



Common Diseases of Turfgrasses in Oklahoma

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Turfgrass Diseases

- Introduction
 - Basic turfgrass biology
 - Bermudagrass (others) fescue and mixes
- Diseases
 - Foliar
 - Dollar spot, leaf spot, large patch, brown patch
 - Soilborne
 - Decline/take-all, spring dead spot, fairy ring
- Conclusions

Bermudagrasses are not all the same

- Common (*Cynodon dactylon*), [U-3, Jackpot]
 - Seeded
 - Generally coarse textured
 - Cold tolerant (northern) and intolerant (Arizona)
- African (*C. transvaalensis*), [Uganda]
 - Not generally a turf type
 - Heat intolerant
 - Fine textured, lime green, prolific seed producer
- Interspecific hybrids [*C. dactylon* x *C. transvaalensis*], [Tifway 419, Patriot, Latitude 36]
 - Fine textured, dark green, often sterile
 - Generally cold intolerant

Warm-season grass

- Spreading/invasive growth habit
 - stolons and rhizomes
- C4 carbon fixation
 - high temperature tolerance
 - drought tolerance
 - salt tolerance
- Good pest resistance profile
- Intolerance to
 - shade
 - low temperatures – highly variable trait



Warm-season grass

- In cool climates, they go “dormant”
 - Slightly misleading
 - Control plant death = freeze injury
- Survival for those cultivars less cold tolerant is primarily from rhizomes underground that do not experience extended periods of freezing temperatures
- This impacts management and some diseases



Other warm-season grasses

Buffalograss

- Native to North America
- Range Mexico to Canada
- Thrives under low rainfall environments
- Stoloniferous – poor wear tolerance
- Forage and some improved turfgrass varieties are available
- Pretty good disease profile – except when conditions are wet



Other warm-season grasses

Zoysiagrass

- Native to Asia
- Two turf-types
 - *Zoysia japonica*
 - *Zoysia matrella*
- Variable cold tolerance and texture
- Stolons and rhizomes
- Slow growing wear and drought intolerant
- Forage and some improved turfgrass varieties are available
- Very good disease profile – except when conditions are wet



Cool-season grasses

- Fescue or fescue/ryegrass/bluegrass blends
 - Fescues' origins are central and northern Europe
 - Ryegrass and bluegrass originate from Europe, Asia and Northern Africa
- Cold tolerance and different textures
- Almost all bunch type grasses – some form stolons
- Fast growing under cool and slow growing under warm conditions
- Many, many, many forage and improved turfgrass varieties are available
- Excellent shade tolerance
- Generally poor disease profile especially when conditions are wet



Management

Cool-season vs Warm-season grasses

- Cool-season grass growth occurs in the spring and fall when temperatures are cool
- Warm-season grass growth occurs in the summer
- Grasses only need to be fertilized when they are active
 - Only fertilize warm-season grasses in the summer months
 - Only fertilize cool-season grasses in Spring and Fall
- Mowing heights should be adjusted to activity
 - Mow warm-season grasses low in the summer months
 - Mow fertilize cool-season grasses low in Spring and Fall
 - Raise mowing heights when grass growth slows
- If irrigation is used, use when the plants are activity growing

Definitions and concepts

Disease Triangle

For any plant disease to occur three factors must be present and conducive for disease

First factor – **the Host**

Consider what is its condition
resistance, predisposed, or age

Second – **the Pathogen**

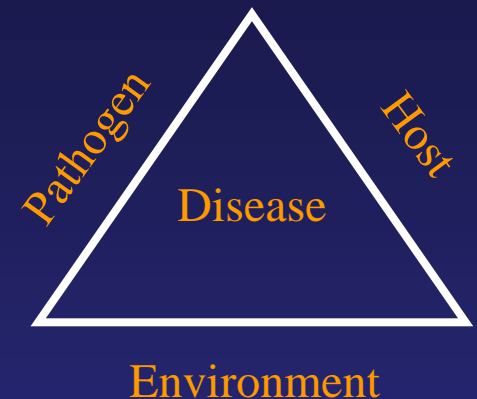
What is the condition of the pathogen/insect
virulence, dormant, population, and what environmental conditions does it require

