



The Other Turfgrass Diseases

Damon L. Smith
Department of Entomology and Plant Pathology,
Oklahoma State University
Stillwater, OK





Dollar Spot

- Important disease of creeping bentgrass putting greens, tall fescue, bermudagrass, and other warm- and cool-season grasses in Oklahoma
- Pathogen: *Sclerotinia homoeocarpa*
- Occurrence: Warm humid weather with cool night – Dew events
- Spring and fall problem in Oklahoma
- More severe in nitrogen deficient turf





Dollar Spot of Turfgrass

Damon L. Smith
Assistant Professor/State Specialist, Horticultural Crops Pathology

Nathan R. Walker
Turfgrass IPM Scientist/Turfgrass Pathologist

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Dollar spot is a common foliar disease that occurs on most types of turfgrasses (bermudagrass, bermudagrass, bluegrass, buffalograss, fescue, ryegrass, and zoysiagrass) throughout Oklahoma. However, this disease is often most severe on turfgrass in residential lawns maintained under a low nitrogen fertility program and on bentgrass golf greens. In Oklahoma, dollar spot is most prevalent in late spring to early fall when high humidity and cool nights favor the formation of dew on turfgrass for extended periods and temperature is most conducive for growth of the fungus.

Symptoms and Signs

Symptoms of dollar spot vary with turfgrass species and management practices. On closely mowed turfgrass, such as bentgrass golf greens, the characteristic symptoms of dollar spot are small, circular, straw-colored, sunken patches that rarely exceed two to three inches in diameter (Figure 1). If the disease becomes severe or is left unmanaged, individual spots may coalesce forming larger, irregular patches of blighted turfgrass that can die back to the soil surface. On residential lawns and taller turfgrasses, symptoms appear in irregularly shaped, bleached patches ranging from four to six inches or more in diameter (Figure 2). Patches may coalesce to cover large areas.

Individual infected leaves exhibit lesions (spots) that are first chlorotic (pale green or yellow), then water-soaked, and finally a bleached straw color (Figure 3). Dollar spot lesions are characteristically bounded by a tan to reddish-brown margin (Figure 4). However, these borders do not usually occur on annual bluegrass. Leaf lesions can expand extending across the entire leaf, resulting in girdling of blades and dieback from leaf tips. Individual leaf blades may have a single lesion, many small lesions, or be entirely blighted. Leaf symptoms can be



Figure 2. Symptoms of dollar spot on a residential lawn planted with bermudagrass.



Figure 3. Leaf spot symptoms bleached leaves characteristic of dollar spot on bermudagrass

confused with those caused by *Pythium* blight and *Rhizoctonia* brown patch.

In the early morning when dew is present on grass blades and the pathogen is active, a white, cottony growth (mycelium) may be seen in the affected patches. The white, cottony growth resembles that of other fungi such as *Pythium* and *Rhizoctonia* or can be confused with windborne seeds of various trees (e.g. cottonwood). The growth rapidly disappears as leaves dry.

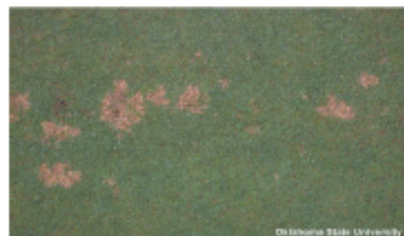


Figure 1. Symptoms of dollar spot on a creeping bentgrass putting green.



Dollar Spot

- Closely mowed grasses
 - Small sunken circular patches (≤ 2 inches)
- Taller grasses
 - Larger, irregularly-shaped, bleached patches (≤ 6 inches)
- Leaf symptoms
 - Tan lesions with reddish-brown/purple margins
 - Water soaked lesions
 - Yellow or straw colored after death
 - Cottony growth present when dew is heavy





Dollar Spot

Control

- Minimize leaf wetness period
- Maintain adequate soil fertility – esp. Nitrogen
- Reduce thatch and soil compaction
- Fungicides (Eagle, Banner, Curalan, Trinity, Emerald etc.; **DO NOT USE HERITAGE**)



2009 Creeping Bentgrass Fungicide Program Trials



Objective: To evaluate season-long fungicide programs for control of dollar spot and brown patch on creeping bentgrass putting greens





Methods

- Location: OSU Turfgrass Research Center
- Host: Creeping bentgrass 'Pennncross'
- Fungicide programs evaluated were developed by BASF Crop Protection, Cleary Chemical, and Oklahoma State University





Treatment and Rate/1000 ft ²	Timing ^z
Non-treated Check	N/A
OSU 1	
Banner Maxx 1.3ME 1.00 oz	1
Emerald 70WG 0.13 oz + Trinity 1.67SC 1.00 oz	2
Curalan 50EG 1.00 oz	3
Honor 28 WG 1.10 oz	4,8
Iprodione Pro 2SE 4.00 oz + Daconil Ultrex 82.5WG 3.20oz	5,7
Fore 80WP 4.00 oz + Heritage 50WDG 0.30 oz	6
Curalan 50EG 1.00 oz + Triton FLO 367SC 0.50 oz	9
3336 Plus 19.4F 4.00 oz.....	10
BASF 1	
Emerald 70WG 0.13 oz	1
Trinity 1.67SC 1.00 oz + Daconil Ultrex 82.5WG 3.20oz	2,10
Insignia 20WG 0.90 oz	3,5,8
Chipco Signature Ultra 80WG 4.00 oz + Daconil Ultrex 82.5WG 3.20oz	4,6
Iprodione Pro 2SE 4.00 oz + Daconil Ultrex 82.5WG 3.20oz	7
Emerald 70WG 0.13 oz + Iprodione Pro 2SE 4.00 oz	9
OSU 2	
Emerald 70WG 0.13 oz + Trinity 1.67SC 1.00 oz	1
Banner Maxx 1.3ME 1.00 oz + Daconil Ultrex 82.5WG 3.20oz	2
3336 Plus 19.4F 4.00 oz	3
Spectro 90WDG 5.80 oz	4
Fore 80WP 4.00 oz + Heritage 50WDG 0.30 oz	5
Iprodione Pro 2SE 4.00 oz + Daconil Ultrex 82.5WG 3.20oz	6
Endorse 2.5WP 4.00 oz	7
Trinity 1.67SC 1.00 oz + Daconil Ultrex 82.5WG 3.20oz	8
Emerald 70WG 0.13 oz	9
Curalan 50EG 1.00 oz	10
ADVISORY	
Emerald 70WG 0.13 oz + Trinity 1.67SC 1.00 oz	1,4,8
3336 Plus 19.4F 4.00 oz	2,6,9
Emerald 70WG 0.13 oz + Daconil Ultrex 82.5WG 3.20oz	3
Emerald 70WG 0.13 oz + Daconil Ultrex 82.5WG 3.20oz + Heritage 50WDG 0.30 oz	7
BASF 2	
Honor 28 WG 1.10 oz	1,5,8,10
Trinity 1.67SC 1.00 oz + Daconil Ultrex 82.5 WG 3.20oz	2,9
Emerald 70WG 0.13 oz + Iprodione Pro 2SE 4.00 oz	3
Chipco Signature Ultra 80WG 4.00 oz + Daconil Ultrex 82.5WG 3.20oz	4
Spectro 90WDG 5.80 oz	6
Iprodione Pro 2SE 4.00 oz + Daconil Ultrex 82.5 WG 3.20oz.....	7
CLEARY	
Curalan 50EG 1.00 oz	1
Strider 1.3MEC 2.00 oz + Legend 54F 3.60 oz	2
3336 Plus 19.4F 3.00 oz + Legend 54F 3.60 oz + Alude 5F 6.00 oz	3
26/36 4F 3.00 oz + Alude 5F 6.00 oz	4
Heritage 50WDG 0.40 oz + Protect 75DF 4.00 oz + Alude 5F 6.00 oz	5
Spectro 90WDG 5.00 oz + Alude 5F 6.00 oz	6
Strider 1.3MEC 1.00 oz + Legend 54F 3.60 oz + Alude 5F 6.00 oz	7
26/36 4F 3.00 oz	8
Spectro 90WDG 4.00 oz.....	9

