

Cool-Season Turf Disease Identification and Control

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Turf University

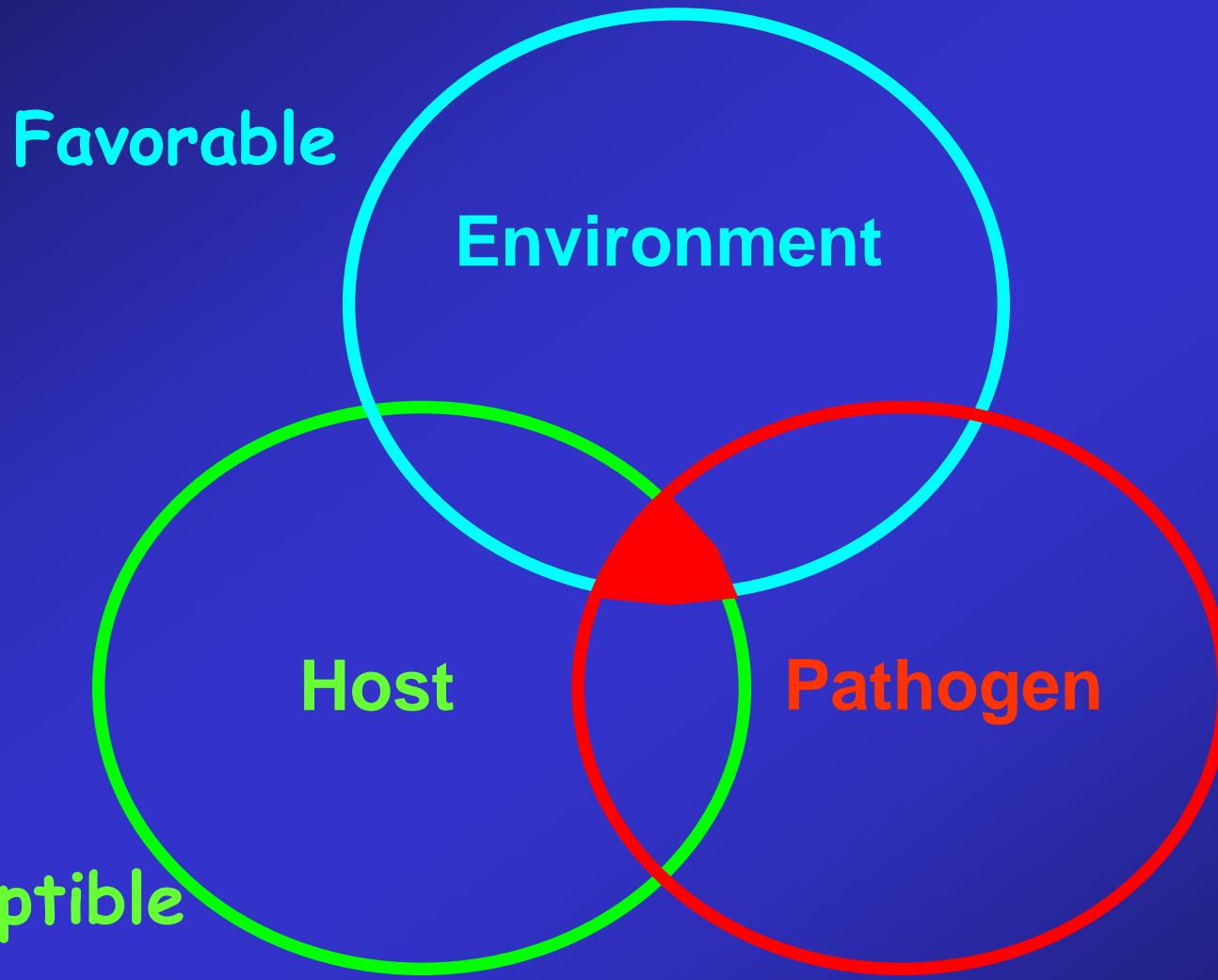
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2M Company, Inc.

Overview

- Disease - It takes 3 to Tango
- Difference between a symptom and sign
- Resources
- Take a close look at several common cool-season turfgrass diseases

Disease = a harmful interaction, between a plant (Host) and a pathogen that disrupts normal plant development resulting in reduced economic or aesthetic value

Plant Disease Triangle



Any of these three elements missing, no disease occurs

Major Cool-Season Turfgrasses (Host)

- Kentucky bluegrass
- Perennial ryegrass
- Fine-leaf and Tall fescues
- Bentgrass
- Annual bluegrass

Pathogen

Pathogen (causal agent) = an organism capable of causing disease in a living host

- Fungi - most common
 - Bacteria
 - Nematodes
 - Viruses (not common in cool-season grasses)
-
- **Proper ID of disease-causing organism is key to selecting correct cultural and chemical treatment**

Environmental Conditions

- Weather conditions
 - Temperature
 - Rainfall
 - Snow
 - %RH
- Management practices
 - Irrigation (amount, timing, source)
 - Mowing frequency and height
- Site conditions
 - Shade
 - Air movement
 - Soil temperature and pH
 - Drainage

A lot is known about common turfgrass disease pathogens, you just have to be a good detective to find which one you have.

Symptom vs Sign

Symptom = a response of the plant to the pathogen; plant's expression of pathological activity over time

Sign = a part of the pathogen, structures or products of the pathogen on or in diseased plants

Symptoms

- Size and shape of disease on turf
 - Round patches, rings, irregular patterns, etc.
- Leaf discoloration
 - Yellowing (chlorosis)
 - Bleached (straw colored), tan, bronze, to red
 - Dark green
- Death (necrosis) of plant parts
 - Leaf spot
 - Root rot
 - Stem rot
 - Blight

