Professorial •Insight OBSERVATIONS AND INSIGHT FROM UNIVERSITY TURF SPECIALISTS

Anthracnose research at Rutgers — a synopsis

The following is condensed from ***Management Practices Associated with Anthracnose and Abiotic Stress on Golf Course Turf (2004 Update)***, by Bruce B. Clarke and James A. Murphy, Rutgers Cooperative Extension. We encourage you to review the entire text at http://www.turf.rutgers.edu/extensionandoutreach/aas2004.pdf

Overview

Anthracnose, a destructive disease caused by *Colletotrichum graminicola* (Ces.), is particularly severe on annual bluegrass and (less so on) creeping bentgrass. During periods of high humidity or extended periods of leaf wetness, and the plants are under stress, the fungus may infect leaf, stem, or root tissue. The disease is most common between April and September in the Northeast and Mid-Atlantic States. Close-cut greens are most frequently affected.

Anthracnose first appears as small patches of yellow to reddish-brown turf, 1 to 2 inches in diameter, which can progress into large irregularly shaped areas on infected greens, tees, or fairways. When plants are weakened by mechanical or environmental stress, the pathogen may also attack stems and leaf sheaths resulting in a "basal stem rot".

The past few years have seen an increase in the incidence and severity of anthracnose on golf courses throughout the east coast and mid-western states. In many cases, epidemics were so severe that fungicides were unable to effectively control the disease.

Certain management practices commonly employed on golf courses may be enhancing abiotic stress and thus predisposing turf to anthracnose. Various combinations of these factors may be enhancing the severity of this disease and making it more difficult to control.

Factors Contributing to Abiotic Stress and/or Anthracnose

Plant Stress

Annual bluegrass is at best a weak perennial known for its prolific production of seed heads, particularly between late-April and early-June. While seed heads are unsightly and may adversely affect the playability of a green, they often significantly deplete the carbohydrate reserves of the plant by early summer. If environmental conditions are also stressful at this time (e.g., hot, humid weather), then annual bluegrass may be particularly susceptible to anthracnose.

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Fertility

The strong trend toward reducing the amount of nitrogen applied to golf course turf can result in reduced plant vigor. Spoon-feeding turf with 0.1 to 0.125 lb N/1000 when plants are of low vigor may not be sufficient to maintain a healthy, disease-free playing surface. Abandoning the practice of applying moderate rates of a slow release nitrogen source (3/4 to 1-1/2 lb N/1000) on greens in the fall or spring further reduces the supply of this important nutrient. On fairways, clippings removal can also remove 25 to 60% of applied nitrogen per season.

Deficiencies in phosphorous or potassium may also predispose turf to anthracnose.

Irrigation

C. graminicola can readily colonize turf weakened by drought stress. The tendency to maintain dry turf and soil to improve playability and to enhance the competitiveness of bentgrass may actually stimulate disease development on annual bluegrass. Wilt stress, particularly from mid-day to late afternoon, should be avoided.

Mowing

Many of the superintendents that have had severe outbreaks of anthracnose over the past few years were maintaining greens at or below 1/8 inch. Where annual bluegrass is a major component of the putting surface, low mowing can deplete the carbohydrate reserves of this species, often already weakened by environmental stress.

Mowing frequency may also affect anthracnose. The increased wear caused by double and triple cutting, particularly at a very low cutting height, can result in greater wounding and may potentially enhance the incidence of stress related diseases. Double cutting at a higher HOC is preferable to mowing at a lower height to achieve greater putting speed.

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Anthracnose *(Continued from page 6)*

Grooved front rollers may increase wounding compared to smooth rollers, but the impact of grooved rollers on anthracnose is currently unknown.

Pesticides

Only five chemical classes or groups appear to effectively suppress anthracnose, and only four of these groups are currently labeled for the control of this disease.

The influence of PGRs and herbicides on anthracnose is not well understood. A study conducted in Kentucky indicates that Dimension might slightly increase this disease, but more research is required.