Third - **the Environment**

The environmental conditions include

For foliar diseases - moisture and temperature,

For soil diseases - temperature, pH, compaction (plant health, O₂), texture for nematodes



Turfgrass IPM - Cultural

Cultural Management of Turfgrass Diseases

Cultivar selection

- mixture versus blends
- a single cultivar is often more at risk from disease
- increasing genetic diversity to increase disease resistance
- some concerns about decreasing quality while increasing the number of cultivars/species
- over time, the population may shift to a single cultivar/species

Drainage

- poor drainage can increase the severity or occurrence of *Pythium*, or brown patch
- consider air drainage

Mowing

- for low cut grasses - raising the height will reduce disease
- for taller grasses it might make the disease worse

Turfgrass IPM - Cultural

Irrigation

- frequent, light irrigation
 - detrimental to root growth
 - fungal spore germination and infection of plants
- late afternoon or evening permits prolonged leaf wetness
- promote guttation water (water from leaves) - nutrient source for fungi
- early morning irrigation can knock down dew, guttation, and aid in faster drying of leaves

Fertility

- Nitrogen
 - excess and deficiency
 - excess nitrogen encourages rapid turf growth = lush, thin walled plant cells which are easier for fungi to enter or more attractive to insects
 - divert resources to growth not resistance
- Deficient = poor growth
 - disease progresses faster than plant growth

Turfgrass IPM - Cultural

Phosphorus and Potassium

- does not effect most turfgrass diseases
- root disease might be more severe when these are deficient
- use a soil test and make appropriate applications

Thatch

- Indirectly affects plant health
- *Bipolaris* and *Drechslera*
- fairy ring

Soil pH

- some say it doesn't matter, Why?
- maintain a proper pH if possible so that nutrient availability is not a problem
- high pH promotes take-all

Differences between what we see

Sign - the presence of the pathogen (often never seen but often needed to diagnose)

Symptom - visual response of plant to a stress, a weak or often inaccurate means to diagnosis the cause of a problem



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Dollar spot



Dollar spot

- Causal organism: *Clarireedia bennettii*, *C. homoeocarpa*, *C. monteithiana*, *C. jacksonii*
- Hosts: most all grasses – more common on **Bermudagrass** and Buffalograss
- Occurs primarily during cool, wet weather but can happen anytime that sufficient moisture is present (heavy dews in August)
- Spring and fall disease
- Symptoms:
 - On low mowed turfgrass, distinct depressed straw-colored patches (less than 3 inches in diameter)
 - For taller grasses, affected areas are large, straw-colored (3-6 inches)
 - Lesions are first chlorotic, then water soaked, and finally bounded by a tan to reddish brown or purple to black margin
 - Sometimes, lesions are hour-glass shaped
 - Caution, lesions can appear similar to those caused by red thread, brown patch, and Pythium blight
- White mycelium is often visible, during periods of heavy dew formation
- Cool periods which result in heavy dew formation
- This is the most important turfgrass disease, i.e. more money is spent to manage this disease than any other

Dollar spot

- More severe on nitrogen deficient turfgrasses
- Thatch and low soil water content are also reported to aggravate the disease
- Survival: mycelium or resting structures in leaf tissues
- The pathogen can only move on infected tissue

- Management
 - Maintain adequate levels of nitrogen
 - Irrigate deeply and infrequently (definitely not in the evening)
 - Increase airflow around the affected areas
 - Remove moisture (many ways)
 - Use resistant cultivars
 - Fungicides

Dollar spot

Cultivar	disease rating	Cultivar	disease rating
TIFWAY	8.0	NUMEX-SAHARA	7.0
FAES 1327	7.7	JSC 2-21-1-V	6.8
PST-R6T9S	7.7	TIFTUF (DT-1)	6.8
KASHMIR (PST-R6P0)	7.6	ASTRO	6.7
12-TSB-1	7.5	JSC 2-21-18-V	6.7
OKS 2009-3	7.5	PATRIOT	6.5
11-T-510	7.3	RIVIERA	6.5
JSC 2009-6-S	7.3	MONACO (JSC 2007-13-S)	6.3
OKS 2011-4	7.3	OKS 2011-1	6.3
11-T-251	7.2	JSC 2007-8-S	6.2
YUKON	7.2	CELEBRATION	6.2
MBG 002	7.0	FAES 1326	6.2
NORTH SHORE SLT	7.0	LATITUDE 36	6.2
	7.0		

