

Symptoms of nutrient deficiency include:
Chlorosis, necrosis, reduced tillering,
lack of growth or over loss of stand resulting
in weed invasion.

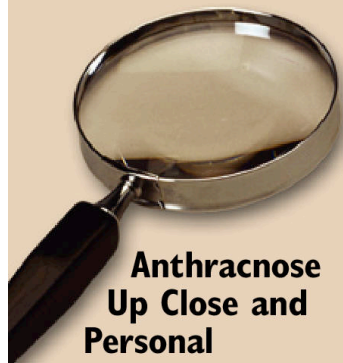
"the essential material available
is almost to a point of approaching
the critical minimum
tend to be the limiting factor."

Crown Rot Anthracnose

Photosynthesis



Rooted in Science



Anthracnose Up Close and Personal

Anthracnose first appears on annual bluegrass as 1/4- to 1/2-inch-diameter spots of yellow to orange-brown turf (top photo), which can progress to large, irregularly shaped areas on infected putting greens, tees, or fairways. Infection often first occurs on older or senescing leaves of plants, causing yellow leaf lesions (middle photo). "Basal stem rot" refers to the stage when the pathogen attacks leaf sheaths, stems, and the crown. Lesions on these plant parts initially appear water-soaked, but quickly turn black as tissue is destroyed. At this point, damaged shoots are easily pulled from the infected crown and the entire plant may die. Upon close examination with a magnifying glass or 10x hand lens, affected foliage and stems are often covered with small, black reproductive structures called *acervuli* (diagnostic feature). As *acervuli* mature, long black spines (*setae*) are produced (bottom photo). Each *acervulus* contains dozens of one-celled, crescent-shaped, asexual spores called *conidia*. The *conidia* are readily moved by wind, water, or other mechanical means to uninfected turf and cause infection.



NOVEMBER-DECEMBER 2007 9

- **Plant health** is a key factor that determines disease severity.
- **Carbohydrate** starved annual bluegrass is more susceptible to anthracnose.
- **Resistance** to systemic fungicides (site-specific mode of action) is a major concern.



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Best management practices for anthracnose on annual bluegrass turf

Although our understanding of anthracnose disease on *Poa annua* greens is incomplete, several cultural and management practices can reduce its occurrence and its severity.

Anthracnose (caused by *Colletotrichum cereale*) is a destructive fungal disease of weakened turf that occurs throughout the U.S., Canada and Western Europe (15) and is particularly severe on annual bluegrass (*Poa annua*). The frequency and severity of anthracnose epiphytotic on golf course greens has increased over the past decade (13,14) and is thought to be associated with some of the management practices used by superintendents to improve playability and ball-roll distance. Combinations of management factors may be enhancing the severity of this disease.

Scientists within the NE-1025 multistate turf research project are studying the biology, ecology and management of anthracnose of annual bluegrass turf on golf courses. They are examining the biology of the pathogen, assessing fungicidal control and fungicide resistance development, evaluating the effect of cultural practices on anthracnose severity and developing annual bluegrass and bentgrass selections for resistance to this disease. Completed and ongoing field trials within this five-year project (2005-2010) have evaluated registered and experimental fungicides, fungicide programs and annual bluegrass management practices, including nitrogen fertility, chemical growth regulation, mowing, rolling, topdressing, verticutting and irrigation as well as the potential interaction among practices. Ultimately, results from these experiments will be used to devise a comprehensive set of best management practices for the control of anthracnose disease on golf courses.

Host susceptibility

Anthracnose can be found on cool- and warm-season turf in roughs, fairways and tees, but often the disease is most destructive on annual bluegrass maintained at a putting green height of cut. Outbreaks are also increasingly common on creeping bentgrass (*Agrostis stolonifera*) and may develop on other cool-season turf species including ryegrasses (*Lolium* species), fescues (*Festuca* species), Kentucky bluegrass (*Poa pratensis*) and velvet bentgrass (*A. canina*).

Although the disease is often most severe during warm weather, outbreaks may occur throughout the year, causing either a foliar blight or a basal rot of leaf sheaths, crowns and stolons (15).

