</sup> | 21.4 a  | 13.0 a                          | 28.3 a  |
| Fenaminosulf 35W    | 53.1                          | 9.0 a              | 21.0 a  | 11.1 a                          | 28.6 a  |
| Metalaxyl 5W        | 28.4                          | 20.1 b             | 20.0 a  | 25.0 b                          | 20.8 a  |

<sup>a</sup> Grams of active ingredient in 42.25 L of H<sub>2</sub>O/92 m<sup>2</sup>.

<sup>b</sup> Mean of six replicates 28 days after fungicide application.

<sup>c</sup> Column values followed by the same letter are not significantly different ( $P = 0.05$ ) according to Duncan's multiple range test.

of mist every 4 hr) for 60 days in the greenhouse. Plants were then transferred to a greenhouse bench and watered as needed to prevent wilting. Numbers of stolons and internode length and diameter were measured and the percentage of diseased leaves was determined 60 and 90 days after transplanting. Density of the turf and

plant height were recorded after 90 days. Density was rated on a scale of 1–9, where 9 = the greatest shoot density. A second application of metalaxyl was made 90 days after the initial application. Plants were harvested 138 days after transplanting. Fresh and dry weights were determined for roots and tops (leaves and stolons) of each plant.

## RESULTS AND DISCUSSION

Internodal length of St. Augustinegrasses with downy mildew was significantly reduced in 10 of 12 cultivars and accessions (Table 1). Reduced internodal width and leaf length and width were also noted in many diseased plants.

Plant height and fresh shoot weight increased 60 and 48%, respectively, in diseased plants when treated with metalaxyl compared with untreated control plants (Table 2). Metalaxyl treatment of the healthy St. Augustinegrass did not affect plant height or fresh shoot weight (Table 2). Fenaminosulf did not affect plant height or fresh shoot weight in diseased or healthy plants. In subsequent experiments, metalaxyl-treated plants were used as healthy controls.

Metalaxyl-treated St. Augustinegrass showed no downy mildew symptoms 60

**Table 3.** Morphological measurements and incidence of downy mildew caused by *Sclerophthora macrospora* for two cultivars of St. Augustinegrass

| Measurements             | Seville              |                   |         |          | Texas Common |          |         |          |
|--------------------------|----------------------|-------------------|---------|----------|--------------|----------|---------|----------|
|                          | 30 Days <sup>a</sup> |                   | 90 Days |          | 60 Days      |          | 90 Days |          |
|                          | Healthy <sup>b</sup> | Diseased          | Healthy | Diseased | Healthy      | Diseased | Healthy | Diseased |
| Internodal length (cm)   | 4.8                  | 3.7* <sup>c</sup> | 2.5     | 1.7*     | 3.4          | 2.4*     | 3.6     | 3.2      |
| Internodal diameter (mm) | 3.1                  | 2.8*              | 2.7     | 2.4*     | 2.9          | 2.7*     | 2.8     | 2.8      |
| Number of new stolons    | 2.0                  | 1.5               | 6.8     | 2.6*     | 1.5          | 1.3      | 2.5     | 2.3      |
| Density <sup>d</sup>     | ...                  | ...               | 7.8     | 6.7*     | ...          | ...      | 4.3     | 3.7      |
| Plant height (cm)        | ...                  | ...               | 5.8     | 5.2      | ...          | ...      | 3.8     | 2.2*     |
| Leaves diseased (%)      | 0.0                  | 80.0*             | 0.0     | 60.0*    | 0.0          | 10.0*    | 0.0     | 14.0*    |

<sup>a</sup> Days after transplanting.

<sup>b</sup> Healthy plants were produced by treating plants at transplanting with metalaxyl applied at 28.4 g a.i. in 42.25 L of H<sub>2</sub>O/92 m<sup>2</sup>.

<sup>c</sup> Mean of six pots per treatment. \* = significantly less than healthy control at  $P = 0.05$  according to a  $t$  test.

<sup>d</sup> Density rated on a scale of 1–9, where 9 = greatest shoot density.

**Table 4.** Effect of *Sclerophthora macrospora* on the fresh and dry weight of two cultivars of St. Augustinegrass 138 days after transplanting

| Cultivar     | Top weight (g) <sup>a</sup> |                     | Root weight (g) |          | Root:top ratio |          |
|--------------|-----------------------------|---------------------|-----------------|----------|----------------|----------|
|              | Healthy <sup>b</sup>        | Diseased            | Healthy         | Diseased | Healthy        | Diseased |
| Seville      |                             |                     |                 |          |                |          |
| Fresh wt     | 153.2                       | 120.7* <sup>c</sup> | 98.5            | 76.3*    | 1:1.6          | 1:1.6    |
| Dry wt       | 28.3                        | 21.8*               | 14.9            | 10.3*    | 1:2.0          | 1:2.2    |
| Texas Common |                             |                     |                 |          |                |          |
| Fresh wt     | 84.7                        | 66.7                | 39.8            | 30.1     | 1:2.1          | 1:2.3    |
| Dry wt       | 16.6                        | 13.5                | 5.6             | 4.7      | 1:3.1          | 1:3.0    |

<sup>a</sup> Tops included leaves and stolons.

<sup>b</sup> Healthy plants were produced by treating plants at transplanting and 90 days later with metalaxyl applied at 28.4 g a.i. in 42.25 L of H<sub>2</sub>O/92 m<sup>2</sup>.