NTEP 2001, 9 = healthy and 1 = severely diseased

Helminthosporium leaf spot and Melting-out



Helminthosporium leaf spot and Melting-out



Helminthosporium leaf spot and Melting-out

- Symptoms
- leaf spots
 - Start usually as water-soaked spots
 - Range in color from purplish black to reddish brown
 - Lesions usually extend parallel to leaf axis
 - Center will turn brown then straw-colored
- Leaf patterns
 - Net blotch or net-like pattern of necrotic lesions
- Crown infections
 - Cause the melting-out symptoms, some report this to be more common during warm periods
- Once crowns or leaves are girdled the leaf or tiller dies
- Conditions conducive for disease
 - Leaf spots followed by melting-out: primarily cool, wet weather
 - Melting-out and root, crown, or rhizome rots: warm, dry or warm, wet

Helminthosporium leaf spot and Melting-out

- Pathogen
 - conidia: always multi-cellular
 - Survive as mycelium or as conidia
 - Grow as saprophytes and sporulate profusely if debris is wetted
 - Spores spread by any means possible
 - Germinate and a germ tube infects leaf tissues – resulting in?
 - Wide range of temperature activity (37 – 80 F)
- Control
 - Balance fertility, especially in early spring
 - Avoid evening irrigation
 - Replace susceptible cultivars with resistant ones
 - Remove thatch
 - Increase mowing heights

Helminthosporium leaf spot and Melting-out

- Melting out in fall ratings of Kentucky bluegrass cultivars
9 = no disease, 0 = severe disease

Cultivar	disease rating	Cultivar	disease rating
DAWN	9.0	AQUILA	6.5
FREEDOM	9.0	RAM-1	6.2
LIBERTY	8.7	HARMONY	6.0
PST-CB1	8.7	WW AG 468	5.8
DESTINY	8.3	WW AG 495	5.8
ASSET	8.0	WABASH	5.5
COMPACT	8.0	BARZAN	5.0
CONNI	8.0	HUNTSVILLE	5.0
MERION	8.0	NE 80-88	4.7
NASSAU	8.0	WELCOME	4.2
ECLIPSE	7.0	JOY	3.5
MARQUIS	6.8	KENBLUE	3.2
COCKTAIL	6.8	S.D. CERTIFIED	3.2
AMAZON	6.7	MYSTIC	2.8

Large patch

Rhizoctonia solania



Large patch

- Causal organism: *Rhizoctonia solani*
- Hosts: **Zoysiagrass** (Hybrid Bermudagrass, buffalograss, and St. Augustinegrass)
- Distribution: transition zone primarily on Meyer Zoysiagrass

- Symptoms: circular shaped patches (2 in to > 15 feet in diam)
 - Orange to bronze colored patches in early spring or fall when the disease is active
 - Small brown to black lesions on basal leaf sheaths
 - Occur during the growing season, but more common in spring and sometimes fall
 - More severe on low mowed turf

- Most (up to 90 %) of the shoots die
- Stolons and roots are not affected

- This used to be called Zoysia patch but large patch is now preferred
- Occasionally it is described as Rhizoctonia blight but this is generally not used

Large patch

Rhizoctonia solani

- Disease is favored by cool, wet periods during which plant growth is slow
- Symptoms generally occur in the same location every year and enlarge
- Turf can be slow to recover and is less dense than unaffected areas
- Weed encroachment can be a significant problem

- The disease is favored by high thatch levels and soil moisture
 - Small brown to black lesions on basal leaf sheaths
 - Occur during the growing season, but more common in spring and sometimes fall
 - More severe on low mowed turf