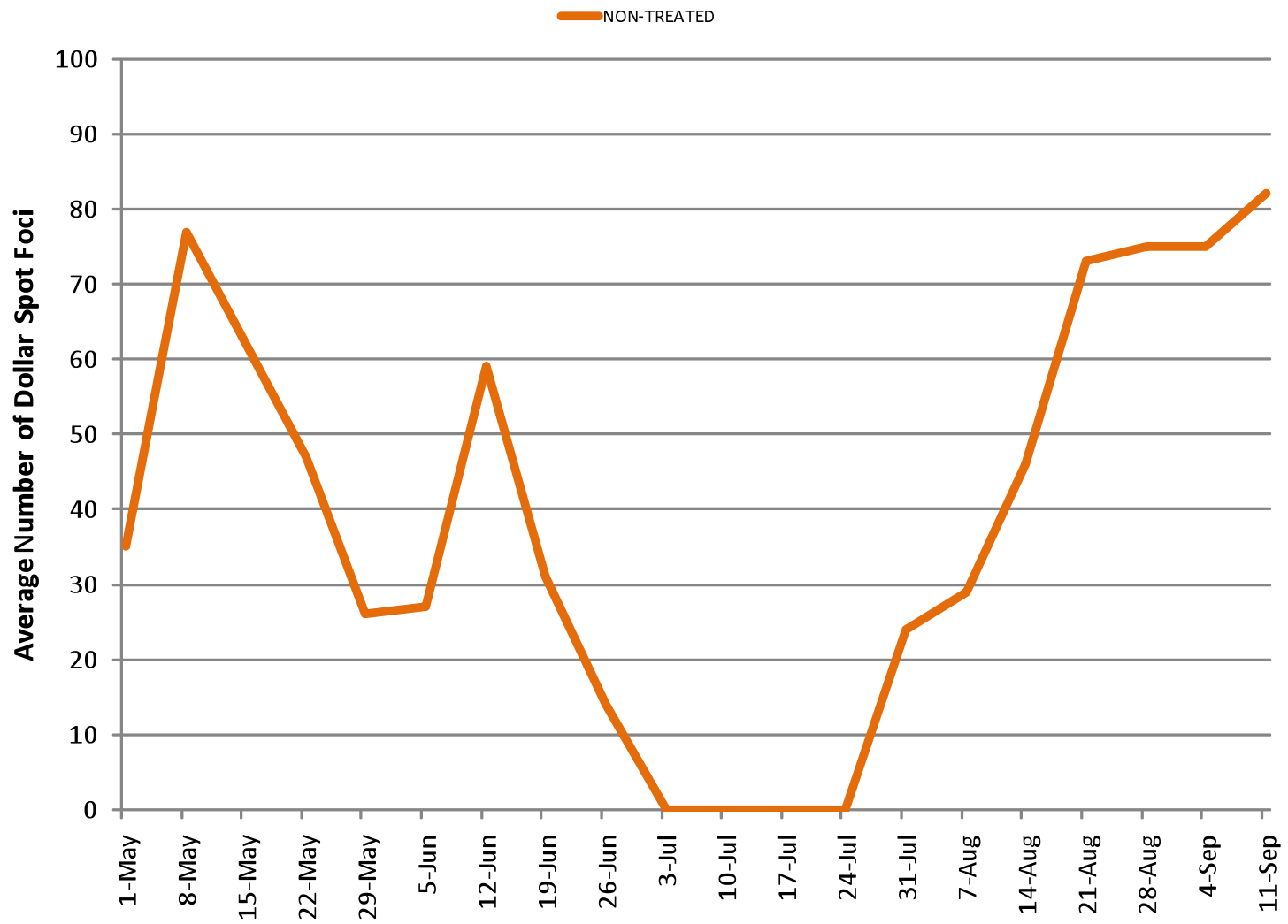


Methods

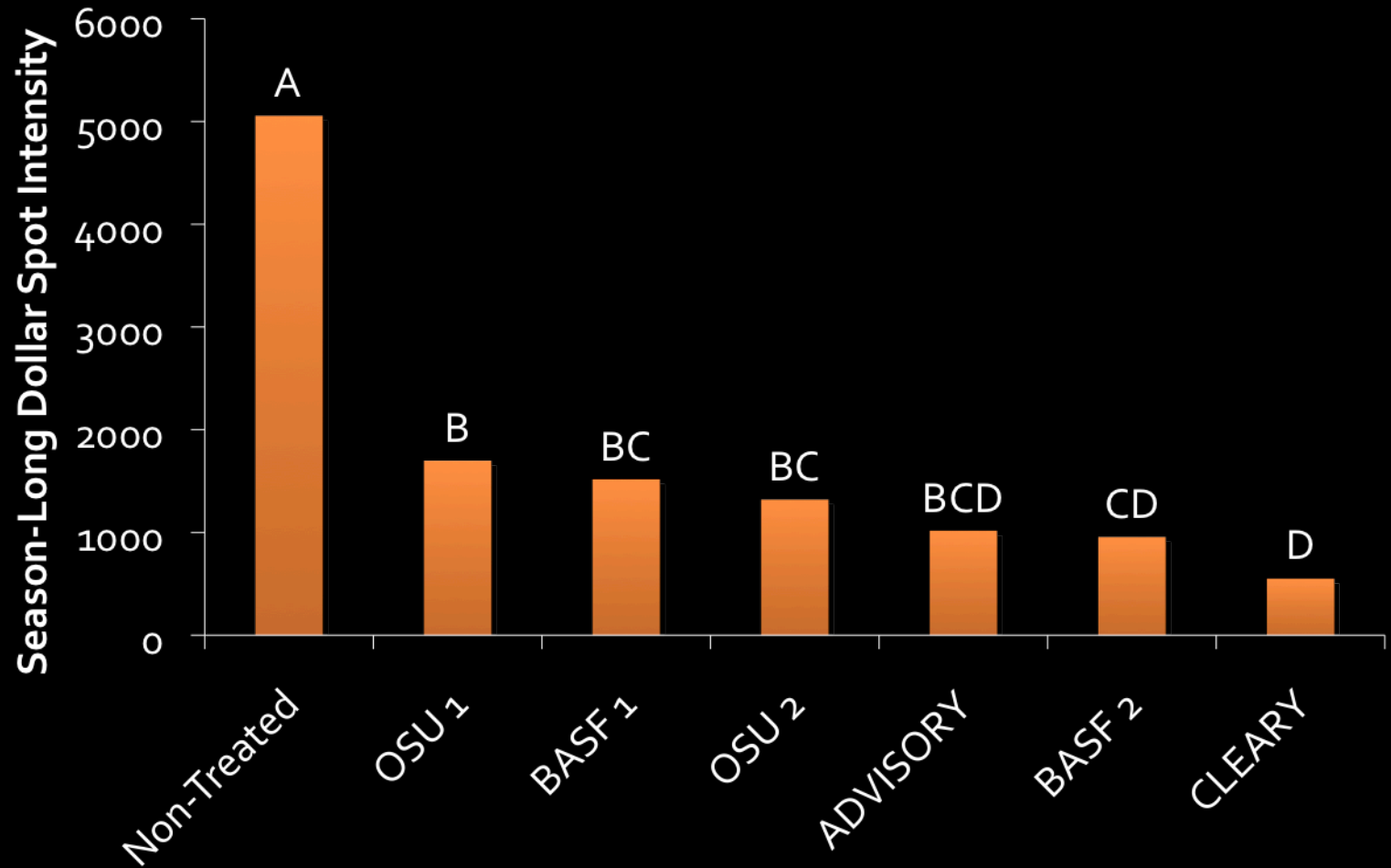
- First applications applied 1-May
- Subsequent applications applied at 14-day intervals (except ADVISORY treatment)
- ADVISORY treatments were applied according to the new dollar spot advisory
- Infested with *Sclerotinia homoeocarpa* 16-May
- Ratings conducted at 7-day intervals
- Ratings for dollar spot initiated 1-May