Symptoms



Pink snow mold



Fairy ring

APS Press



Anthracnose

APS Press



Pink snow mold

Signs

- Mycelium
- Sclerotia
- Sporophores
- Mushrooms



Signs

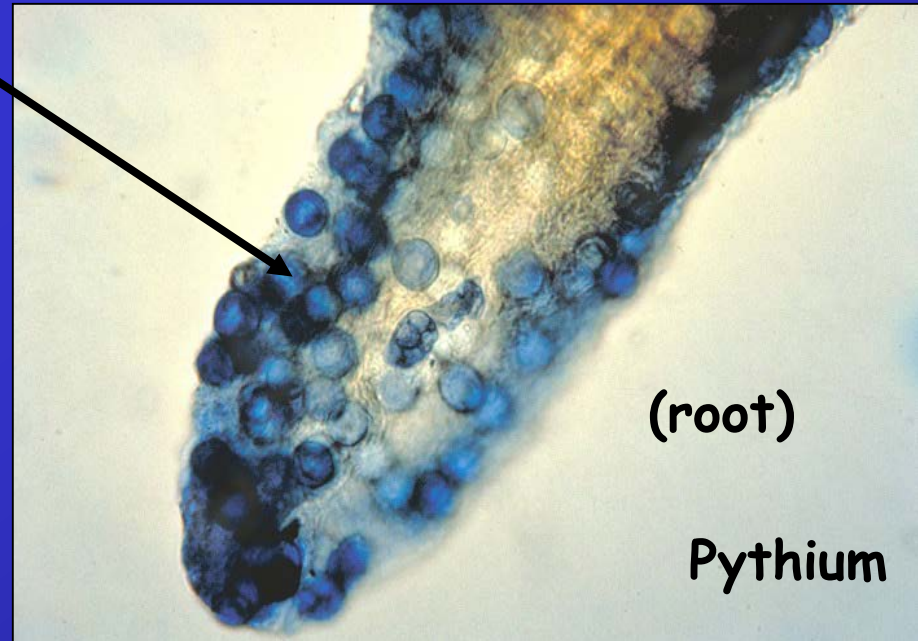
- Acervuli
- Oospores
- Spores



Anthracnose



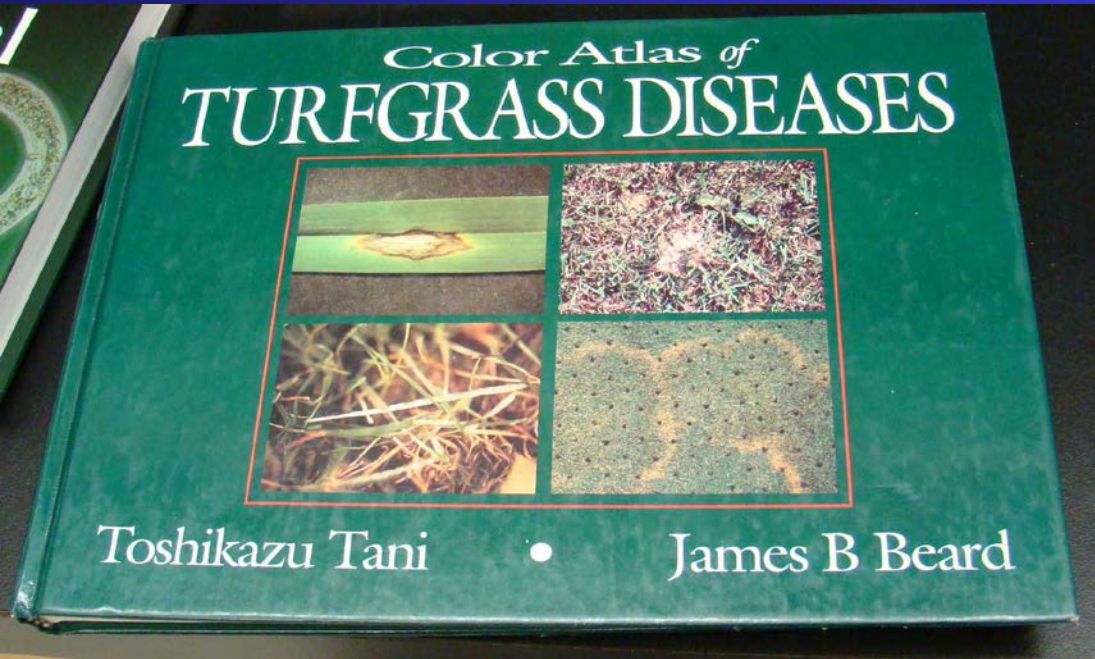
Rust



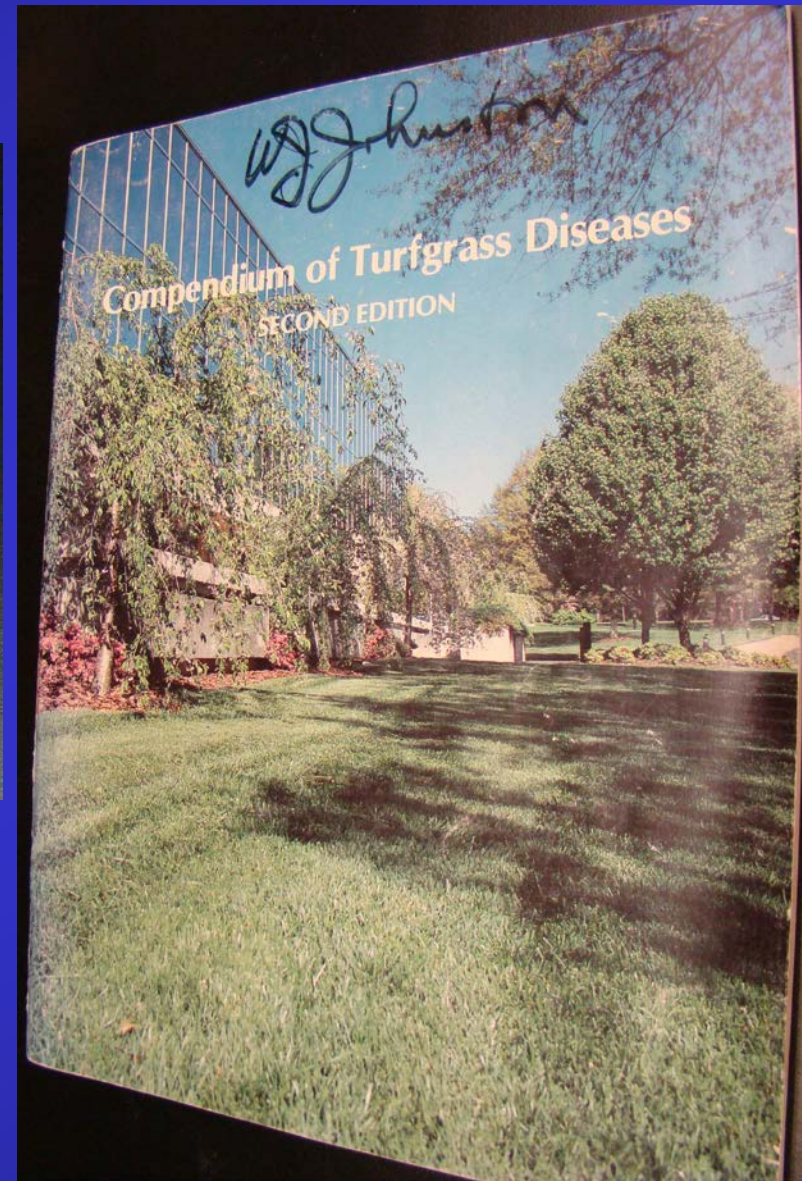
(root)

Pythium

Resources



Online: turfgrass diseases



APS Press
American Phytopathological Society

But if all else fails

Professional diagnosis Many Universities and private labs provide this service. Check with lab before you send sample.

Collect a sample

- Plug at least 4" x 4" inches and 3 inches deep that includes both infected and non-infected area

Package according to lab specs (don't seal or add water)

Send promptly to lab!! (not Friday or before National holiday)

- Include a detailed description of the area, turf species and cultivar, symptoms & signs, recent pesticide applications/cultural practices, and include digital pictures

Common Cool-season Turf Diseases

Common name	Type of disease
Anthracnose	leaf blight, basal stem rot
Brown/yellow patch	root, crown, leaf rot
Fairy ring	other
Necrotic ring spot	root and crown rot
Powdery mildew	foliar
Pythium	foliar, crown rot, root rot
Red thread	foliar blight
Rust	foliar
Snow mold (Pink and Gray)	foliar blight

Anthracnose

Pathogen: *Colletotrichum graminicola*

Where: Greens, tees, and fairways

Host:

- Annual bluegrass
- Bentgrass

Becomes a serious problem on stressed turf:

- Low fertility
- High traffic
- Low mowing heights
- Poorly drained areas
- Shade
- Heat
- Drought

Anthracnose (Foliar blight)

Symptoms: Irregular patches of yellow to bronze turf. Generally on older leaves, develop yellow to reddish-brown leaf lesions, progresses to younger leaves and stems

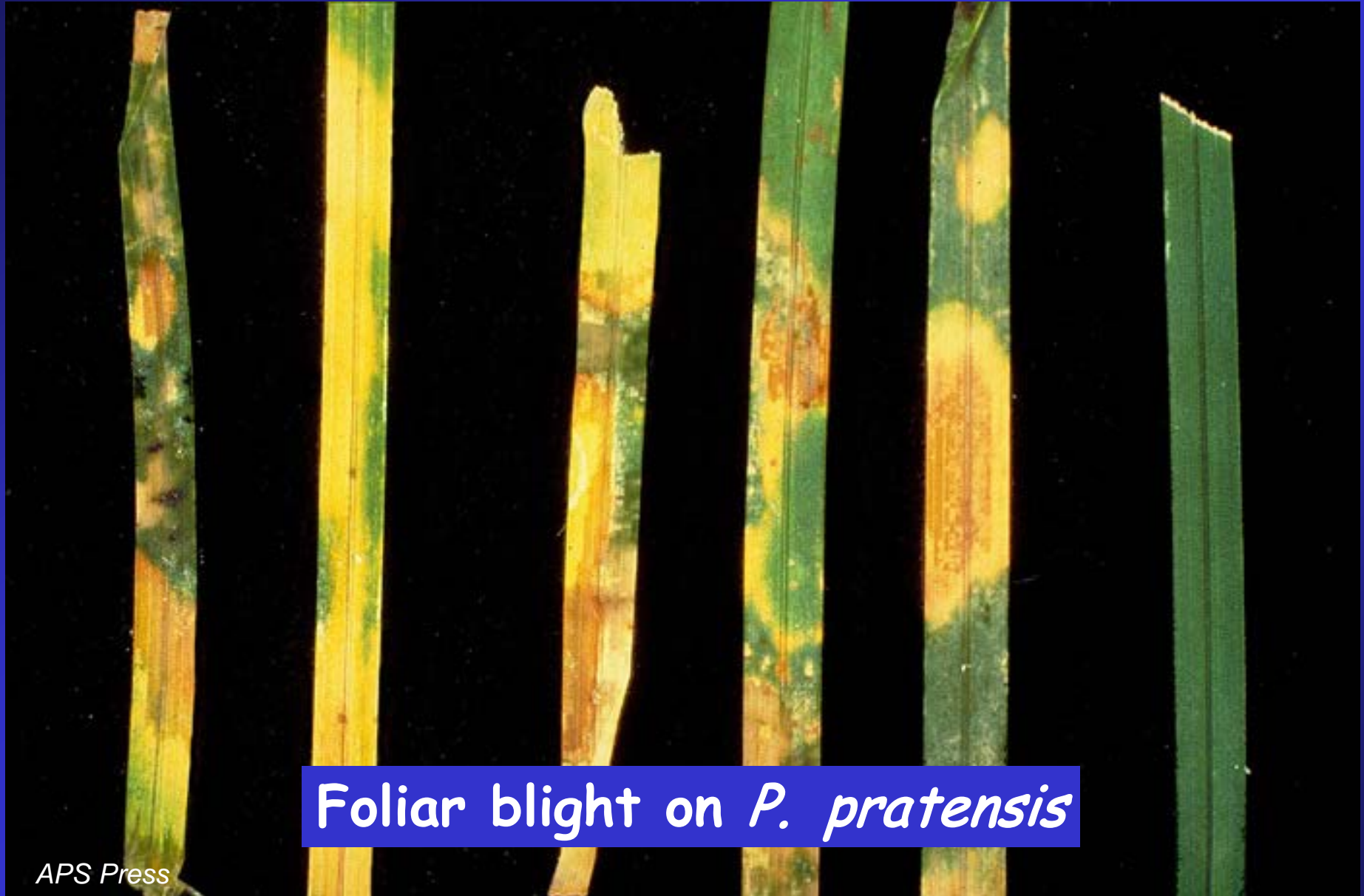
Signs: black acervuli with setae on leaf

Anthracnose (Basal rot)

Symptoms: water-soaked stem lesions that darken and turn into basal stem rot causing the central shoot to detach easily

Signs: look for black acervuli with setae on stem bases and infection mats of black tissue

