

Anthracnose

[*Colletotrichum cereale*]



SYMPTOMS

Anthracnose diseases are common and destructive problems in golf course putting greens established with creeping bentgrass or annual bluegrass. Anthracnose may develop as a foliar blight, in which the turfgrass leaves are infected, or a basal rot, which attacks the leaf sheaths, crowns, and stolons of the plant. Anthracnose symptoms are highly variable, appearing yellow to orange in color and in an irregular pattern, in small freckle-like spots, or in circular patches up to 1' in diameter. Symptoms are typically most severe in areas that are stressed from low mowing, excessive traffic, or inadequate irrigation or fertilization. On individual plants, symptoms first appear on the oldest leaves, which die back from the tip, and gradually progress to the younger leaves. Symptoms of anthracnose foliar blight will initially be limited to the leaves, with the crowns, leaf sheaths and stolons healthy. In the case of basal rot, the leaf sheaths, crowns, and stolons will be dark and rotten. The anthracnose pathogen produces spores inside of structures called acervuli, which are black, saucer-shaped pads with black spines (setae) protruding from them. These can be seen on the infected leaves (foliar blight) or basal tissues (basal rot) with a magnifying glass or small microscope.



anthracnose acervuli

Characteristic	Description
Host Grass Species	creeping bentgrass, annual bluegrass
Month(s) with symptoms	May to September
Stand Symptoms	irregular distribution across turf stand or patches (4 to 12 inches)
Foliar Symptoms - Location/Shape	dieback from leaf tip, blighting of entire leaves
Foliar Symptoms - Color	yellow, orange, tan, red
Root/Crown Symptoms	none or roots, stolons, rhizomes, and/or crowns dark brown or black
Fungal Signs	acervuli with setae

Note: Still not sure if this is the right disease? The [Turfgrass Disease Identification](#) program may be helpful. Or consult the experts at the [Turf Diagnostics Lab](#). Check the TurfFiles [glossary](#) for definitions of unfamiliar terms.

FACTORS AFFECTING DISEASE DEVELOPMENT

Greens established with annual bluegrass or susceptible varieties of creeping bentgrass can be attacked by anthracnose throughout the entire growing season. In creeping bentgrass putting greens, the basal rot form of the disease is most active during hot weather in the summer, whereas the foliar blight is most common during cool and cloudy conditions. The opposite is true on annual bluegrass, with the basal rot being most severe in cool, cloudy weather and the foliar blight more common during hot, dry weather.

Anthracnose diseases are stress-induced. Physiological stress from any source greatly encourages the development and spread of the disease. In golf course putting greens, the most common culprits are close mowing, drought stress, low fertility, excessive traffic, poor soil drainage, or excessive thatch/organic matter accumulations.

Because of its sensitivity to stress, annual bluegrass is much more susceptible to anthracnose than creeping bentgrass. However, creeping bentgrass varieties vary tremendously in their susceptibility to anthracnose as well. Older varieties, such as Penncross, Pennlinks, Dominant, Dominant Plus, L-93, and Crenshaw are susceptible to anthracnose, whereas the disease is rarely observed on modern varieties such as the Penn A and G series.

CULTURAL CONTROL

Because annual bluegrass is most susceptible to anthracnose, preventing this grassy weed from encroaching into putting greens is an effective way to manage anthracnose. Conversion of putting greens to newer, resistant varieties of creeping bentgrass will eliminate the problem in most circumstances.

Avoiding or alleviating physiological stress is another effective way to manage anthracnose. Raising mowing heights prior to and during periods of disease activity have been shown to reduce anthracnose development. Recent research at Rutgers University demonstrated that anthracnose severity was greatest in annual bluegrass mowed at 0.110", less at 0.125", and the least disease was observed at 0.150". Golf course superintendents should employ growth regulators and lightweight rollers to increase putting speeds in lieu of low mowing heights. When using sidewinder-type rollers, care must be taken to prevent scuffing and abrasion at the end of each pass, as this injury may encourage anthracnose activity.