Anthracnose is often present on turf mowed at a higher height without producing severe damage, which suggests that plant health (vigor and stress) is a major factor that determines disease severity. The disease can cause extensive injury on turf maintained at low fertility, very low mowing heights or turf grown under suboptimal conditions (drought stress, excess shade, high humidity).

The greater susceptibility of annual bluegrass to anthracnose is probably related to a number of factors including the weak perennial nature of this grass species. Annual bluegrass is well known for its prolific seedhead (flowering) expression that occurs predominantly in the spring (April through early June). Seedhead development requires considerable metabolic energy, which reallocates photosynthate away from roots and shoots toward seedheads just before the most stressful time of



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August 2008 GCM 93

- Low-rate **soluble nitrogen** fertilization (.10 lbs. per 1,000) every 7 days has the greatest reduction in anthracnose.
- **Phosphites** are very effective against anthracnose when used preventatively.
- Multi-site **contact fungicides** like chlorothalonil are very effective when used preventatively and are an important strategy against resistance.



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MSU 2008-2009 Crown Rot Anthracnose

Weeks 1 & 3		Weeks 2 & 4	
Product	Rate/1000	Product	Rate/1000
Power C3 23-0-0	6.0 oz.	Power C3 23-0-0	6.0 oz.
P48 (Power 6-12-3)	.10 lbs.	P48 (Power 6-12-3)	.10 lbs.
PK Fight	2.0 oz.	PK Fight	2.0 oz.
Chlorothalonil (Echo)	2.0 oz.	Chlorothalonil (Echo)	2.0 oz.
Astron	1.5 oz.	Astron	1.5 oz.
Renaissance (Knife Plus)	1.0 oz.	Renaissance (Knife Plus)	1.0 oz.
Protesyn	3.0 oz.	Floradox Pro	3.0 oz.

Applied Weekly from mid-May through August

Weekly NPK per 1,000: .10# N - .05# P - .08# K



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Crown Rot Anthracnose

2 0 0 8	Treatment and Rate	Interval (Days)	% Disease (8/6/08)
	Floratine Foliar + Echo Ultimate 2.0 oz.	7	1.75%
	Disarm C 4.32 oz.	14	3.63%
	Instrata 4.0 oz.	14	2.50%
	Concert 4.5 oz	14	3.38%
	Signature 4.0 oz + Daconil Weather Stik 3.6 oz Banner Maxx 2.0 oz (alt.)	14	6.75%
	Trinity 1.0 oz	14	9.00%
	Insignia 0.7 oz + Trinity 1.0 oz	14	7.13%
	Insignia 0.9 oz	14	10.25%
	Endorse 4.0 oz + Alude 6.0 oz	14	10.25%
	Banner Maxx 2.0	14	9.50%
	Untreated Control	--	17.00%