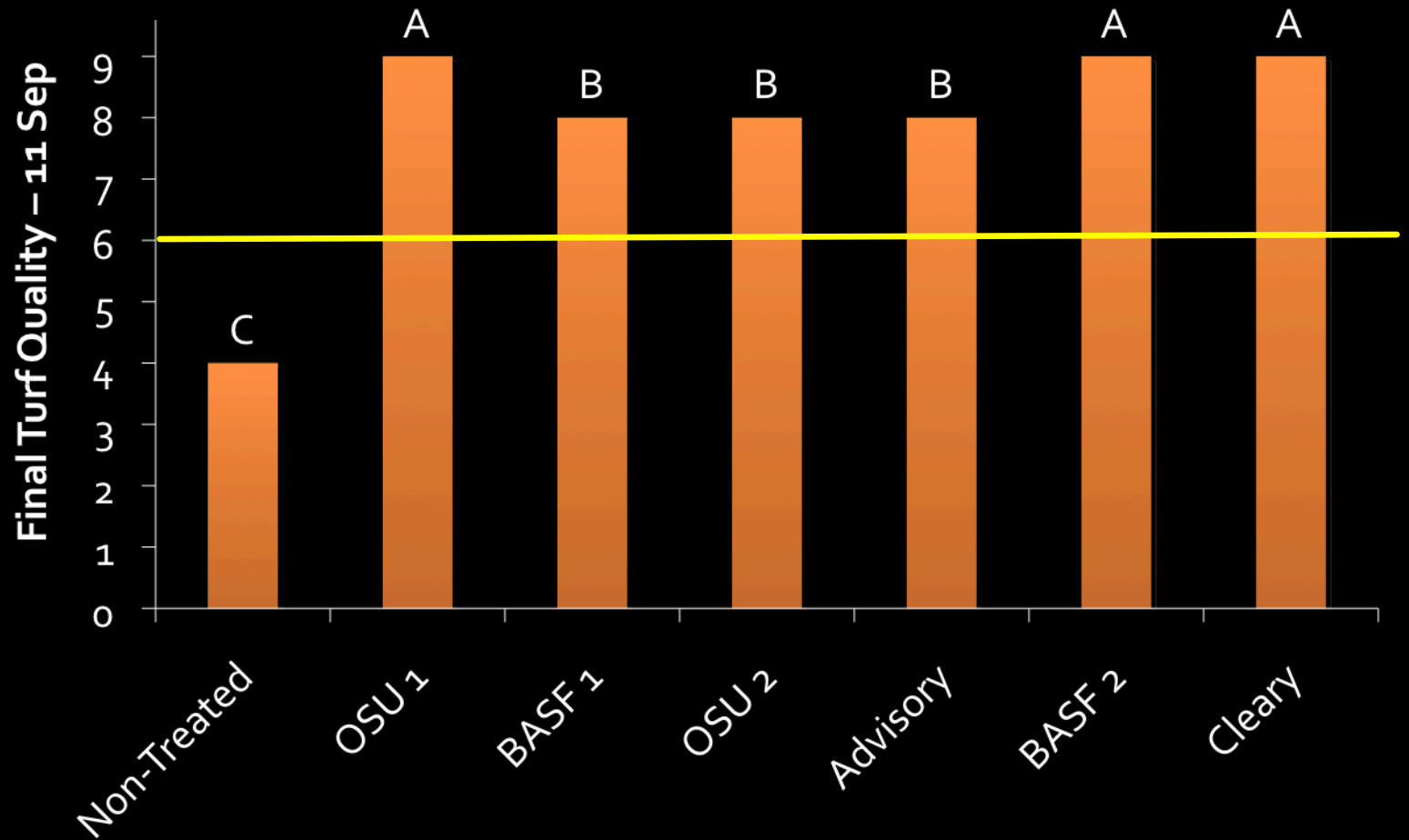
2009 Dollar Spot Progress



Results – Dollar Spot



Results – Final Turf Quality



Conclusions

- All fungicide programs resulted in highly acceptable turfgrass quality
- CLEARY program controlled dollar spot and brown patch to the highest degree throughout the season
- All other fungicide programs resulted in acceptable control of dollar spot
- ADVISORY program saved 2 sprays