Anthracnose



Foliar blight on *P. pratensis*

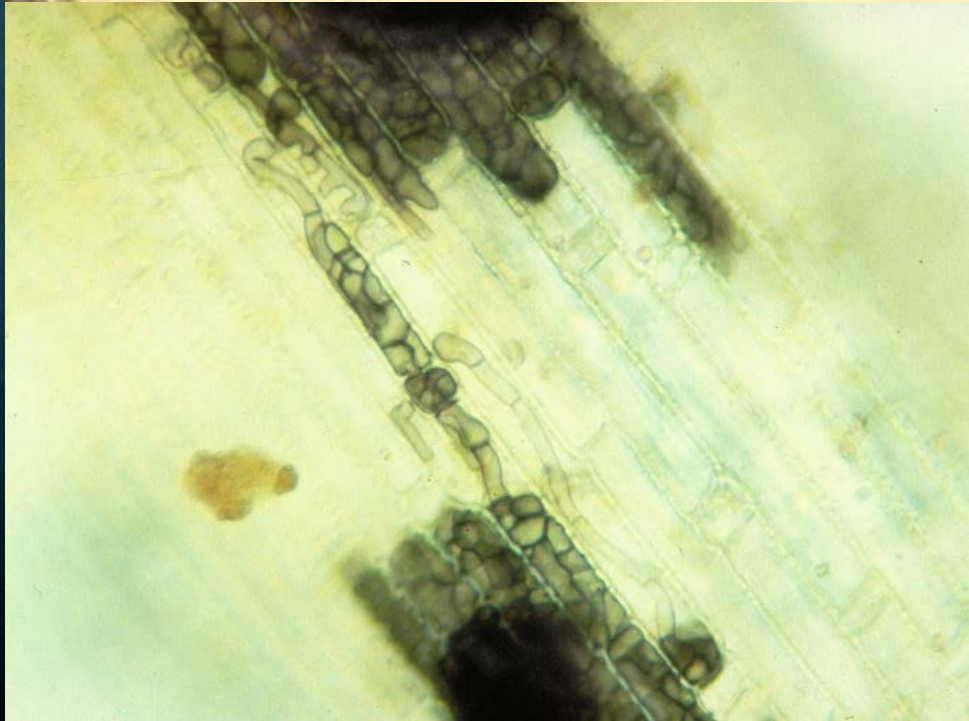
Anthracnose



APS Press



acervuli



infection mat

basal crown and stem rot

Anthracnose basal stem rot

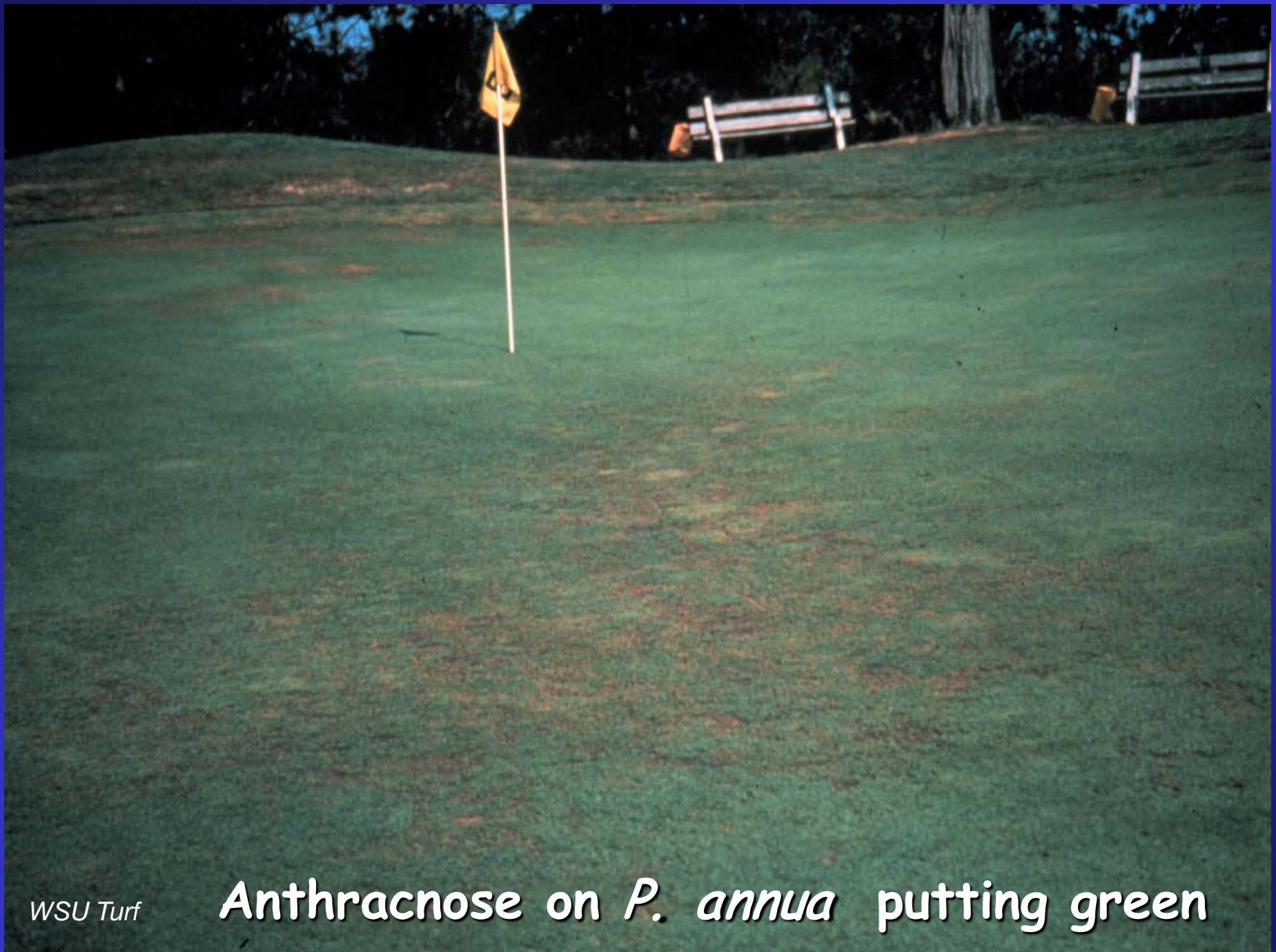


P. annua

APS Press



A. stolonifera



WSU Turf

Anthracnose on *P. annua* putting green

Anthracnose

- Cultural control:

- Increase N fertility
- Adequate irrigation, water in the morning not in the evening (reduce time moisture on leaf surfaces)
- Remove thatch
- Core aerify to relieve soil compaction, improve drainage
- Redirect traffic
- Raise mowing height

Anthracnose

- **Chemical control:** timely application of fungicides
 - fenarimol (Rubigan)
 - propiconazole (Banner MAXX)
 - triadema-fon (Bayleton)
 - fludioxonil (Medallion)
 - pyraclostrobin (Insignia)
 - trifloxystrobin (Compass)

Fairy Ring

Pathogen: fungi that decompose organic material
(> 60 spp.)

Where: Golf courses, sports fields, and lawns

Host: affects all turf species. Not pathogenic to
turfgrasses

Fungi live in thatch and soil and may grow a dense
network of hyphae 4" - 6" into the soil

Damage results from the production of waxy
materials that make the soil hydrophobic

Symptoms often greatest with moisture stress, low
fertility and heavy thatch

Fairy Ring

Rings enlarge outward, up to 30' or more

Type 1 - rings of dead grass with inner &/or outer rings of stimulated grass

Type 2 - a single ring of darker green stimulated grass

Type 3 - rings of mushrooms or puffballs with no apparent effect on grass

Signs: Rings of mushrooms or puffballs
- mid to late spring
- late summer to mid fall

Dense network of hyphae 4" - 6" into the soil

(Type 1) Fairy Ring



(Type 2) Fairy Ring





(Type 3) Fairy Ring



Fairy Ring

Cultural control:

- Remove plant debris: stumps, tree roots, limbs, fence posts, etc. before planting
- Avoid rootzone mixes with large amounts of organic matter
- Maintain adequate irrigation and balanced fertility (mask symptoms)
- Reduce thatch (vertical mow)
- Spike or aerify and add wetting agents to encourage water penetration

Fairy Ring

- **Cultural control:**

- Remove sod, thoroughly mix soil, soak with water and wetting agents (encourage antagonistic microbes), let sit over winter, plant in spring

- Backhoe



Fairy Ring

Chemical control:

- Fumigate: metam-sodium (Vapam)
- Fungicides: azoxystrobin (Heritage), flutolanil (Prostar), pyraclostrobin (Compass), polyoxin D (Endorse) plus a nonionic surfactant
 - Core aerify or spike area (at least 2' beyond outer circle) and apply at 5 to 50 gal water/1000 ft²
 - Early spring - early summer
 - Late summer - mid fall

North Carolina State University

Fairy Ring Research (Lee Miller)

- Which fungi cause fairy ring?
- What is the best management practice (BMP) of control for each of these fungi?
- They want your fairy ring!!!
- www.paceturf.org

Necrotic Ring Spot

Pathogen: *Leptosphaeria korrae*

Where: Fairways, roughs, sports fields,
and lawns

Host:

Kentucky bluegrass
annual bluegrass
fine-leaf fescues

Necrotic Ring Spot

- Common on newly laid sod 2 - 4 years old on compacted soil with thick thatch layer
- Most active during cool wet periods (spring and fall)
- Damage throughout growing season. mid to late summer

Necrotic Ring Spot

Symptoms:

- light green to straw colored patches
- doughnut (frog eye) rings
- sunken area of dead turf
- root and crown discoloration and rot

Signs:

dark pigmented fungal threads on roots

**Dark fungal threads
on roots
(hand lens 10x)**



**Doughnut
(Frog eye)**

Necrotic ring spot

Cultural control:

- Remove thatch (fall best)
- Aerate in fall to reduce compaction, increase infiltration, and helps decompose thatch
- Bump up N fertility use slow release fertilizer
- Lightly water mid-day >85°F
- Overseed with resistant cultivars:
 - **Kentucky bluegrass cultivars:** 'Adelphi', 'Apex', 'Eclipse', 'Kelly', 'Midnight', 'NuBlue', 'Nugget', 'NuStar', and 'Wabash'
 - **Perennial ryegrass**
 - **Tall fescue**
- Do not resod

Necrotic ring spot

Chemical control:

- azoxystrobin (Heritage)
 - myclobutanil (Eagle)
 - propiconazole (Banner MAXX)
 - thiophanate-methyl (Cleary's 3336)
- Spring apply, soil temps 65 °F, and water in $\frac{1}{4}$ "
 - Reapply in 30 days
 - May need to apply fungicides for several years

Pythium Diseases

Many different *Pythium* spp.:

Red blight

Blight (I)

Blight (II)

Yellow spot

Snow blight

Damping off

Disease cycle: spores survive in thatch & soil

Environment:

- most severe when turf is over-irrigated & heavily fertilized
- hot, humid weather favors disease, but can appear as a general decline/thinning in cooler climate too

Damping off

Pathogen: *Pythium* spp.