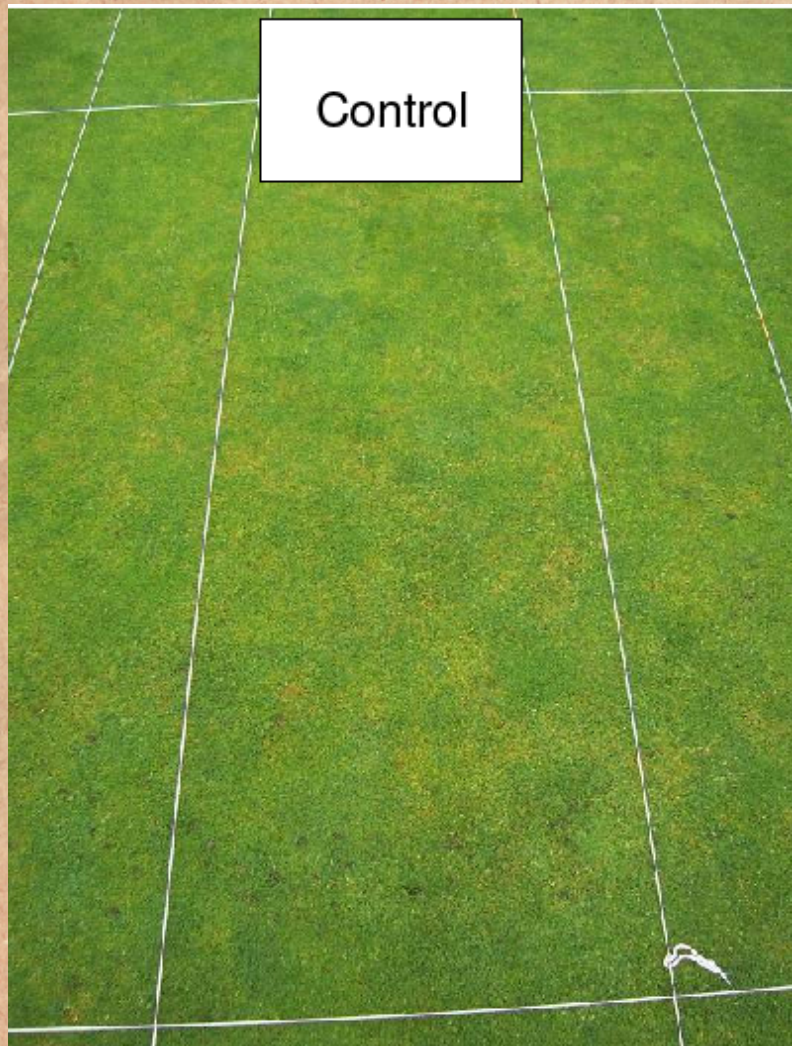
2 0 0 9	Treatment and Rate	Interval (Days)	% Disease (8/16/09)
	Floratine Foliar + Echo Ultimate 2.0 oz.	7	1.60%
	Triton Flo 0.5 + Signature 4.0	14	4.50%
	Triton Flo 0.5 + Signature 4.0 Daconil Ult 3.2 + Signature 4.0	14	7.50%
	Tartan 2.0 oz.	14	8.30%
	Instrata 9.3 oz.	14	9.00%
	Concert 5.0	14	18.80%
	Disarm 480SC 0.36 oz.	14	25.00%
	Honor 1.1 oz.	14	26.30%
	Trinity 1.0 oz.	14	28.80%
	Banner Maxx 2.0 oz.	14	30.00%
	Tourney 0.37 oz.	14	31.30%
	Untreated Control	--	57.50%

Most Effective Treatment - 2008 & 2009



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2009 MSU Crown Rot Anthracnose Study



*Symptoms of nutrient deficiency include
Chlorosis, necrosis, reduced tillering,
lack of growth or over loss of hard wintering
in weed invasion*

Control Plot

Final Rating

08/16/09

% Disease

57.5%



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2009 MSU Crown Rot Anthracnose Study