Disease Advisories

- Advisories can help anticipate onset or increase of disease
- Can improve fungicide application timing
- Can help save fungicide applications



Dollar Spot Advisory

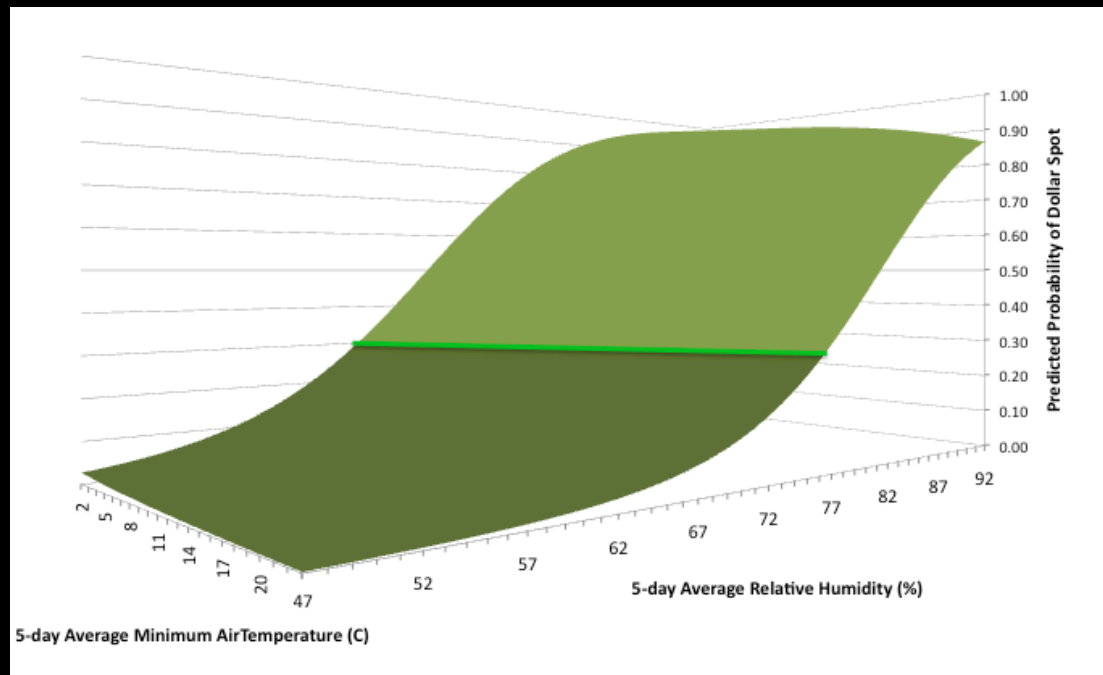
- Location: OSU Turfgrass Research Center, OK (Fall, Spring 2008; Spring 2009); OJ Noer Turfgrass Center, WI (3 locations – 2009 growing season)
- Host: Creeping bentgrass
- Treatments: Non-treated, Preventative, Curative
- New dollar spot foci counted daily
- Hourly weather data recorded



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Predictive Risk Advisory

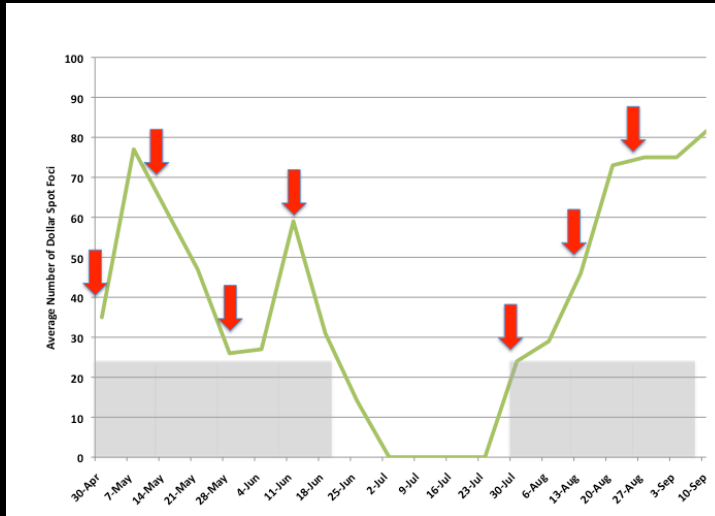
Moving Average	Best Model	Max-Rescaled R ²	Concordant (%)	Area Under ROC
5-day	-11.63 - 2.43 (FUNG) - 0.12 (MINAT) + 0.178(MEANRH)	0.46	88	0.88



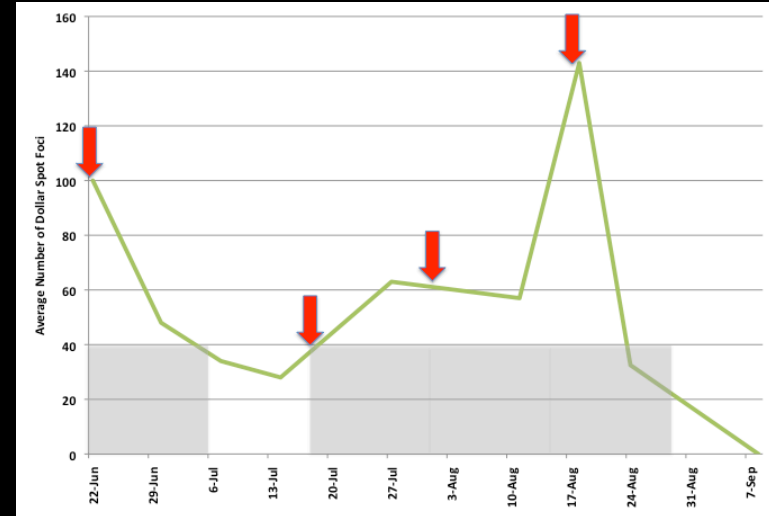
- n=423 (2,538 obs averaged across rep)
- Oklahoma and Wisconsin data