Addressing the Problem

Improve Cultural Practices

Since nitrogen deficient turf is more susceptible to anthracnose, be sure to maintain adequate nitrogen levels. Annual bluegrass typically requires 1-½ to 4 lb N/1000 sq ft/year depending on the age of the green and the intensity of traffic. Consider periodically increasing the frequency of nitrogen applications from every two weeks to once a week. Also consider applying moderate rates of a slow release nitrogen source (3/4 to 1-1/2 lb N/1000 sq ft) to greens in the fall or spring to prevent the "nitrogen bank" in the turf from becoming depleted.

Avoiding drought stress can help improve turf vigor and may reduce the development of anthracnose. Avoiding wilt stress after 3 PM, when the crew goes home, is an important consideration. Remember that straight sand topdressing does not retain as much moisture as do mixes with higher organic matter content. If you have changed to straight sand topdressing, make sure you have altered irrigation practices accordingly.

Where possible, raise the mowing height when turf is under environmental stress. Raising the HOC 1/32 of an inch will increase the photosynthetic capability of the turf, thus increasing the carbohydrate level in the plant and aiding in recovery once the disease is suppressed with fungicides. Lightweight rolling can simulate the effect of a double cut or a 1/32-inch reduction in the mowing height.

Any attempt to reduce wounding (e.g., avoid aerifying, verticutting, or sand topdressing when the disease is active) may reduce the incidence of new infections.

Implement an Effective Fungicide Program

On sites with a previous history of this disease, apply fungicides on a preventive basis two to three weeks before symptoms typically develop. The key to good disease control is to prevent severe epidemics from getting established..

Fungicides within the nitrile (Daconil Ultrex 82.5SDG at 3.2 oz/1000 sq. ft.) and the antibiotic polyoxin-D (Endorse 2.5W at 4.0 oz/1000 sq. ft.) chemical classes provided excellent (96-100%) control...

Prior to 2002, only fungicides within the benzimidazole, strobilurin, nitrile, and DMI classes have been reported to consistently control anthracnose. Fosetyl Al (i.e., Aliette, Signature) had also provided good disease suppression in some tests when used in combination with chlorothalonil (e.g., Daconil Ultrex).

Flutolanil (e.g., ProStar) has been shown to intensify anthracnose on bentgrass studies at Rutgers and should not be applied to turf infested with C. graminicola.

Laboratory studies have recently identified isolates of C. graminicola with reduced sensitivity to benzimidazole or QoI fungicides, and superintendents have reported difficulty controlling outbreaks with these products.

A field study on a putting green at Ridgewood Country Club (Paramus, NJ) was established in 2002 and continued in 2003. This green had a previous history of anthracnose and the superintendent had reported difficulty controlling outbreaks with benzimidazole and QoI fungicides.

Results of the study indicate that

- fungicides within the nitrile (**Daconil Ultrex 82.5SDG** at 3.2 oz/1000 sq. ft.) and the antibiotic polyoxin-D (**Endorse 2.5W** at 4.0 oz/1000 sq. ft.) chemical classes provided excellent control (96-100%), compared to the control.
- Of the DMI fungicides, only propiconazole (**Banner MAXX 1.3MC** at 1.0 fl oz/1000 sq. ft.), tebuconazole (**Lynx 45W** at 1.11 oz/1000 sq. ft.), and triticonazole (**Chipco Triton 1.67SC** at 1.0 fl oz/1000 sq. ft.) adequately controlled the disease (98-100% control), Myclobutanil (**Eagle 40W** 1.0 oz/1000 sq. ft.) provided moderate control (80-100%), and Triadimefon (**Bayleton 50W** at 1.0 oz/1000 sq. ft.) proved ineffective at the rate tested.
- The phosphonate fosetyl-Al (**Chipco Signature 80WG** at 4.0 oz /1000 sq. ft.), the dicarboximide iprodione (**Chipco 26GT 2SC** at 4.0 fl oz/1000 sq. ft.), and the phenylpyrrole fludioxonil (**Medallion 50W** at 0.25 and 0.33 oz/1000 sq. ft.) provided good to excellent suppression of this disease (78-100%).
- As a group, fungicides within the QoI chemical class including pyraclostrobin (**Insignia 20WG** at 0.5 oz/1000 sq. ft.), azoxystrobin (**Heritage 50WG** at 0.2 oz/1000 sq. ft.), and trifloxystrobin (**Compass 50W** at 0.25 oz/1000 sq. ft.) provided relatively poor control of anthracnose basal rot (3-46% control) at this site.