<sup>c</sup> Mean of six replicates. \* = Significantly less than diseased control at  $P = 0.05$  according to a  $t$  test.

or 90 days after the first fungicide application (Table 3), whereas all untreated plants expressed disease symptoms. Internodal length and width were reduced in mildewed plants of Seville at 60 and 90 days and in diseased plants of Texas Common at 60 days. Healthy Seville plants had initiated more new stolons at 90 days than untreated plants (Table 3). This contributed to the greater turf density of healthy plants compared with diseased plants. Healthy and mildewed plants of Texas Common did not differ in numbers of new stolons or density at 90 days. At harvest, fresh and dry weights of roots and tops were less in diseased plants of Seville (Table 4). Dry weights of roots and tops were reduced 31 and 23%, respectively, in Seville (Table 4). Plant height and leaf length were less for diseased plants of Texas Common than for healthy plants (Tables 1 and 3). Differences in plant height were not observed in Seville. The percentage of diseased leaves was higher for Seville than for Texas Common (Table 3). This agrees with earlier field observations by Toler et al (8) in which Scott 1081 and Scott 516 (Seville) had a higher percentage of leaves infected than Texas Common. The higher percentage of disease in Seville and Scott 1081 caused by *S. macrospora* resulted in significant reductions in top, root, and fresh shoot weights (Tables 2 and 4). Root-to-top ratios were not significantly different between healthy and diseased plants.

*S. macrospora* suppressed the growth (Fig. 1) of St. Augustinegrass and caused such significant morphological changes as shortening of internodes (Fig. 2). The significant reduction in the vigor that

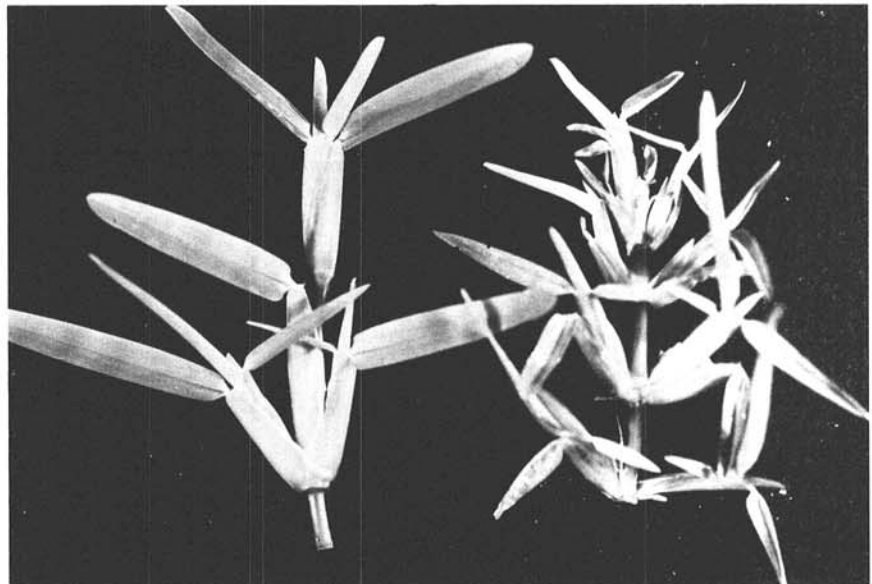


Fig. 2. Effect of *Sclerophthora macrospora* on length of stolon internodes of St. Augustinegrass cultivar Floratam. (Left) Healthy control and (right) downy mildew-diseased.

occurred in plants heavily diseased with *S. macrospora* justifies efforts to control the disease in highly susceptible cultivars.

#### LITERATURE CITED

1. Bruton, B. D., Toler, R. W., and Blasingame, D. L. 1981. Downy mildew of St. Augustinegrass in Mississippi. *Plant Dis.* 65:925.
2. Bruton, B. D., Toler, R. W., and Frederiksen, R. A. 1977. Inoculation and identification of the downy mildew fungus of St. Augustinegrass. *Proc. Annu. Tex. Turfgrass Conf.* 32:118-121.
3. Bruton, B. D., Toler, R. W., and Frederiksen, R. A. 1978. *Sclerophthora macrospora*, a downy mildew of St. Augustinegrass. (Abstr.) *Phytopathol. News* 12:189.
4. Dale, J. L., and Toler, R. W. 1972. Downy mildew of St. Augustinegrass in Arkansas. *Plant Dis. Rep.* 56:658.
5. Holcomb, G. E., Derrick, K. S., Carver, R. B., and Toler, R. W. 1973. Downy mildew and rust found in St. Augustinegrass in Louisiana. *Plant Dis. Rep.* 57:16.
6. Jones, B. L., and Amador, J. 1969. Downy mildew, a new disease of St. Augustinegrass. *Plant Dis. Rep.* 53:852-854.
7. Semeniuk, G., and Mankin, C. J. 1964. Occurrence and development of *Sclerophthora macrospora* on cereals and grasses in South Dakota. *Phytopathology* 54:409-416.
8. Toler, R. W., Bruton, B. D., and Grisham, M. P. 1983. Evaluation of St. Augustinegrass accessions and cultivars for resistance to *Sclerophthora macrospora*. *Plant Dis.* 67:1008-1010.
9. Toler, R. W., and Walla, W. J. 1976. Turf diseases. *Tex. Agric. Exp. Stn. Prog. Rep.* PR-3375C. 30 pp.