Dramatization - 2009



Oklahoma

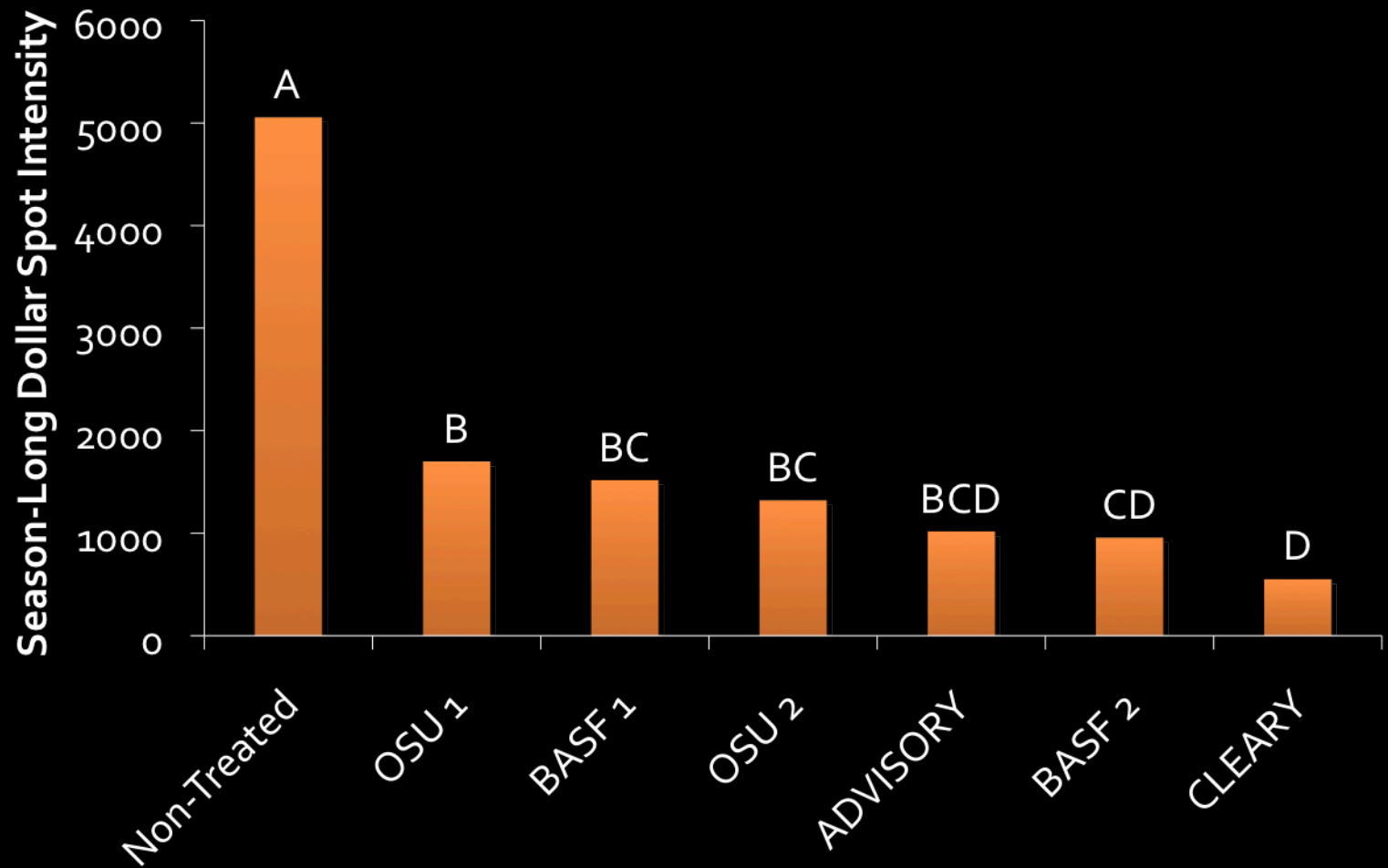


Wisconsin

-  = Advised Fungicide Application
-  = Actual number of dollar spot foci
-  = 14-day fungicide protection interval



Results – Earlier Version





Takeaway Message

- Fungus has a wide temperature range that it can grow → 50 F to 86 F (lab data not shown)
- Increasing Humidity = Increased Likelihood of dollar spot
- 5-day average humidity of 70% or more is sufficient for dollar spot
- Doesn't necessarily need to rain
- Dew events are sufficient



Large Patch



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Large Patch

Pathogen: *Rhizoctonia solani* (AG 2-2 IV)

R. solani (AG 2-2 IIIB) is the pathogen that causes brown patch of cool-season grasses

- Hosts (warm-season [C4] grasses): bermudagrass, zoysiagrass, St. Augustinegrass
- Occurrence: primarily in the spring and fall



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Large patch (Zoysia Patch) of Warm-Season Turfgrasses

Damon L. Smith
Assistant Professor/State Specialist, Horticultural Crops Pathology

Nathan R. Walker
Turfgrass IPM Scientist/Turfgrass Pathologist

Large patch is an occasional disease of warm-season turfgrasses (bermudagrass, zoysiagrass, and St. Augustinagrass) in Oklahoma. The disease can occur in residential, landscape, and recreational warm-season turfgrasses. In Oklahoma, the disease is most noticeable in early spring when turfgrasses are breaking dormancy and weather conditions are wet and mild. In some years, the disease is also evident in the fall. However, infection by the pathogen during this time of year may not always result in visible symptoms.

Symptoms and Signs

Affected areas may range from inches to many yards in length or diameter (Figures 1 and 2). The turf in affected areas will thin and grass leaves may appear bleached or yellow (Figure 3). Large circular, semi-circular, or arcs of damaged turf will be apparent. When the disease is active, the interface between healthy and diseased turf may appear orange or bronze in color (Figure 4). Orange-bronze borders of the patches are most apparent on zoysiagrass. Symptoms associated with other turf diseases including leaf lesions, a white, cottony growth (mycelium), and "smoke rings" at the edge of the diseased areas will be absent. Patches are perennial, typically expand in size and often can reach several yards in diameter. Affected shoots can be easily pulled from points of attachment (sheaths) and the base of the shoot may appear water soaked. As plant stand density is reduced, weed encroachment is common both during and after disease development (Figures 3 and 4).

Causal Agent and Disease Cycle

The fungus, *Rhizoctonia solani* is the causal agent of large patch. This fungus and several related species are responsible for numerous turfgrass diseases (including brown patch and yellow patch) that can occur at anytime on all grasses, except during very cold winters. The fungus overwinters as dormant thread-like fungal strands (mycelium) in infected plants or as special survival structures (sclerotia). The production of true spores does not occur. Therefore, spread of this fungus can occur through movement of infected plant parts or soil by equipment, people, animals, water, or wind. Epidemics are typically initiated when temperatures are mild and prolonged periods of high humidity exist. In Oklahoma, infection of susceptible grasses begins in late September when soil temperatures are

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Figure 1. Symptoms of large patch on a mixed sward of St. Augustinagrass and bermudagrass in Southeastern Oklahoma.