- Management
 - Increase soil drainage
 - Increase mowing height
 - Reduce thatch / promote stolon growth
 - Do not fertilize turf with nitrogen in early spring (do not apply more than 2 lbs N / 1,000 sq ft / year)
 - Preventative fungicide applications work best – fall or early spring
 - Fungicides - flutolanil (Prostar), azoxystrobin (Heritage), triadimefon (Bayleton), and propiconazole (Banner MAXX)

Large patch

Rhizoctonia solani



Large patch

Rhizoctonia solani



Brown patch

Rhizoctonia solani



Brown patch

- Causal organism: *Rhizoctonia solani*
- Hosts: most turfgrasses – especially cool-season turfgrasses - Fescue
- Summer disease

- Conditions conducive for disease
 - hot, humid weather that results in heavy dew formation

- Symptoms:
 - For low mowed turfgrasses
 - Circular patches
 - A gray smoke ring may be present early in the morning

 - For taller turfgrasses
 - Irregular patches
 - Distinctly brown in color
 - Often a lesion, boarded by a dark-brown band (caution)
 - Upon close inspection, mycelium may be found in the canopy

- *Rhizoctonia solani* requires a minimum of 10 consecutive hours of leaf wetness or relative humidity 95%

Brown patch

Rhizoctonia solani

- Just be aware that two other species of *Rhizoctonia* can cause a similar diseases of turfgrasses
 - These are rare and confined largely to much warmer climates
- Survival
 - Overwinters as sclerotia (bulbils) or as mycelium in infected tissues
- Colonization occurs during warm weather
- Infection occurs through stomatal openings or directly using an appressoria
- Conditions conducive for disease
 - Day time temperatures > 85 F
 - Evening temperatures > 68 F
 - High relative humidity > 90 %
 - Leaf wetness minimum 6 hours

Brown patch

Rhizoctonia solani

- Management
 - Irrigate early in the morning
 - Let turf dry between syringing
 - Remove free moisture
 - Increase air movement, pruning, fans, and remove shade
 - Improve soil drainage
 - Avoid high rates of nitrogen / balanced fertility
- Many fungicides were once labeled for this disease in residential lawns
 - But this has changed (chlorothalonil, iprodione, and vinclozolin)
- Resistant cultivars are not available but some cultivars have better tolerance
- Resistance to fungicides has not generally occurred for this organism
- Fungicides – many labeled

Brown patch

Rhizoctonia solani

Tall Fescue

9 = no disease, 0 = severe disease

<u>Cultivar</u>	<u>Disease rating</u>	<u>Cultivar</u>	<u>Disease rating</u>
ROCKWELL (LTP-TWUU)	7.7	W41	7.0
ROWDY (SRX-TPC)	8.0	ATF 1704	7.0
AVENGER II (PPG-TF-156)	7.7	JS 916	7.7
TITANIUM 2LS (PPG-TF-152)	7.7	PPG-TF-138	7.3
GTO (BURL TF-2)	8.7	K12-05	8.0
VALKYRIE LS (PPG-TF-172)	7.7	JS 809	6.0
PST-5EX2	7.7	K12-13	6.0
IS-TF 308 SEL	7.3	ANNIHILATOR	5.7
FIREWALL (PSG-WE1)	7.7	COMP. RES. SST	4.7
LEONARDO (LTP-FSD)	7.0	WARHAWK	5.0
SALTILLO (PST-5SALT)	6.7	MARAUDER	4.3
		204 RES. BLK4	3.3