Adequate fertilization and irrigation are also essential to anthracnose management. Deficiencies of any essential plant nutrient will slow turf growth and increase anthracnose development. Tissue samples should be analyzed for nutrient content on a regular basis to ensure that all nutrients are present in adequate amounts. Irrigation should be applied frequently enough to prevent severe wilt and drought stress during the day.

Regular aerification and topdressing of putting greens is essential to preventing severe anthracnose problems. As a general rule of thumb, 15% to 20% of the putting green surface area should be impacted by hollow-tine aerification annually, and 5000 lbs/1000 ft² of topdressing should be applied each year. Hollow-tine aeration should be performed during cool weather conditions when the turf is growing optimally. Solid-tining or spiking is recommended during stressful conditions to provide temporary channels for air and water movement through the soil profile. Topdressing applications during the summer should be light enough to water-in, as the wounding caused by dragging or brooming operations could cause a short-term increase in anthracnose activity.

CHEMICAL CONTROL

Successful control of anthracnose with fungicides requires a preventative approach. Although the precise timing of infection is unknown, the anthracnose pathogen likely infects turf plants long before the symptoms appear. Where anthracnose has been a persistent problem, a preventative fungicide program should be in place throughout the growing season. In less severely affected sites, a preventative program should be implemented prior to the onset of summer stress and during extended periods of cool, cloudy weather.

The anthracnose pathogen can become resistant to certain fungicides very quickly. In a recent survey of *C. cereale* populations in North Carolina, all isolates were resistant to the benzimidazole fungicides, and most exhibited some level of resistance to the Qols. Research at the University of California-Riverside has shown that DMI resistance is developing slowly in anthracnose populations as well. Golf course superintendents should tank-mix and rotate fungicide classes regularly to slow the development of resistance and reduce their reliance on a single fungicide chemistry.

Fungicide	Efficacy ⁽¹⁾	Resistance Risk ⁽²⁾	Class ⁽³⁾	Products ⁽⁴⁾
pyraclostrobin + boscalid**	++++	9	carboxamide + Qol	Honor

Fungicide	Efficacy ⁽¹⁾	Resistance Risk ⁽²⁾	Class ⁽³⁾	Products ⁽⁴⁾
tebuconazole**	++++	6	DMI	Torque
chlorothalonil + propiconazole + fludioxonil**	++++	3	DMI + nitrile + phenylpyrrole	Instrata
azoxystrobin + propiconazole	++++	9	DMI + QoI	Headway
fluoxastrobin + myclobutanil	++++	9	DMI + QoI	Disarm M
chlorothalonil + fluoxastrobin**	++++	9	nitrile + QoI	Disarm C
azoxystrobin	++++	9	QoI	Heritage
fluoxastrobin	++++	9	QoI	Disarm, Disarm G
pyraclostrobin	++++	9	QoI	Insignia
thiophanate-methyl	+++	9	benzimidazole	3336, Fungo, Systec, T-Bird, T-Storm, Tee-Off, TM
flutolanil + thiophanate-methyl	+++	9	benzimidazole + carboxamide	SysStar
iprodione + thiophanate-methyl**	+++	9	benzimidazole + dicarboxamide	26/36, Dovetail, Fluid Fungicide
chlorothalonil + thiophanate-methyl**	+++	6	benzimidazole + nitrile	Spectro, ConSyst, Peregrine, Tee-1-Up, TM/C
mancozeb + myclobutanil**	+++	6	dithiocarbamate + DMI	Manhandle
fenarimol**	+++	6	DMI	Rubigan
metconazole	+++	6	DMI	Tourney
myclobutanil	+++	6	DMI	Eagle, Myclobutanil
propiconazole	+++	6	DMI	Banner MAXX, Kestrel, Kestrel MEX, ProPensity, Propiconazole, Propiconazole G-Pro, Propiconazole Pro, Savvi, Spectator, Strider
triticonazole	+++	6	DMI	Trinity, Triton
chlorothalonil + propiconazole**	+++	4	DMI + nitrile	Concert
chlorothalonil**	+++	3	nitrile	Daconil, Chlorostar, Chlorothalonil, Echo, Legend, Manicure, Pegasus
chlorothalonil + phosphorous acid**	+++	6	nitrile + phosphonate	Vitalonil
fludioxonil	+++	3	phenylpyrrole	Medallion
polyoxin D	+++	6	polyoxins	Endorse, Affirm
triadimefon	++	6	DMI	Bayleton, Granular Turf Fungicide, Systemic Fungicide
triadimefon + trifloxystrobin	++	9	DMI + QoI	Armada, Tartan
trifloxystrobin	++	9	QoI	Compass
mineral oil**	?	3	hydrocarbon	Civitas