Figure 2. Symptoms of large patch on bermudagrass.

above 50° F, moisture is adequate, and may continue until dormancy. Fungal activity can resume in early spring but is suppressed by soil temperatures that exceed 85° F.

Turfgrass grown under high nitrogen fertility that is applied too late in the year or very early in the spring is more prone to the development of large patch. Turfgrass that is also excessively irrigated, has abundant thatch, or poor air circulation



Environmental Conditions

- Pathogen active when soil temperature falls below 21°C (70 °F)
- Symptoms don't typically appear in fall
- Symptoms noticed in the spring after green-up
- Extended wet periods and saturated soils favor disease development
- Excessive nitrogen exacerbates disease
- Zoysiagrass most susceptible, followed by St. Augustine, and Bermudagrass



Large Patch

Symptoms

- Appear as turf breaks or approaches dormancy
- “smoke ring” absent
- “Orange halo” present



Large Patch

Symptoms

- A reduction in the number of live tillers present in spring
- Weed encroachment common
- Lesions are generally absent
- Shoots may be pulled easily from sheath



Photo Credit: Lane Tredway, NCSU





Management

Cultural control

- Fertility, refrain from fertilizer applications until turf is actively growing
 - Avoid too much nitrogen when turf is actively growing
- Reduce thatch and soil compaction
- Reduce soil water saturation





Management

Fungicides

- Applied in the fall
- First application when soil temperatures @ 21°C (70 °F)
- Second application 28 days later
- Mapping of areas for spot treatment



Large Patch

Fungicide Trials 2008 – 2009

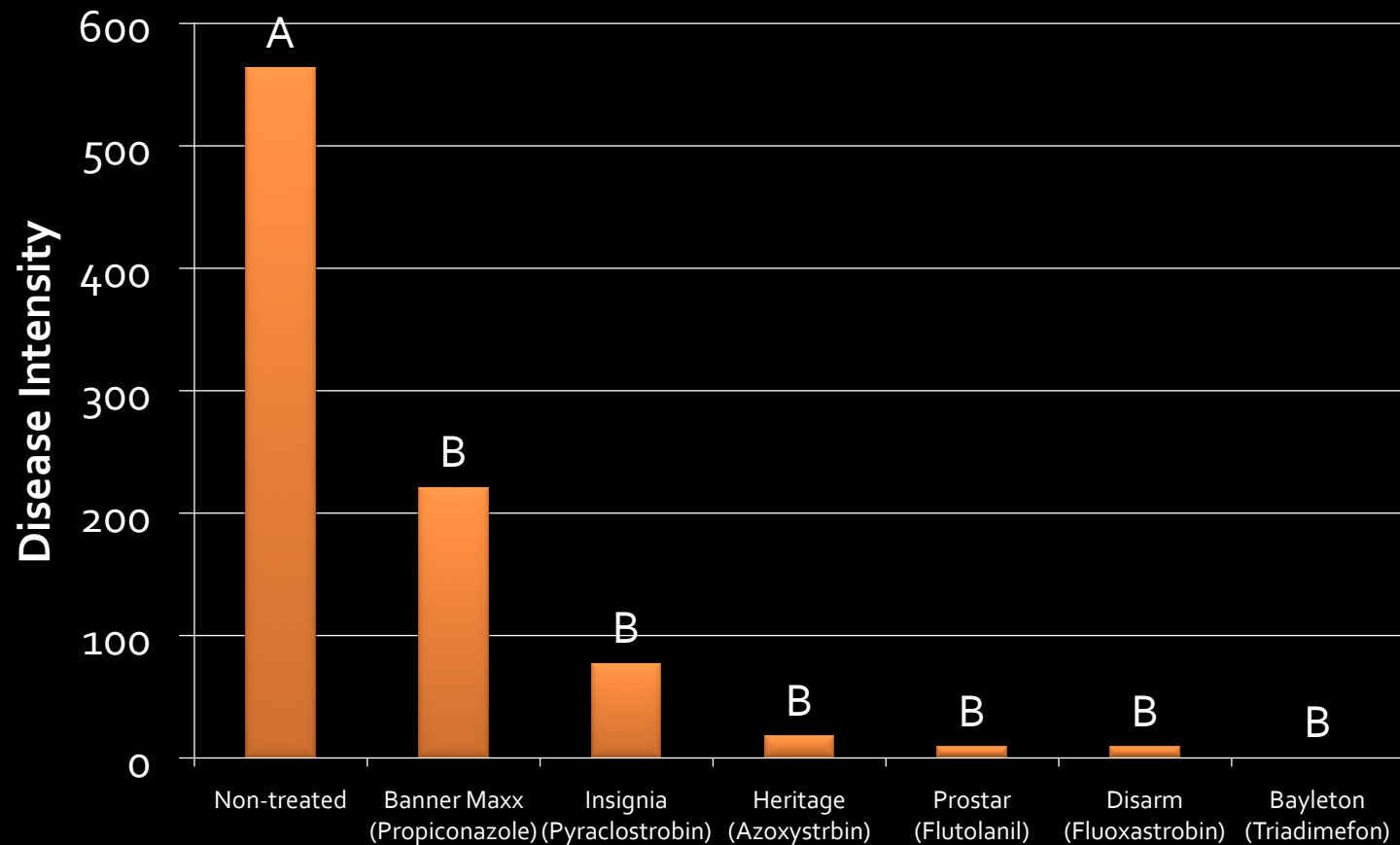
- Zoysiagrass – 'Meyer'
- First application – 26 Sep.
- Inoculated – 6 Oct.
- Second application – 24 Oct.
- Heavily irrigated until dormancy
- Rated Spring 2009 –
Percentage of plot diseased