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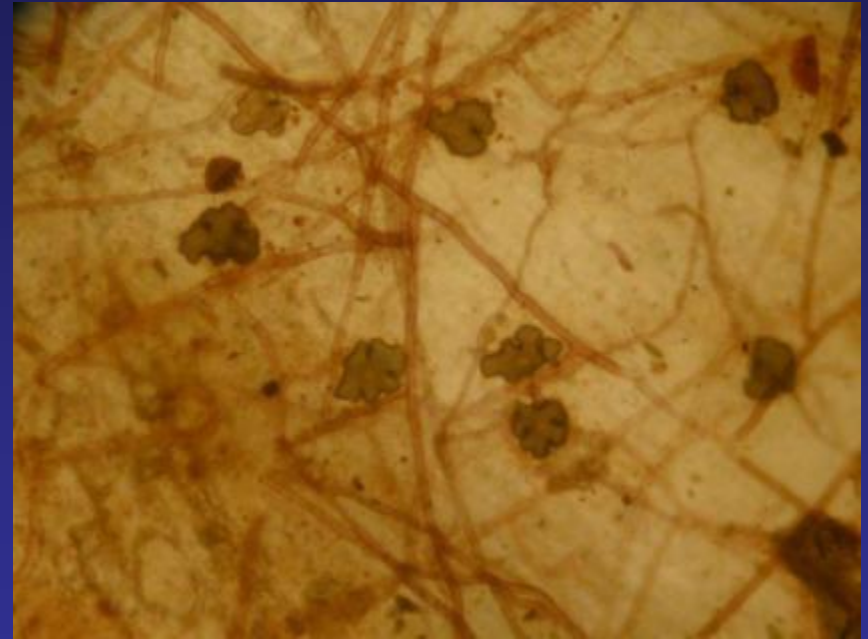
Take-all root rot/Decline of warm-season grasses

- In 1984 Freeman and Augustin described a decline of closely-mowed bermudagrass in Florida
- *Gaeumannomyces graminis* was identified as causing take-all root rot or decline of warm-season grasses on:
 - Bermudagrass and hybrids and **St. Augustinegrass**
 - Previously *G. graminis* was only considered a pathogen of corn and wheat
- Additional causal agents including *G. incrustans* and *G. wongoonoo* (Wong) have been associated with root declines of turfgrasses
- Conditions conducive for disease include:
 - hot, wet weather (> 80 F, frequent rain), rain is associated with low light levels that do not favor bermudagrass growth
 - High soil pH, lime applications
 - Frequent applications of nitrate forms of nitrogen or imbalance fertility (low potassium)
 - Additional stress factors such as low mowing heights or nematodes, i.e. root-knot nematode

Take-all root rot/Decline of warm-season grasses (*Gaeumannomyces graminis*)



Close up of a bermudagrass stolon with dark mycelium and hyphopodia



Each hyphopodia is an infection center

Take-all root rot/Decline of warm-season grasses

Management:

- Can be a very difficult disease to manage (as with all soilborne diseases)
- All bermudagrass appear to be susceptible
- - Increase mowing heights, especially during rainy periods
 - Thatch removal/core aeration (remove cores)
 - Balanced 1:1 or 1:2 ratio of N to K
 - Best results are obtained when soil pH is adjusted below 6.5
 - Use slow-release or acidifying fertilizers such as ammonium sulfate
- Overtime the disease may decline
 - This is thought to be caused by antagonists that build-up in the soil
- Fungicides
 - Heritage MAXX, (azoxystrobin), Insignia (pyraclostrobin), Bayleton (triadimefon), and Banner MAXX, (propiconazole)
 - Sporadic, slow, must be applied in the fall and spring, multiple applications are typically required and they should be watered in

Spring and Fall diseases: spring dead spot
Ophiosphaerella herpotricha, *O. korrae*, and *O. narmari*



Spring Dead Spot



Spring Dead Spot



Spring Dead Spot

Caused by three closely related ectotrophic root infecting fungi

In Australia, New Zealand and the west coast of North America

Ophiosphaerella narmari (formerly *Leptosphaeria narmari*)

Throughout eastern and south eastern North America

Ophiosphaerella korrae (formerly *Leptosphaeria korrae*)

In south central North America the most important is:

Ophiosphaerella herpotricha

Now the disease, through movement of plant materials, can be found in:

Asia – China

Europe – Italy

South America - Argentina

Symptoms of Spring Dead Spot

- Clearly defined circular patches of dead grass apparent in early spring
- Most prevalent on intensively managed bermudagrass
 - Fairways, athletic field, home lawns, and commercial landscapes
 - Ultradwarf bermudagrass greens (a different story)
- Important and devastating disease because:
 - Appearance
 - Weed encroachment
 - Golf play
 - Tournament scheduling