Where: Golf courses, sports fields, and lawns

Host: cool-season grass seedlings

Symptoms:

- Seedlings pinched off at soil line and fall over
- Spots appear in hot or cool weather with excessively wet soil
- spreads rapidly

Signs:

oospores on leaves and roots



**Damping off of Kentucky bluegrass seedlings
(infection at soil line)**

Pythium (Damping off)

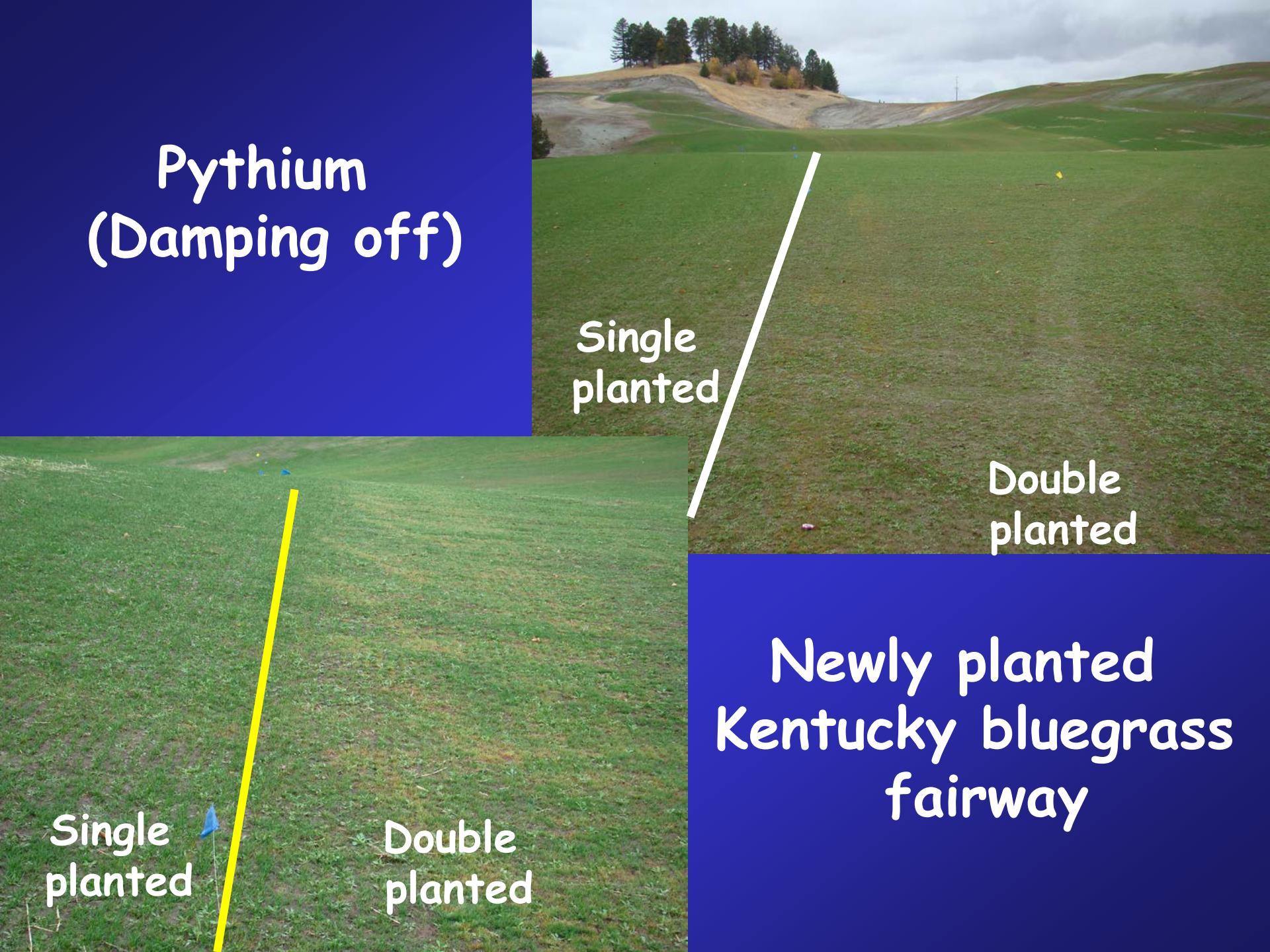
Single
planted

Double
planted

Single
planted

Double
planted

Newly planted
Kentucky bluegrass
fairway



Pythium Blight (I)

Pathogen: *Pythium* spp.

Where: Golf courses, sports fields, and lawns

Host: newly seeded or overseeded bentgrass and ryegrass < 1 year old

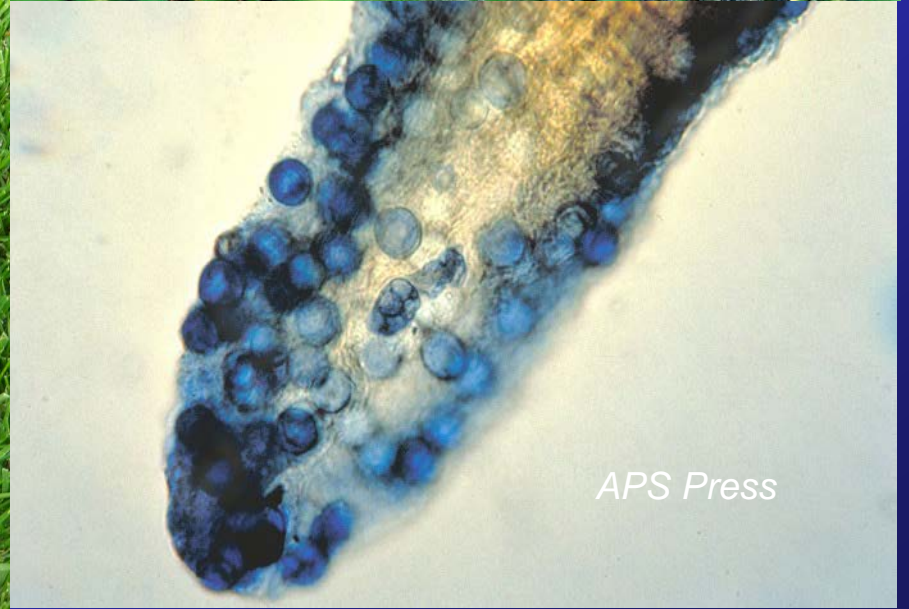
Symptoms:

- Irregular spots and black, greasy turf with leaves that are water-soaked and fall over
- Spots appear in hot, humid weather and spread rapidly - often follow drainage paths or mowing pattern (streaking)

Signs:

Gray cottony web-like mycelium on foliage

Look for web-like, cottony mycelium on leaves & oospores in roots



APS Press

The image is a composite of two photographs showing golf greens. The top-left photograph shows a green with a white flagstick in the distance and some minor discoloration. The bottom-right photograph shows a close-up of a green with significant, irregular patches of brown and tan, indicating severe damage from Pythium damping-off and blight. The background of the slide is blue.

Pythium Damping-off and Blight on overseeded greens

Pythium Diseases

Cultural Control:

- Water management - avoid extended periods of leaf wetness & promote good drainage
- Avoid excessive N application
- Reduce traffic in diseased areas, esp. when wet

Chemical control:

- Timely fungicide applications: Fosetyl-Al (Aliette, Signature), Metalaxyl (Ridomil, Subdue), Strobilurins (Heritage, Insignia, Compass), Mancozeb (Dithane, Fore)

Snow molds

- Pink snow mold
 - *Microdochium nivale*
- Gray snow molds
 - *Typhula incarnata*
 - *Typhula ishikariensis*

Pink Snow Mold

Pathogen: *Microdochium nivale*

Where: Golf courses, sports fields, and lawns

Host: all turf species, annual bluegrass, bentgrasses, and perennial ryegrasses are most susceptible

Most common in the spring and fall

- cool, wet, cloudy weather 32-55 °F
- snow cover
- Heavy thatch
- High N

Pink Snow Mold

- **Symptoms:**

- no snow - small water-soaked patches orange- to reddish-brown to gray in color when wet
- snow - pinkish-colored patches with dark periphery following snow melt then turn to tan

- **Signs:**

- Pinkish spordochia on leaves and white mycelium immediately after snow melt which soon disappears