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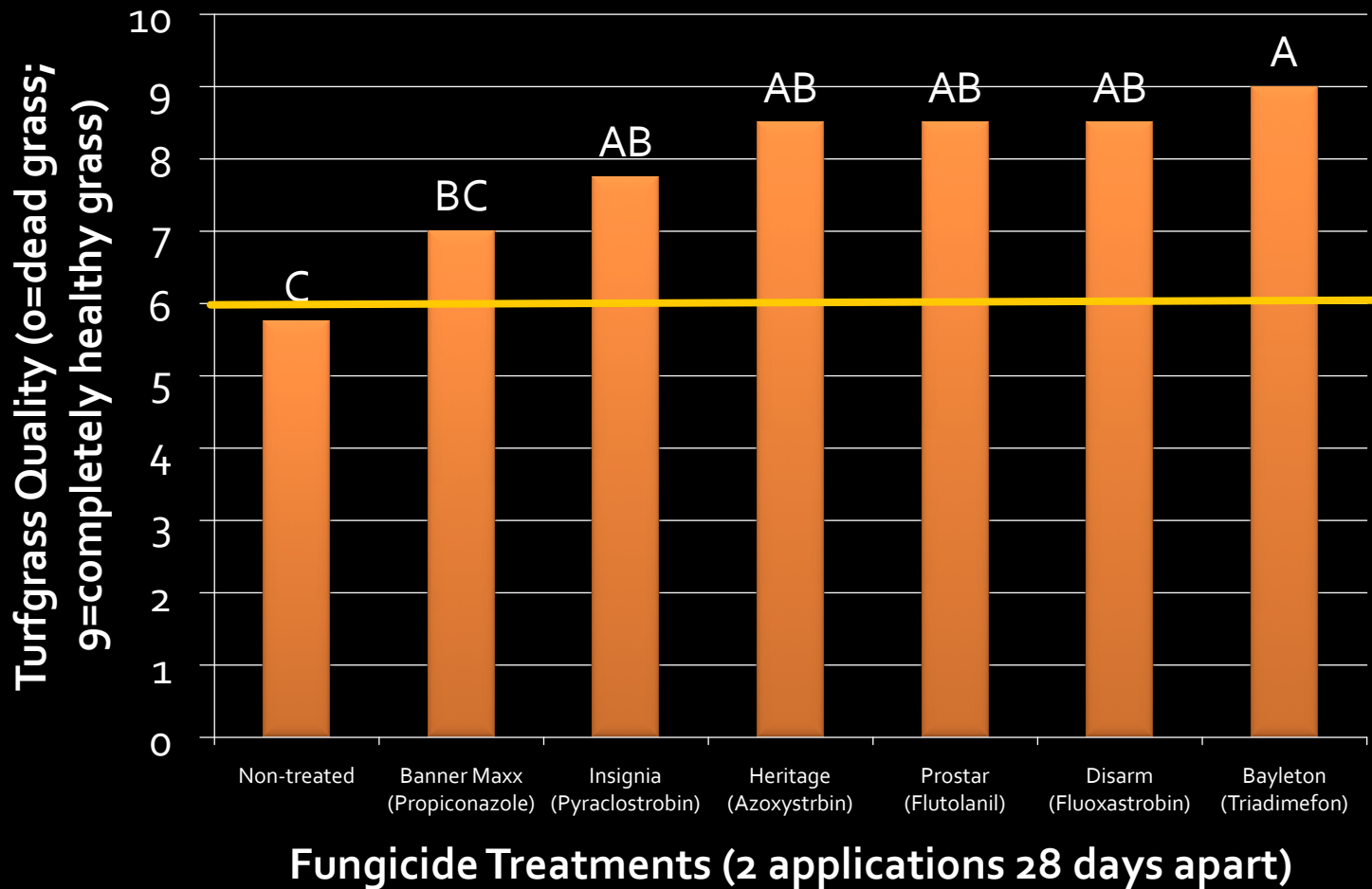
Results – Large Patch



Fungicide Treatments (2 applications 28 days apart)



Turf Quality – 22 May



2009 - 2010 Trials

Spray Interval Study

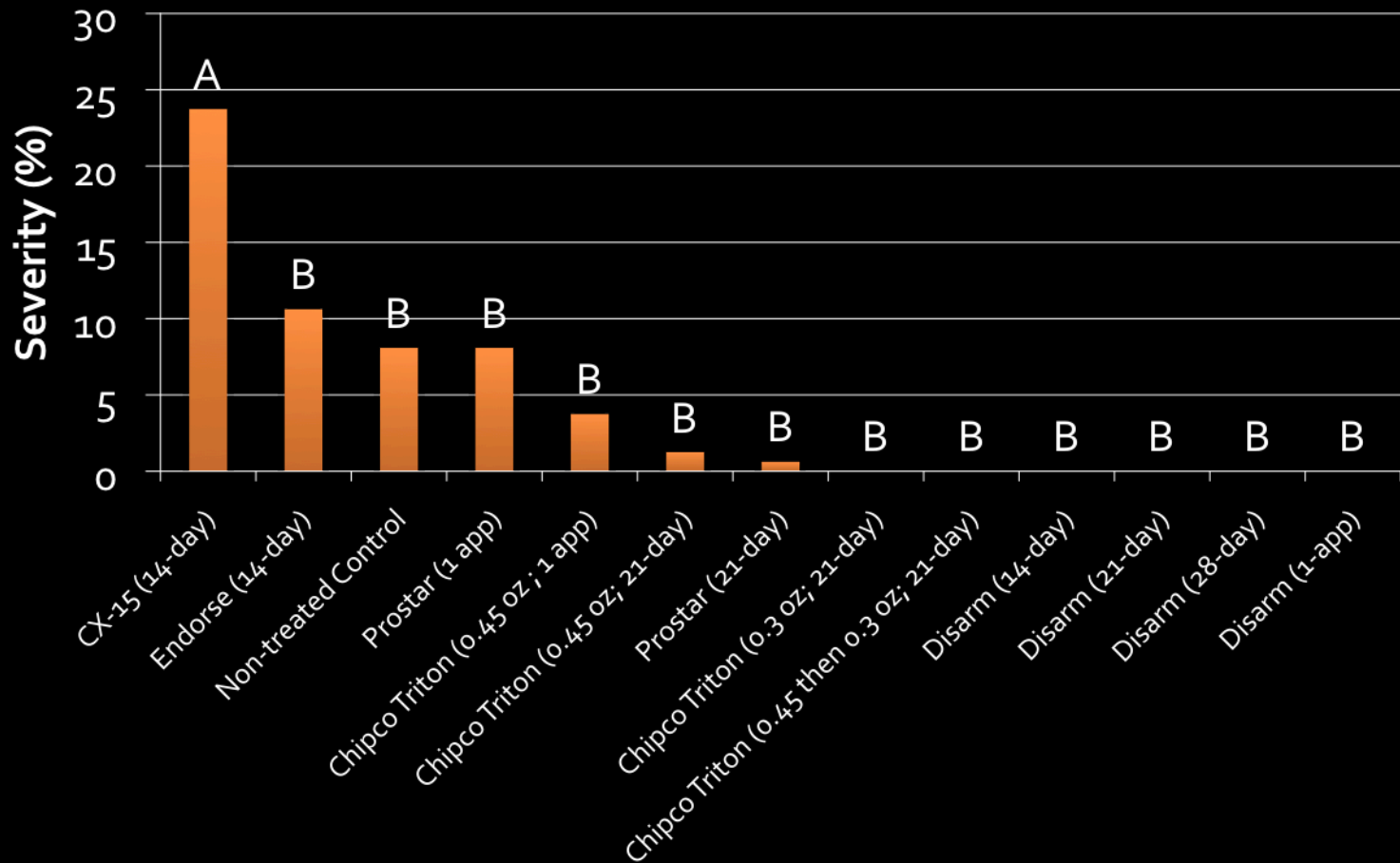
- Zoysiagrass – 'Meyer'
- First application – 17 Sep.
- Inoculated – 21 Sep.
- 14-day interval – 1 Oct.
- 21-day interval – 9 Oct.
- 28-day interval – 15 Oct.
- Rated Spring 5 May