Spring Dead Spot

- In the spring, if you excavate diseased plants, dark, discolored roots, crowns, and stolons are visible to the naked eye
- Leaves are straw colored or bleached in contrast to the dark, black roots



Spring Dead Spot

- In most cases, the patches will recover in one season; however, in severe situations more than one year might be necessary
 - However, this can be slowed due to the establishment of weeds



Spring Dead Spot

- Local and long distance movement
 - *O. korrae* & *O. narmari* - infested soil, plant materials, and possibly spores
 - *O. herpotricha* - infested soil and plant materials
- Optimal infection and colonization occurs when soil temperatures are cool
 - less than 24 C
- Wet or near saturated soils may aid in infection
 - Disease may be more severe in heavy soils
- Typically symptoms do not appear on a newly established planting (< 3 years old)
- Symptoms will first appear as small spots
 - Often overlooked

Managing Spring Dead Spot

- Host plant resistance
 - Use resistant varieties
- Avoid late season applications of nitrogen
 - Or practices that delay normal dormancy
- Organic soil amendments/fertilizers
 - More N or K increased disease severity
- Cultural management
 - Reduce soil compaction
 - Aeration
 - Disease tends to be more severe with increasing thatch
 - Vertical mowing
- Soil pH in has not been a good predictor of disease incidence or severity



Indirect problem - Fairy ring

- Causal agent: many basidiomycete fungi
- Affected turfgrasses: all
- Conducive conditions: warm, moist weather with intermittent periods of drought
- This is not a true “disease”, rather a soil organism which causes a change in the soil environment to which the plants respond
- Symptoms are usually in the form of circles or arcs
- Types (I don’t like this classification system)
 - 1 - kills grass, outer zone of green grass, and mushrooms
 - 2 - dark, green stimulated grass (dead zone in center is absent), +/- mushrooms
 - 3 - only mushrooms appear
- Can be a problem anywhere on newly established golf courses, lawns, and parks, right-of-way, and sod fields

3/2012

Memorial Hill Cemetery

E0250 Rd

Google Earth

Tour Guide

1990

Imagery Date: 3/31/2012 36°39'13.39" N 98°51'26.04" W elev 1553 ft eye alt 2379 ft

Fairy ring

various basidiomycetes

- Typically, only a band of lush turf (6-8 inches) will develop
- Dead or dormant turf may develop on in inside of the band
- A second band of lush turf may develop on the inside of the dead zone, but this does not occur very frequently
- Realistically, any combination is possible depending on the fungi and environment
 - Two zones of lush turf, a dead zone, and mushrooms
 - One zone of lush turf
- 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 death of the mycelium which releases nitrogen into the soil

Fairy ring

various basidiomycetes

- The dead zone is attributed to soil hydrophobicity
 - Often white mycelium can be visible in the soil
 - Occasionally, a mushroom odor can be detected
 - Soil is dry and surrounding plants may appear gray/purple or feel warm
- Decomposing wood material is thought to contribute to problems with fairy ring
- The rings will be disrupted by any structure such as walls, landscaping beds, or sidewalk
- When two rings meet, the symptoms stop
 - This is thought to be caused by inhibitory metabolites
 - strobilurins
- New fairy rings are:
 - Often initiated from spores produced by the mushrooms
 - Moving any soil/thatch will move the fungus – frequent problem on golf courses

Fairy ring

various basidiomycetes

- Management is difficult to achieve
 - Eventually the problem may go away (slow)
- Control
 - Water injection with surfactants or wetting agents
 - Use a tree-root watering wand every other day for a month
 - Prevents soil drying and may encourage antagonists
 - Aerification, combined with deep watering
 - Fumigation
 - Metam-sodium (Vapam) or dazomet (Basamid)
 - Kills turf and all other living organisms
 - Access to the location must be restricted
 - Soil removal or mixing
 - Take advantage of the antagonism – kill or remove grass and mix soil thoroughly
 - Remove soil and replace with new soil
 - Fungicides
 - Injected under high pressure
 - Flutalonil (Prostar) or strobilurins (Heritage or compass)
- Mask symptoms with light nitrogen applications, aerification, and deep watering