- **Diagnosis:** observation of sporodochia & *Fusarium*-like conidia

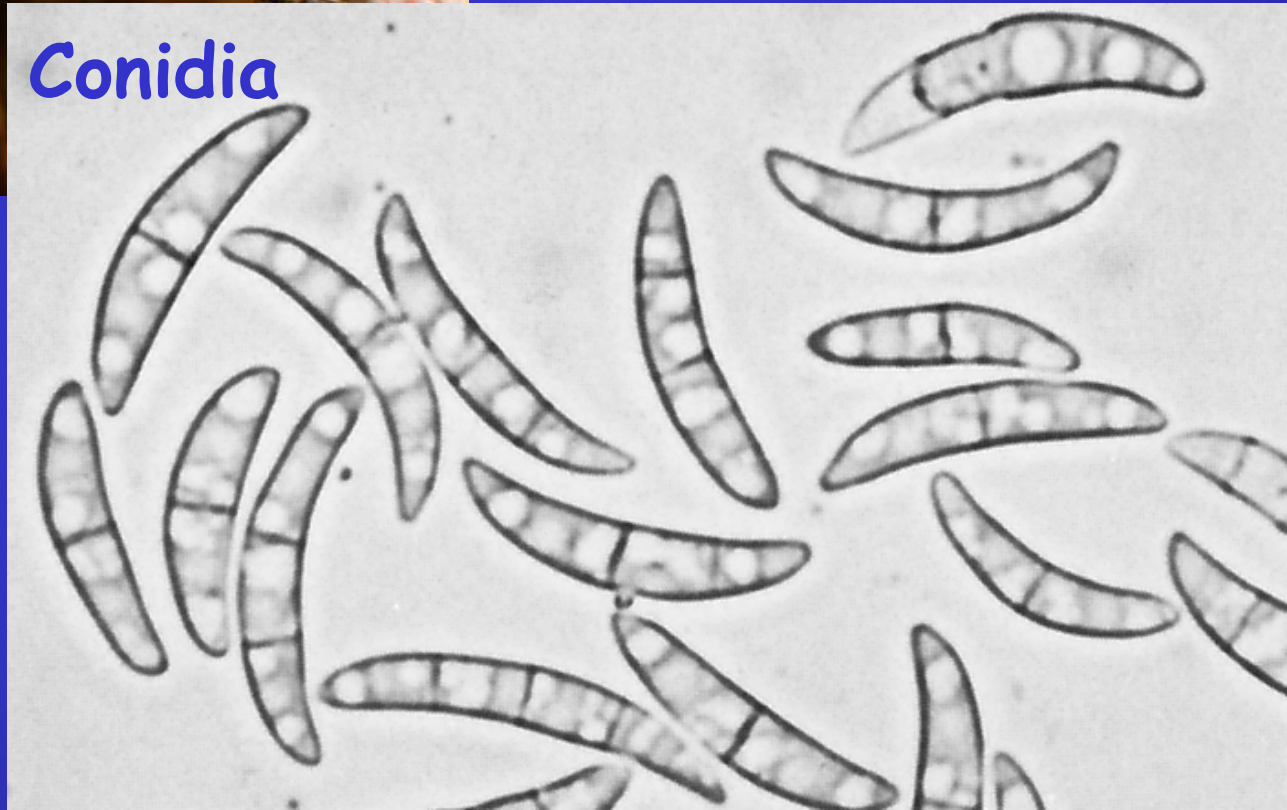
Sporodochia



APS Press

Microdochium
Patch

Conidia



Pink snow mold



Mycelium
after snow melt



1 week later

Bentgrass
(Fairway/Tee cut)
No fall fungicide



Pink Snow Mold

Pink snow mold

Snow cover



No snow cover



Gray Snow Molds

Typhula incarnata
Typhula ishikariensis

Typhula incarnata

- >60 days continuous snow cover
- 34-36 °F
- Variable patches of gray/white matted turf after snow melt
- Sclerotia: up to 5 mm diameter, red/brown, embedded in dead leaf tissue (spring)
- Sporocarps: pinkish gelatinous looking upright structures 20 mm tall (fall only)

Typhula ishikariensis

- >100 days continuous snow cover
- 34 - 36 °F
- Variable patches of bleached crust of mycelium after snow melt
- Sclerotia: <2 mm, dark brown/black, visible on crust (spring)
- Sporocarps: silvery-white; very small <15 mm tall (very rare) (fall only)