**Final
Rating**

08/16/09

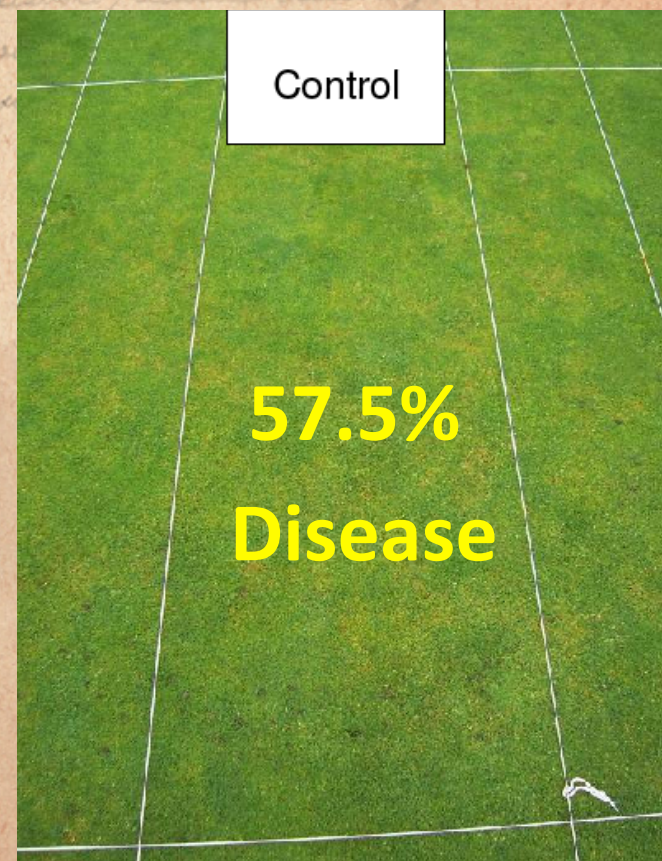
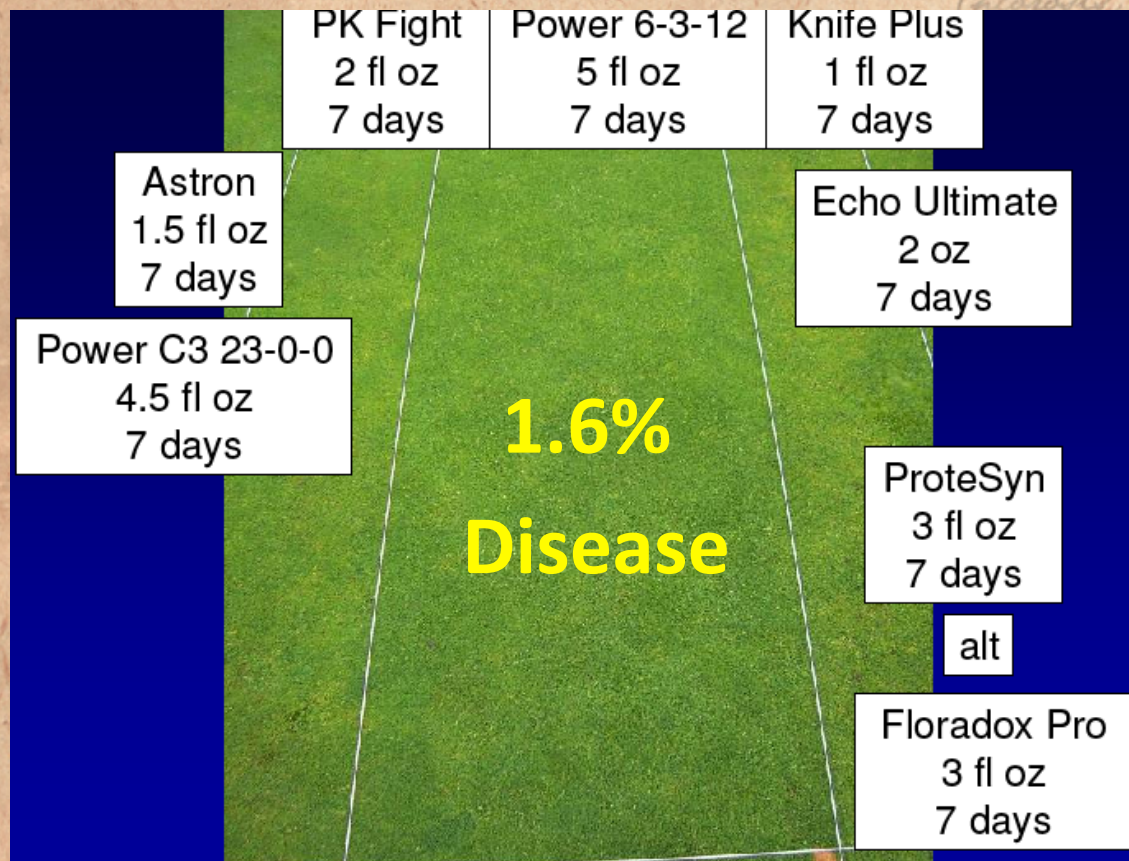
% Disease

1.6%



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2009 MSU Crown Rot Anthracnose Study



Photosynthesis



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