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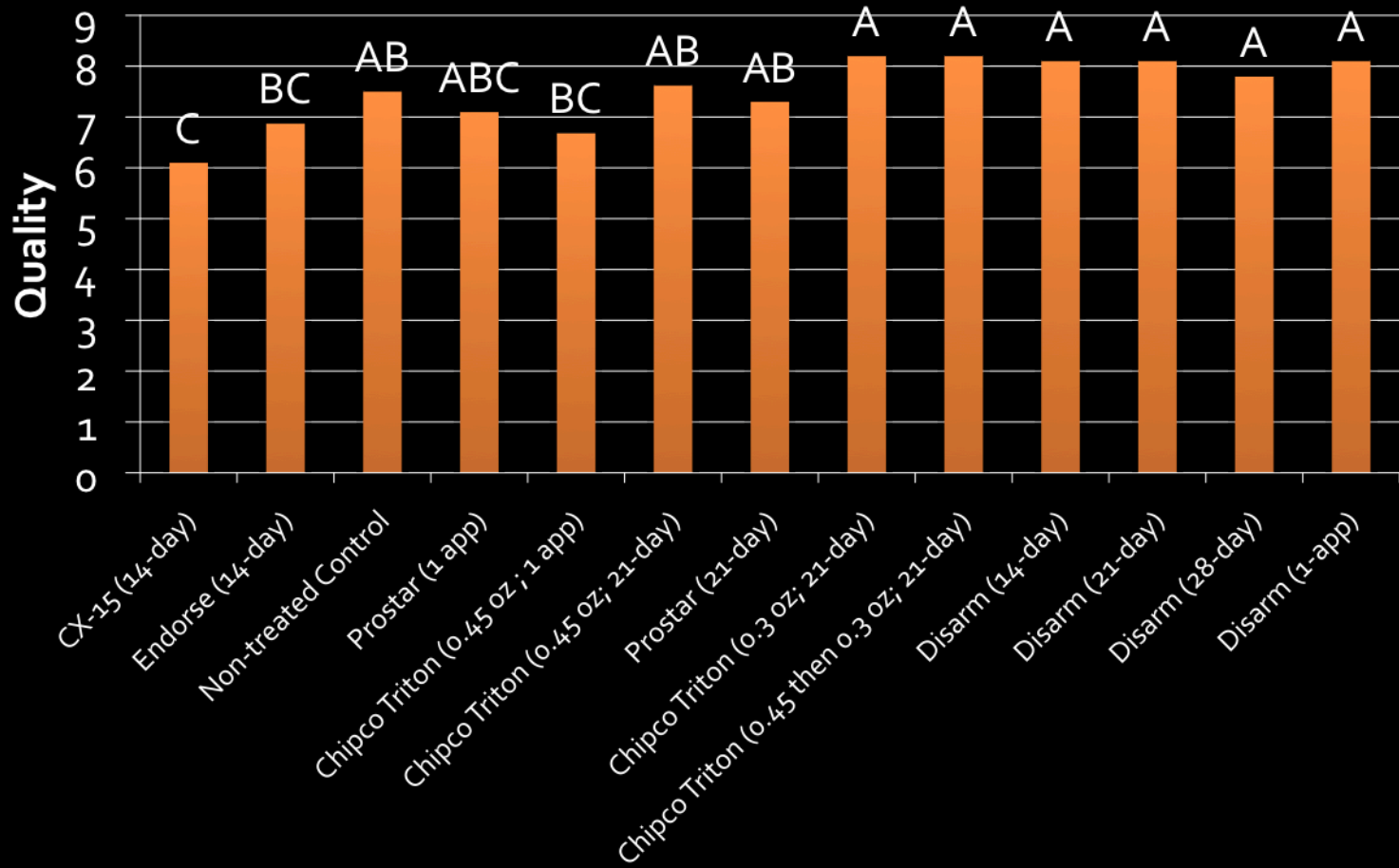
Severity – 3 May



Fisher's LSD = 11.4 %



Quality – 3 May



Fisher's LSD = 1.1



Bipolaris Diseases



Photo Credit: Steve Vann, University of Arkansas

Property of Oklahoma State University



Bipolaris Diseases

- Pathogens: *Bipolaris spp.*
- Can cause a leaf spot (spring and fall) and crown rot (heat of the summer)
- Generally favored by cool, wet weather
- Can be common in spring and fall or periods of stress
- Excessive nitrogen can make disease worse
- Nitrogen deficient turfgrass also favors disease



Bipolaris Diseases

Symptoms

- Leaves can appear yellow to tan (leaf spots)
- Distinct, irregularly shaped lesions on leaves with brownish green or purple to black edge
- Extensive rot of stems, crowns, and roots may occur



Photo Credit: Steve Vann, University of Arkansas



Bipolaris Diseases

Control

- Plant Resistance – Some “common” types are very susceptible
- Avoid excessive or deficient soil fertility and excessive herbicide applications
- Fungicides – numerous, sometimes not needed
- Avoid extended periods of leaf wetness
 - Promote air movement and reduce shade, if possible
- Reduce thatch in spring or fall for cool season grasses and in summer for warm season grasses
- Reduce soil compaction
- Raise mowing heights



Fairy Ring



Fairy Ring

- Pathogen: Various basidiomycete (mushroom/puffball) fungi



Fairy Ring

- The symptoms are a result of a fungus decomposing organic matter (thatch) in the soil
- The fungus can grow less than an inch up to 18 inches per year
- Depth of growth is usually limited to 6 inches
- The lush growth is caused by release of nitrogen into the soil due to decomposition
- Decomposing wood material is thought to contribute to problems with fairy ring
- New fairy rings are:
 - Often initiated from spores produced by the mushrooms
 - Moving any soil/thatch will move the fungus



Fairy Ring

Control

- Frequent aerification (even a pitchfork will work!), combined with deep watering
- Soil removal or mixing
- Fungicides
azoxystrobin (Heritage), flutolanil (Prostar), fluoxastrobin (Disarm), pyraclostrobin (Insignia), azoxystrobin + propiconazole (Headway)
- Mask symptoms with light nitrogen applications, aerification, and deep watering



Questions