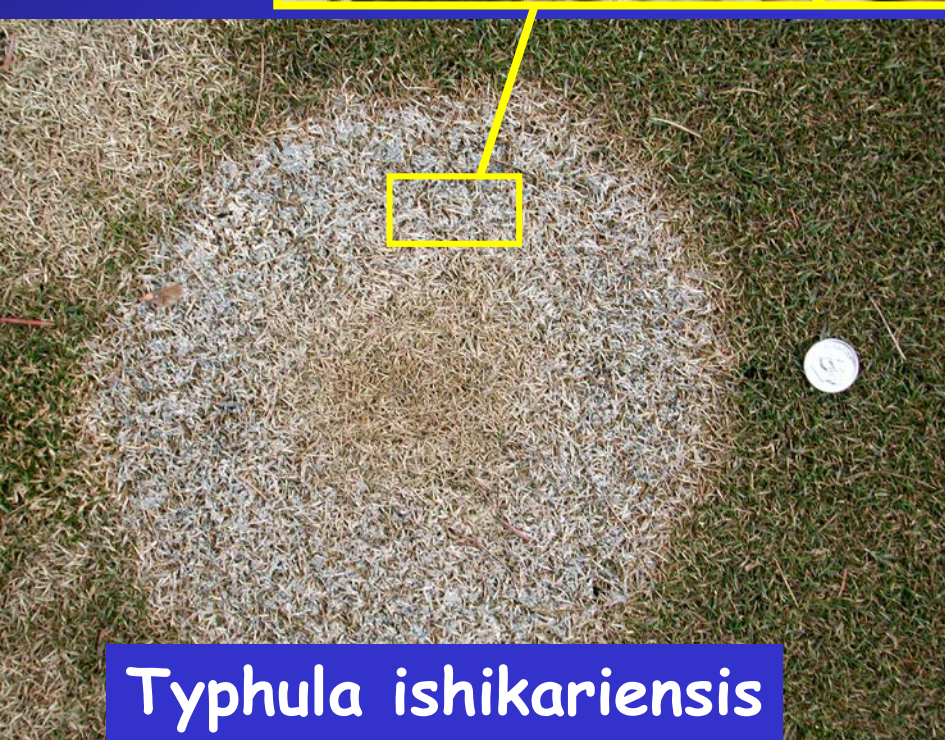
sclerotia



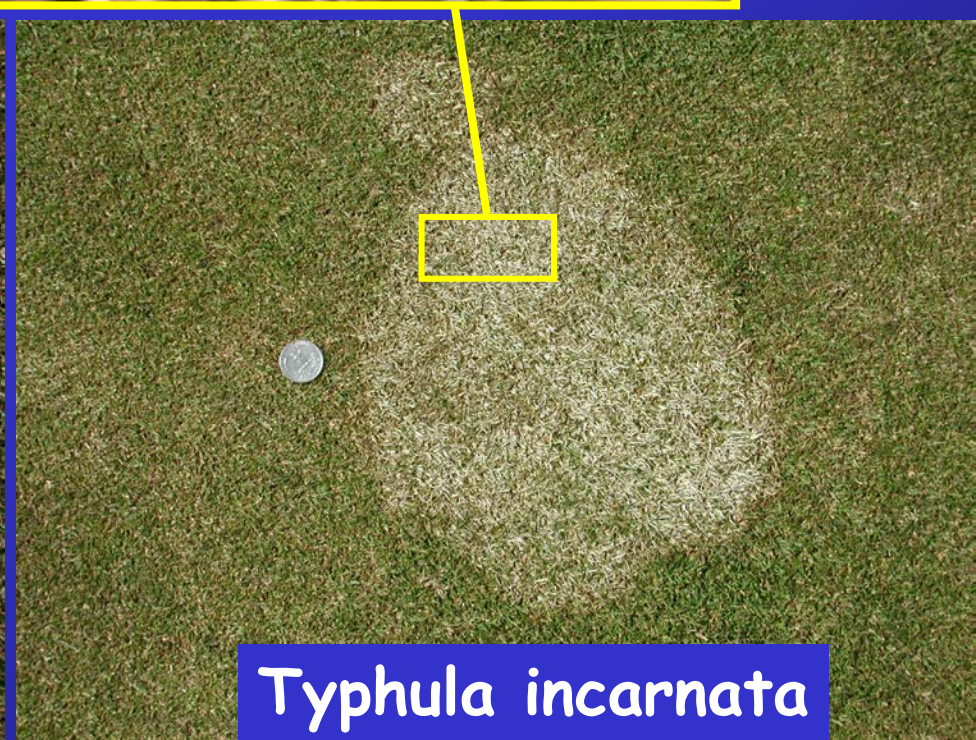
Tom Hsiang



sclerotia



Typhula ishikariensis



Typhula incarnata

T. incarnata sporocarps in
low cut turf in the fall



McCall, ID

Very severe

167 days snow cover

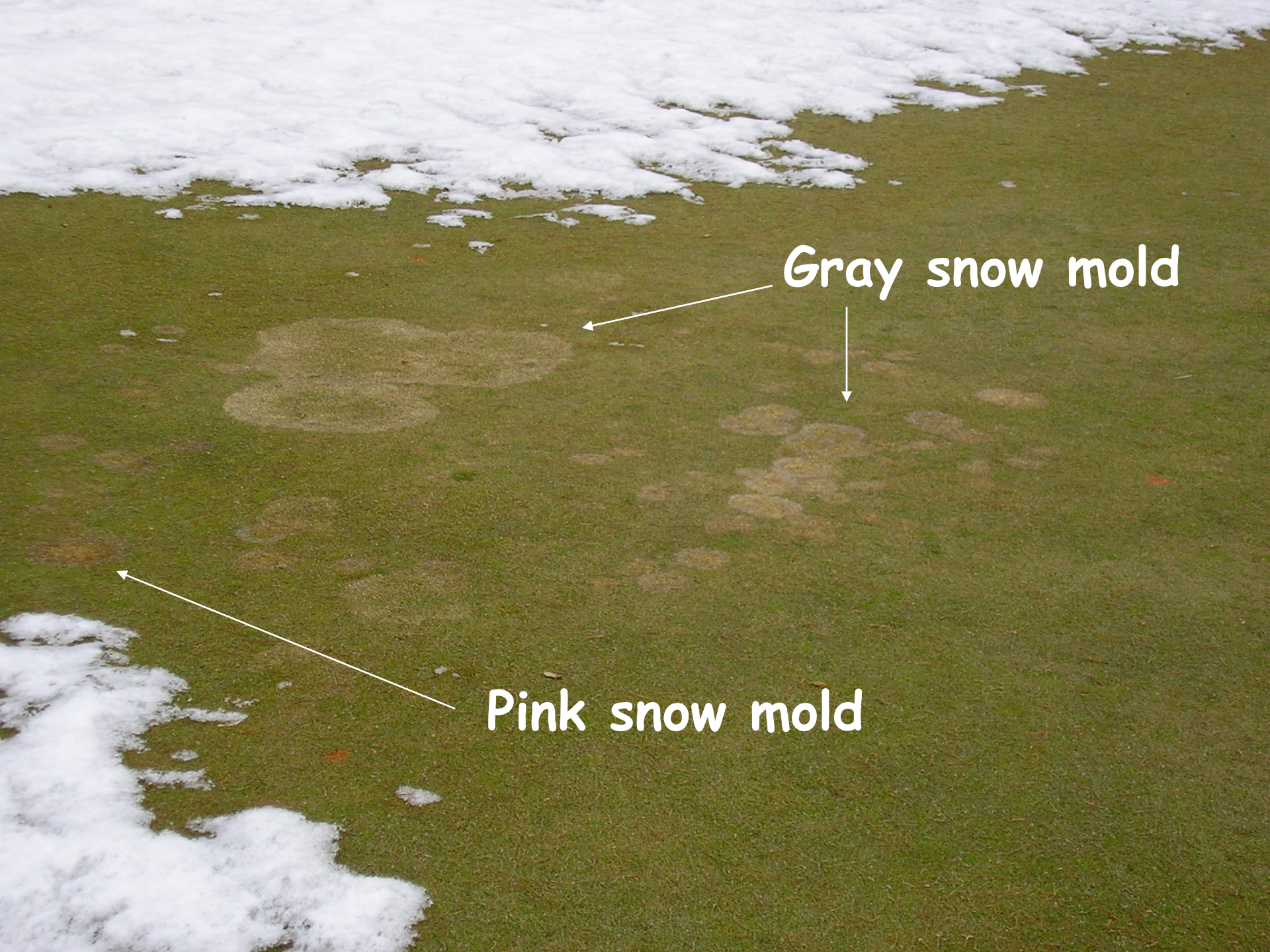
95 % *T. ishikariensis*

5 % *T. incarnata*

? *M. nivale*

CHECK

Typhula Blight = New Job



Gray snow mold

Pink snow mold

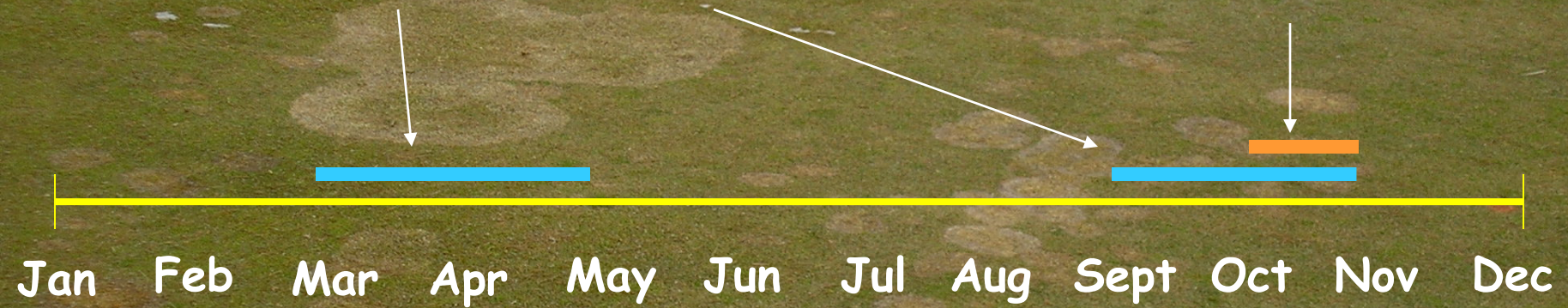
Cultural control

- Control thatch
 - Aerify/topdress
 - Verticut/topdress
- Avoid excess nitrogen late in the fall
- High K fertilizer in the fall (2-3 lbs/M)
- Mow as long as possible
- Surface drainage
- Clear debris
- Trim or remove trees
- Extreme case remove snow

Fungicide Timing

Pink snow mold

Gray snow mold



DMI Fungicides

- **Banner MAXX, Spectator Ultra**
 - Propiconazole
- **Trinity**
 - Triticonazole
- **Lynx**
 - Tebuconazole
- **Bayleton**
 - Triadimefon

Strobilurin Fungicides

- **Heritage**
 - Azoxystrobin
- **Compass**
 - Trifluroxystrobin
- **Insignia**
 - Pyraclostrobin

Fungicides

- **Daconil, Manicure**
 - Chlorothalonil
- **Medallion**
 - Fludioxonil
- **26GT, 18 Plus**
 - Iprodione
- **Cleary's 3336**
 - Thiophanate-methyl
- **Terraclor, Turfcide 400, Revere 4000**
 - PCNB, Quintozene

Single formulations with 2 to 3 fungicides

- **Instrata** (Propiconazole + Fludioxonil + Chlorothalonil)
- **Headway** (Propiconazole + Azoxystrobin)
- **Concert** (Propiconazole + Chlorothalonil)
- **Tartan** (Trifloxystrobin + Triadimefon + StressGard)
- **TBZ + TFS Green** (Trifloxystrobin + Tebuconazole + StressGard)
- **Reserve** (Tebuconazole + Chlorothalonil + StressGard)
- **Spectro 90** (Chlorothalonil + thiophanate-methyl)

Snow mold control

- Apply as weather dictates in the spring and fall, single or 2-way fungicide mixes
- Snow cover <60 days 2-way mixes
- Snow cover >60 days apply a 3-way mix of fungicides

Take Home Message

- ✓ Know the turf
- ✓ Monitor weather conditions
- ✓ Management practices
- ✓ Site conditions
- ✓ Scout for Symptoms/Signs often
- ✓ ID of pathogen is important in selecting the best cultural and chemical control
- ✓ Use cultural practices to maintain a healthy turf and discourage disease development

Take Home Message

- ✓ Chemical control as necessary (read and follow the label directions)
- ✓ Beware of fungicide resistance
 - You must rotate chemical families, not names

WSU Disclaimer

“Some of the pesticides discussed in this presentation were tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to \$7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. **It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.**”

A photograph of a golf course in a cold climate. The foreground shows a green fairway with a large, irregular patch of snow. In the middle ground, there's a sand trap and more snow patches. The background is a dense forest of evergreen and deciduous trees, with a mountain slope visible in the distance.

Questions?

Instrata 9.3 fl oz

Instrata 11 fl oz

Instrata 6 fl oz

CHECK

165 days
snow cover

25% Gray
75% Pink

Rated: 5/4/06

165 days

LESCO 2005-06. City of McCall Golf Course. McCall, ID.

snow cover

25% Gray

75% Pink

CHECK

Par-Flo 12 fl oz (late)

Insignia 0.7 oz (early) +
18 Plus 4 fl oz (late) +
Manicure Ultra 5 oz (late)

18 Plus 4 fl oz (early) +
Manicure Ultra 5 oz (early) +
Revere 4000 8 fl oz (late)

Pink snow mold

Snow cover



No snow cover



Microdochium nivale

Interior recovers as
disease spreads outward

Reddish bronze
fringe (active)



Microdochium patch, aka Pink Snow Mold

Pathogen: *Microdochium nivale*

Host: all turf species, especially *P. annua*, *P. pratensis*, & *Agrostis spp.*

Symptoms: can be observed year-round
no snow - small water-soaked patches orange- to reddish-brown to gray in color when wet, can coalesce
snow - pinkish-colored patches with dark periphery immediately following snow melt

signs = pinkish sporodochia on leaves

Diagnosis: observation of sporodochia & *Fusarium*-like conidia

Summary

- PCNB?
- Cultural methods to minimize impact
- Instrata at 9 to 11 fl oz with >60 days snow cover. Pink only 5 to 7 fl oz.
- StressGard in Tartan and TBZ + TFS Green increases turf quality. Use with Daconil with >60 days snow cover.
- Insignia + 26GT + Manicure Ultra very good control and turf quality with >60 days snow cover without a DMI fungicide
- Minimize resistance rotate your fungicides (especially strobilurins)
- Biocontrol agents: some degree of suppression

bleached patch



Microdochium Patch

“pink” patch



Microdochium patch

Disease cycle: pathogen survives as hyphae & conidia in thatch & soil

Environment: most common in spring and fall
- cool, wet, cloudy weather 40-55°F,
snow cover, heavy thatch & high N

Control: avoid high N in fall, mow and remove leaf litter before snow fall
- avoid snow compaction, promote early melt
- plant resistant cultivars
- fungicides applied protectively before snow fall (several options)