** Not for application to residential lawns.

Footnotes:

(1) **Efficacy Codes:**

++++	excellent control when conditions are highly favorable for disease development
+++	good control when disease pressure is high, or excellent control when disease pressure is moderate
++	good control when disease pressure is moderate, excellent control when disease pressure is low
+	good control when disease pressure is low
0	does not provide adequate control under any conditions
?	cannot be rated due to insufficient data

(2) **Resistance Risk:**

- 1 Rotating and tank-mixing not necessary, but recommended to avoid potential side effects from continuous use of same chemical class.
- 2 Rotate to different chemical class after 3-4 applications; tank-mixing not necessary.
- 3 Rotate to different chemical class after 2-3 applications; tank-mixing not necessary.
- 4 Rotate to different chemical class after 1-2 applications; tank-mixing not necessary.
- 6 Rotate to different chemical class after 1-2 applications; tank-mixing with low or moderate risk product recommended.
- 9 Rotate to different chemical class after EVERY application; tank-mix with low or moderate risk product for EVERY application.

(3) Continual use of fungicides with similar control mechanisms (modes of action) can result in fungi that are resistant to some chemicals. Poor or ineffective disease control can be expected when this occurs. Managers can reduce the chances of this happening by mixing or alternating fungicides belonging to different chemical classes.

(4) Recommendations of specific chemicals are based upon information on the manufacturer's label and performance in a limited number of trials. Because environmental conditions and methods of application may vary widely, performance of the chemical will not always conform to the safety and pest control standards indicated by experimental data. When more than one brand name exists for an agricultural chemical, the name of brand that first came onto the market is listed first. Otherwise, brand names are listed in alphabetical order. The order in which brand names are given is not an indication of a recommendation or criticism.

Recommendations for the use of agricultural chemicals are included in this publication as a convenience to the reader. The use of brand names and any mention or listing of commercial products or services does not imply endorsement by North Carolina State University or discrimination against similar products or services not mentioned. Other brand names may be labeled for use on turfgrasses. Individuals who use agricultural chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage regulations and examine a current product label before applying any chemical. For assistance, contact your county's Cooperative Extension agent.

Useful links:

Glossary: <http://www.turffiles.ncsu.edu/Glossary.aspx>

Turf Diagnostics Lab: <http://ncstateturfdiagnostics.com/TDL/Home.html>

Turfgrass Disease Identification Program: <http://www.turffiles.ncsu.edu/diseaseID/>

Turfgrass Disease Management Program: <http://www.turffiles.ncsu.edu/diseasemgmt/>

Turf Irrigation Management System: <http://www.turffiles.ncsu.edu/tims/>

© North Carolina State University. This information sheet was prepared by Lane P. Tredway, Gail G. Wilkerson, Bridget R. Lassiter, Jenifer J. Reynolds, and Gregory S. Buol. Departments of Plant Pathology and Crop Science, College of Agriculture & Life Sciences, North Carolina State University. Prepared February 8, 2011. Available on-line at www.turffiles.ncsu.edu. This publication was made possible through a grant provided by the Center for Turfgrass Environmental Research & Education (CENTERE) whose purpose is to support worthwhile projects that will benefit both the private sector and the public, and protect the environment.