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- The carboximide flutolanil (**ProStar 70WG** at 2.2 oz/1000 sq. ft.), the dicarboximide vinclozolin (**Vorlan 50DF** at 1.0 oz/1000 sq. ft.), the dithiocarbamate mancozeb (**Fore Rainshield 80W** at 8.0 oz/1000 sq. ft.), and the benzimidazole thiophanate-methyl (**Cleary 3336 50W** at 4.0 and 6.0 oz/1000 sq. ft.) also did not significantly control this disease.

Nitrogen (urea) significantly reduced disease severity. On non-fungicide treated turf, the addition of 0.125 lb N/1000 sq. ft. every two weeks reduced the severity of symptoms 18-36%.

When developing a fungicide program for your golf course, try to schedule the application of products when more than one target disease can be controlled.

The amount of water applied with a fungicide can affect efficacy. Products applied in less than 1 gal. water/1000 sq ft. will almost certainly result in reduced levels of control. This is particularly true for the nitrile fungicides, since they are contact fungicides that must thoroughly cover leaf and stem tissues to be effective. In no instance should contact fungicides be watered into the thatch layer.

Anthracnose as Influenced by Nitrogen, Growth Regulators, Pre-emergence Herbicides, and Verticutting: 2003 and 2004 Summer Research Update

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Tank mixtures and rotational programs (i.e., applying products from different chemical classes every two weeks) provided excellent disease control that was equivalent to or better than single product entries. Do not apply more than two or three consecutive applications of any fungicide used to control anthracnose. Alternating or tank mixing products with different modes of action (i.e., different fungicide classes) is the most effective strategy for preventing resistance.

The effect of nitrogen, the growth regulators Embark 0.2L (mefluidide) and Primo MAXX 1MC (trinexapac-ethyl), and verticutting on the severity of anthracnose was assessed on a *Poa annua* putting green turf at Rutgers University from April to October in 2003 and 2004.

Turf receiving the high rate of nitrogen had 25 to 65% less disease than turf maintained with the low rate of nitrogen over both years of the study.

Embark enhanced disease severity in June (six to eight weeks post-treatment), and had no effect on anthracnose from July through October 2003 and 2004, compared to turf not treated with this plant growth regulator. Embark did, however, reduce the number of seedheads per unit area and increased turf quality before the onset of disease.

Repeat applications of Primo improved turf quality, increased turf density, and reduced anthracnose severity, compared to non-Primo treated turf in both years. In 2004, an interaction involving Embark and Primo was apparent by 7 July and continued through the remainder of the season. Plots receiving Embark and sequential applications of Primo had 36-37% and 27-41% less anthracnose compared to Embark or Primo applied alone, respectively. The combined effect of these growth regulators on anthracnose may be due to an increase in carbohydrate reserves resulting from the suppression of seedheads with Embark and reduced mowing stress associated with the use of Primo.

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Anthracnose was enhanced by verticutting at low nitrogen, but was unaffected at the high nitrogen rate. In 2004, no effect of verticutting on anthracnose was observed.

Summary: Anthracnose Basal Rot Research at Ridgewood Country Club, 2002-2003

- **Preventative control better than curative**
- **Nitrogen (1/8 lb. @ 14-day interval) reduced disease severity**
- **DMI, Nitrile (Daconil), Polyoxin-D (Endorse)=Excellent control (DMIs variable)**
- **Benzimidazole and QoIs may or may not provide control depending on the fungal strains present.**
- **Phosphonate (Signature), Dicarboximide (Chipco 26GT), Phenylpyrrole (Medallion)=Good control**
- **Tank mixes and rotation programs always provided excellent control**
- **Phosphite/phosphorus acid appeared to reduce the severity of anthracnose.**