Different Species



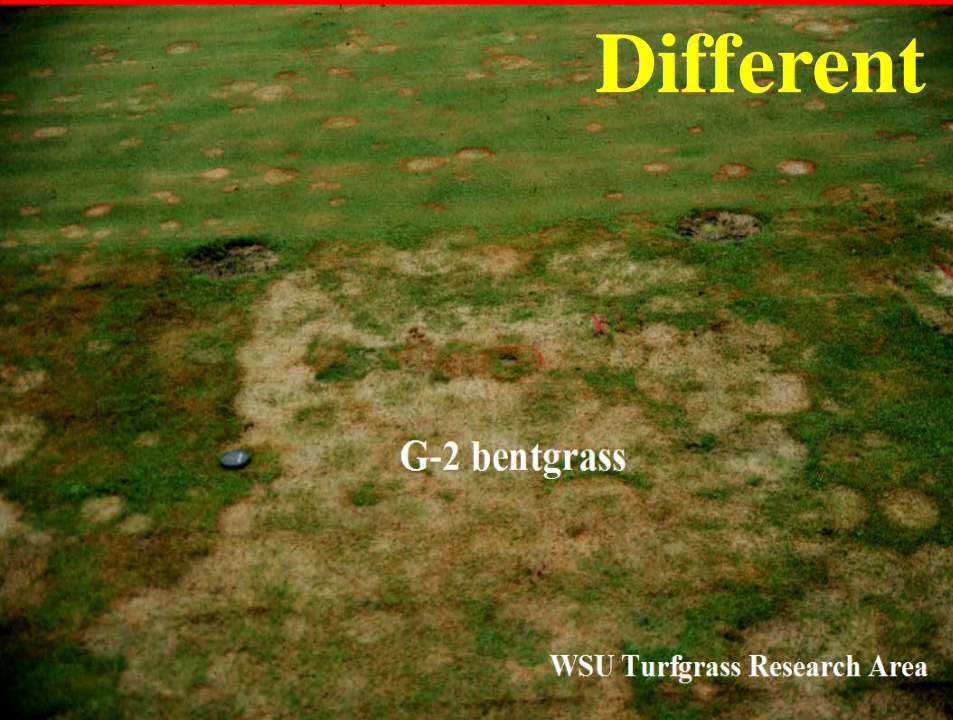
Perennial ryegrass

WSU Turf



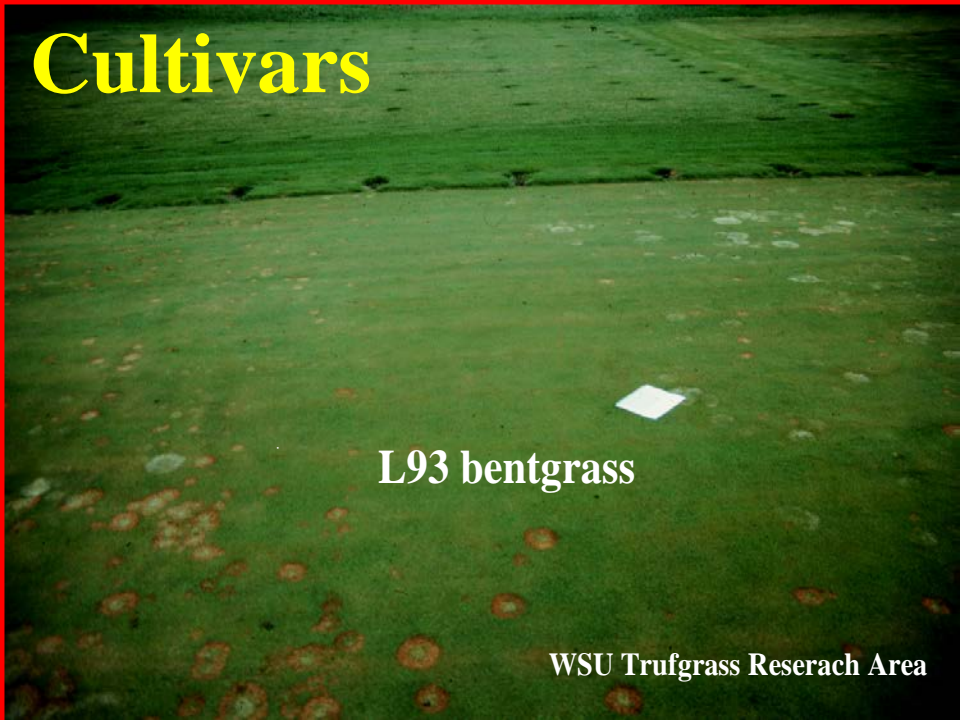
Kentucky bluegrass

Different Cultivars



G-2 bentgrass

WSU Turfgrass Research Area



L93 bentgrass

WSU Turfgrass Research Area

Al Law, 1976 Bentgrass Cultivar Trail Hangman Valley G C, Spokane, WA



Pythium Diseases



ARS Press



Cool-Season Turf Disease Identification and Control

Charles Golob, William J. Johnston, and Tim Murray
Washington State University



Necrotic ring spot

Diagnosis: presence of large frog eye spots on turf with sunken rings and root discoloration

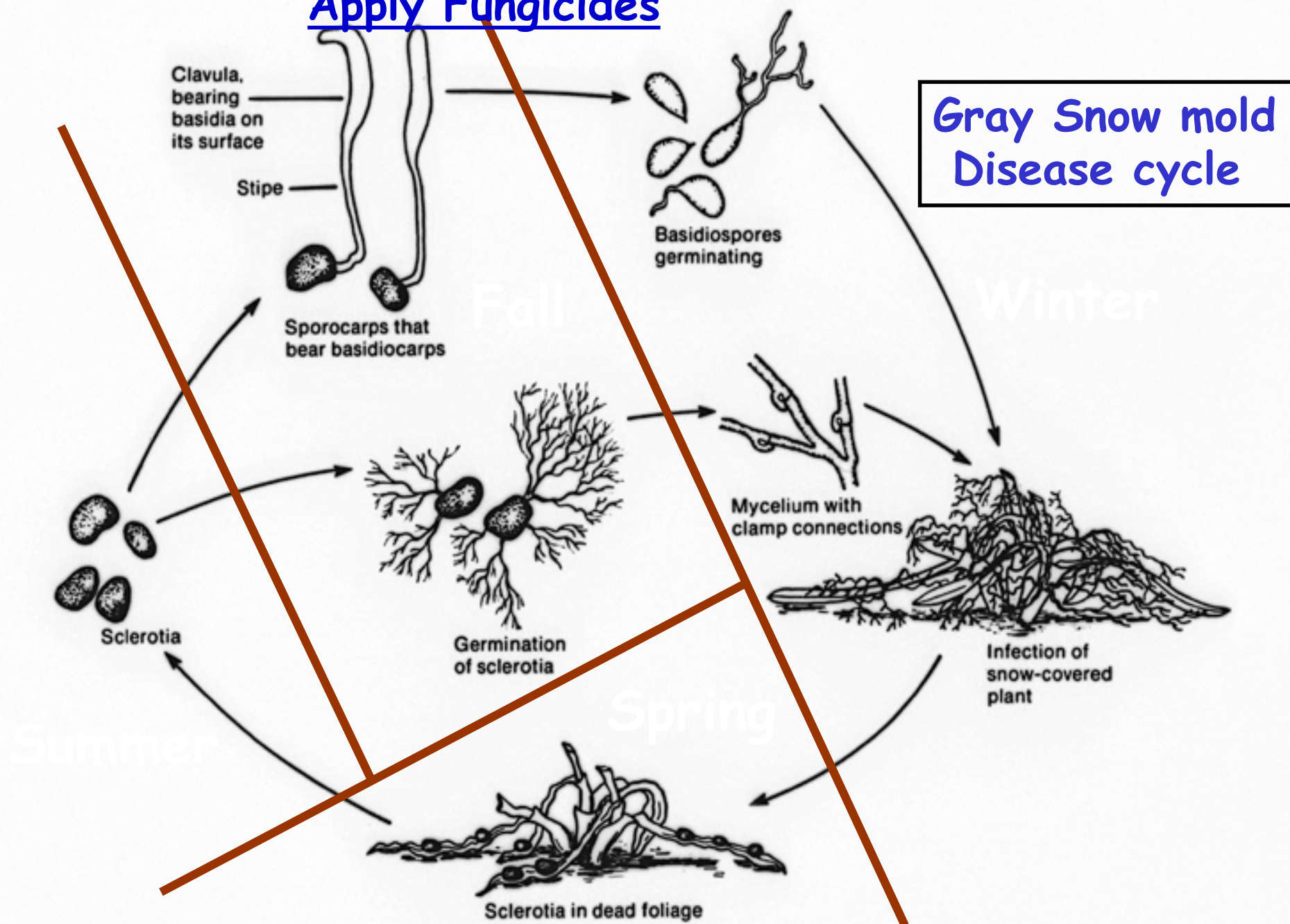
Disease cycle: perennial problem

Environment:

- Active at soil temps 65 and 80 °F

Apply Fungicides

Gray Snow mold Disease cycle



Disease Severity

Snow cover

Diseases

100 days

Typhula ishikariensis

60 days

Typhula incarnata

0 days

Microdochium nivale



WSU Turf

Pink snow mold



Typhula incarnata

- >60 days continuous snow cover
- Temperatures 34-36 °F
- Variable patches of gray/white matted turf
- Sclerotia: up to 5 mm diameter, red/brown, embedded in dead leaf tissue (spring)
- Sporocarps: pinkish gelatinous looking upright structures 20 mm tall (fall only)

Typhula ishikariensis

- >100 days continuous snow cover
- Temperatures 34 - 36 °F
- Bleached crust of mycelium after snow melt
- Sclerotia: <2 mm, dark brown/black, visible on crust ('Speckled' snow mold) (spring)
- Sporocarps: silvery-white; very small <15 mm tall (very rare) (fall only)

Chemical Control

Late fall application of
fungicides before permanent snow
cover

McCall, ID 2006-07
 150 days snow cover
 25% Gray and 75% Pink

Treatment	Rate (prod/M)	Disease (% area infected)	Turf quality
Instrata 3.61SE	11 fl oz	0.0 a	5.3 a
Instrata 3.61SE	9 fl oz	0.3 a	5.0 ab
Banner MAXX (Propiconazole) + Turfside 400 (40% PCNB)	2 fl oz 6 fl oz	4.3 a	4.3 abc
Turfside 400 (40% PCNB)	12 fl oz	4.3 a	3.3 c
Instrata 3.61SE	5 fl oz	8.3 a	4.0 abc
Banner MAXX (Propiconazole) + Medallion 50WP (Fludioxonil)	4 fl oz 0.33 oz	13.0 a	3.7 bc
CHECK	0	87.3 b	1.0 d

Pullman 2006-07 (Pink Snow Mold)

Treatment	Rate (oz or fl oz) prod/M)	Disease (% area infected)	Turf quality**
Tartan (Trifloxystrobin + Triadimefon + SG) + Chipco 26GT (Iprodione)	2 fl oz 4 fl oz	0.0 a*	5.0 a
Compass 50WG (Trifloxystrobin) + Chipco 26GT (Iprodione)	0.25 oz 4 fl oz	0.0 a	4.0 b
TBZ + TFS Green (Trifloxystrobin + Tebuconazole+ SG)+ Chipco 26GT (Iprodione)	2 fl oz 4 fl oz	0.3 a	5.0 a
TBZ + TFS Green (Trifloxystrobin + Tebuconazole + SG)+ Daconil Ultrex 82.5WDG (Chlorothalonil)	2 fl oz 5 oz	0.3 a	5.0 a
Tartan (Trifloxystrobin + Triadimefon + SG) + Terraclor 75WP (PCNB)	2 fl oz 4 oz	0.3 a	4.7 ab
Instrata 3.61SE (Propiconazole + Fludioxonil + Daconil)	9 fl oz	0.3 a	3.0 c
Tartan (Trifloxystrobin + Triadimefon + SG)	2 fl oz	0.7 a	5.3 a
TBZ + TFS Green (Trifloxystrobin + Tebuconazole + SG)	2 fl oz	0.7 a	5.0 a
CHECK	0	18.0 b	2.7 c

McCall 2006-07

25% Gray and 75% Pink Snow
Mold

150 days snow cover

Treatment	Rate prod/M)	App. date	Disease (% area infected)	Turf quality
Insignia 20WG + Manicure Ultra + Revere 4000	0.7 oz 5.0 oz 8.0 fl oz	early late late	0.0 a	5.3 bc
Insignia 20WG + 18 PLUS + Manicure Ultra	0.7 oz 4.0 fl oz 5.0 oz	early late late	0.3 a	7.0 a
18 PLUS + Manicure Ultra + Revere 4000	4.0 fl oz 5.0 oz 8.0 fl oz	late late late	1.0 a	5.7 b
Spectator Ultra + Insignia 20WG + Manicure Ultra	4.0 fl oz 0.7 oz 5.0 oz	early early late	2.0 a	6.3 ab
FFII 14-3-3 (PCNB) Granular + Fungicide V (Chloroneb) Granular	6.36 lbs 5.95 lbs	late late	14.7 c	4.0 d
CHECK	0.0		73.3 d	1.0 e

Disease Control - IPM

Use of multiple approaches to disease/pest control

- Cultural practices that discourage the development of the most important diseases in your area
- Plant adapted cultivars with disease resistance
- Use fungicides as necessary

IPM

Timing is everything - when you do something can be as important as what you do...

→ Scout for Symptoms/Signs Every Day

- Check areas historically prone to disease
- Early morning when dew is present may reveal signs, e.g. web-like cottony structures (mycelia)

Pink Snow Mold Control with Products from Bayer 2006-07.
WSU TARC. Pullman, WA.

<50 days snow cover
100% Pink SM

Instrata 9 fl oz

CHECK

Compass 0.25 oz +
26GT 4 fl oz

TBZ + TFS Green w/StressGard 2 fl oz

Pink Snow Mold

(Microdochium nivale)

- Cool moist conditions 30-60 °F (Spring and Fall)
- Does not require snow cover
- Circular patches up to 20" diameter
- Reddish bronze to light gray

Typhula Blight (Gray Snow Mold)

Pathogen: *Typhula incarnata* & *T. ishikariensis*

Where: Golf courses, sports fields, and lawns

Host: all turf species

Symptoms: symptoms observed following snow melt

- tan to gray-brown patches of turf with leaves matted to the ground and covered with light-colored mycelium
- turf dries and becomes brittle

Signs: dark-colored sclerotia on leaves

Diagnosis: look for sclerotia on leaves and in crown (esp. *T. incarnata*)

Typhula Blight

Disease cycle: pathogen survives as sclerotia in thatch & soil; may produce club-like basidiocarps in fall

Environment: cool, wet weather with persistent snow cover on unfrozen soil, heavy thatch

Control: avoid high N in fall, mow and remove leaf litter before snow fall, reduce thatch

- resistant turf species
- promote early snow melt, avoid compaction
- fungicides applied protectively before snow fall (several options)

Diagnosis - How to be a good detective

Know the turf!!

- Species/cultivars present

How did the problem develop?

- Overnight or over days or weeks

Climate/microclimate

- recent weather and/or irrigation events
- temperature
- relative humidity
- time of the year
- shade
- air movement

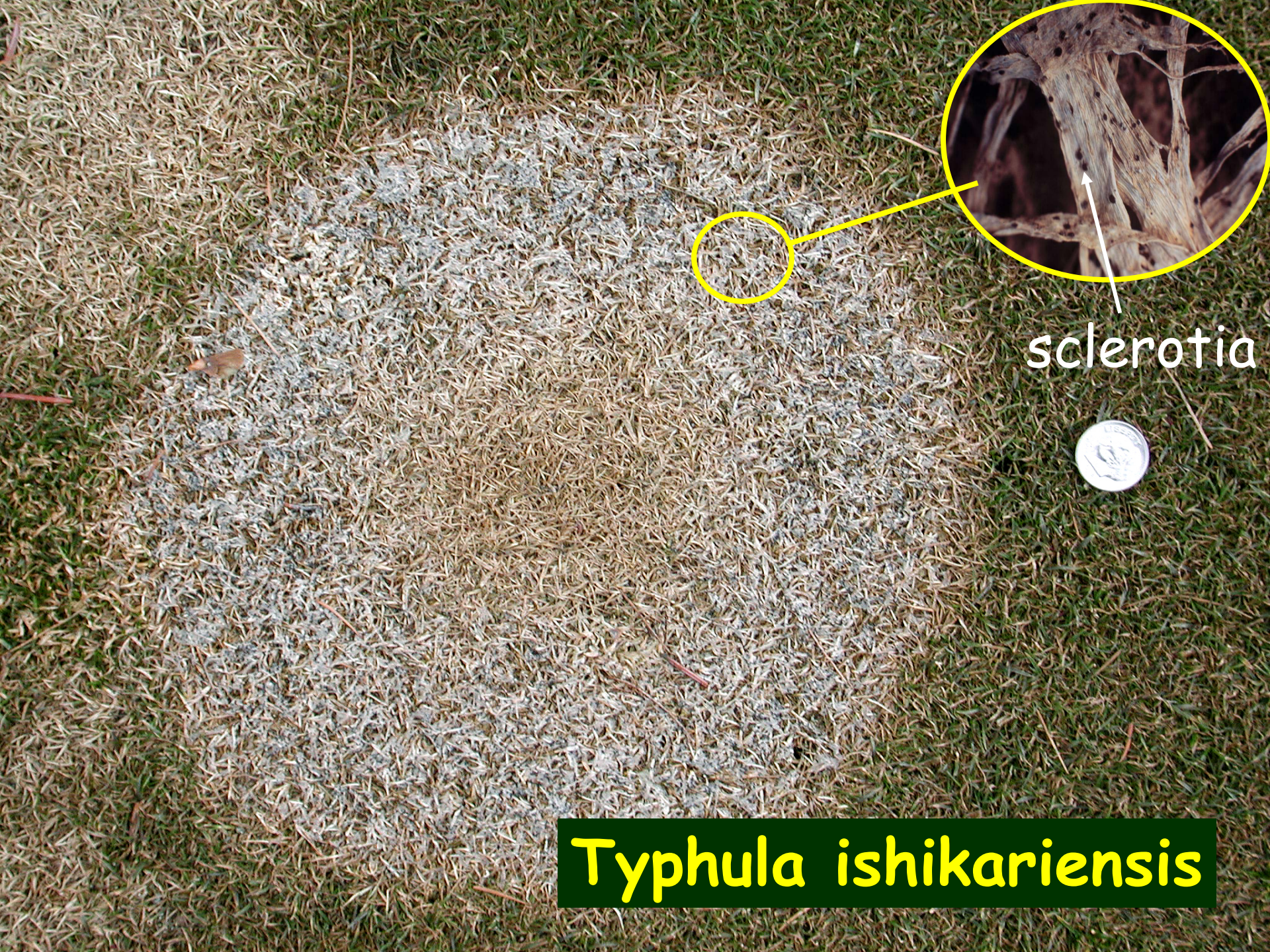
Symptoms

- leaf spot, root rot, size and shape of patch or ring, leaf color, etc.

Signs

- mycelium, sclerotia, mushrooms, acervuli, etc.

Recent pesticide and fertilizer applications



sclerotia

Typhula ishikariensis

Remember !!!

Proper ID of the pathogen(s) is essential for correct cultural and chemical treatment of the disease

You wouldn't take cough syrup for a sore toe !!

Environmental conditions

- Temperature (air and soil)
- Rainfall or irrigation (amount, timing, source)
- Relative humidity
- Time of year
- Shade
- Air movement
- Soil conditions (drainage, pH, etc.)



APS Turf Workshop 2004

Control of Anthracnose

Raise mowing height if possible.

**Control foliar blight stage of anthracnose to prevent
Moving into the basal crown rot stage.**

**Make protective fungicide applications prior to
Aerification. Use enough water to thoroughly soak
The crowns of the plants.**

Rotate fungicides with different modes of action.

Environmental Conditions

Weather conditions

Management practices

Site conditions