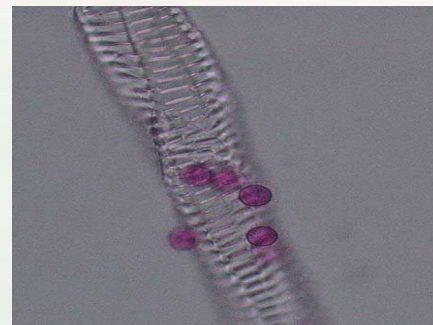




UNIVERSITY OF  
**GEORGIA**  
EXTENSION

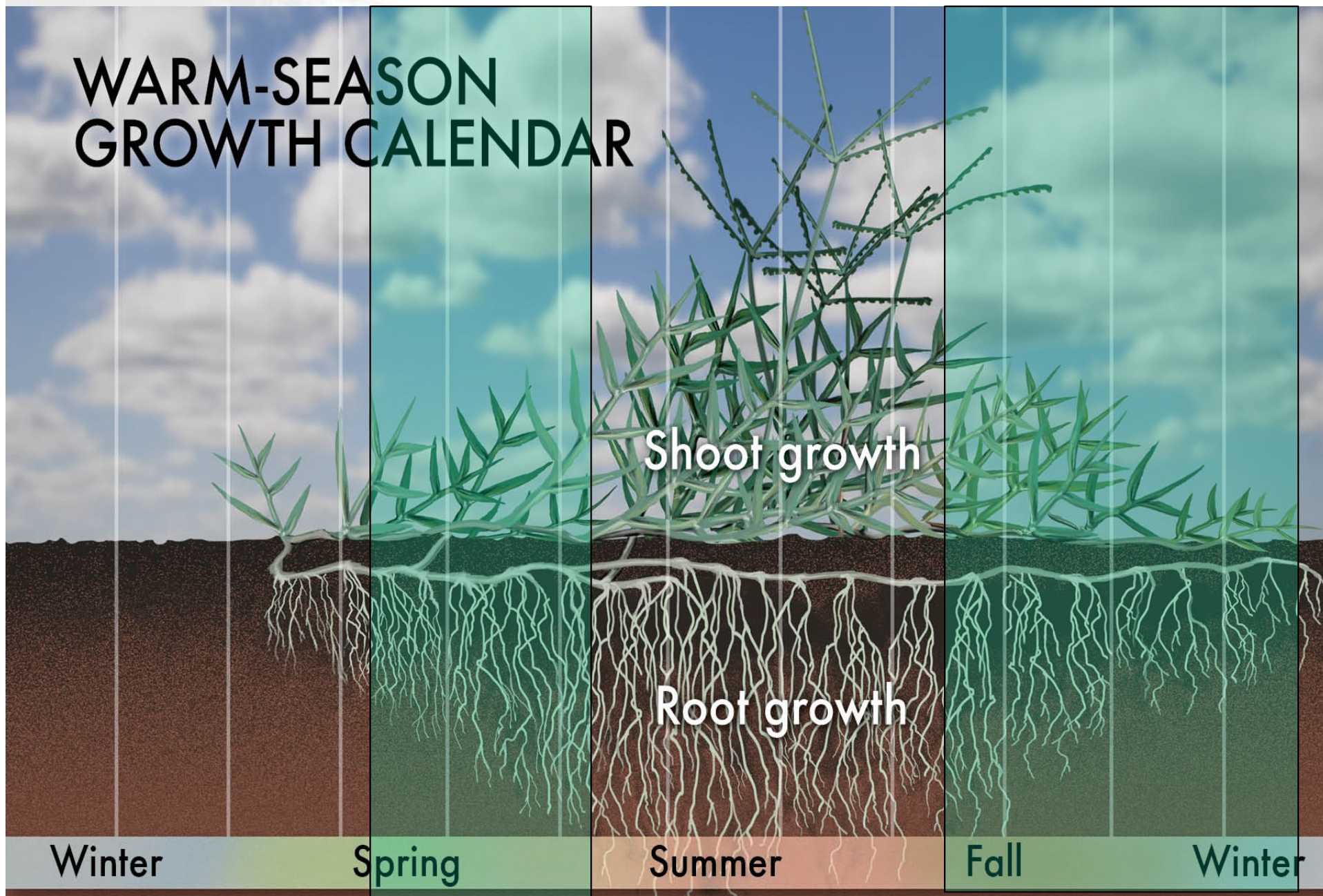
# PREVENTING TURFGRASS DISEASES

ALFREDO MARTINEZ  
PLANT PATHOLOGY DEPARTMENT

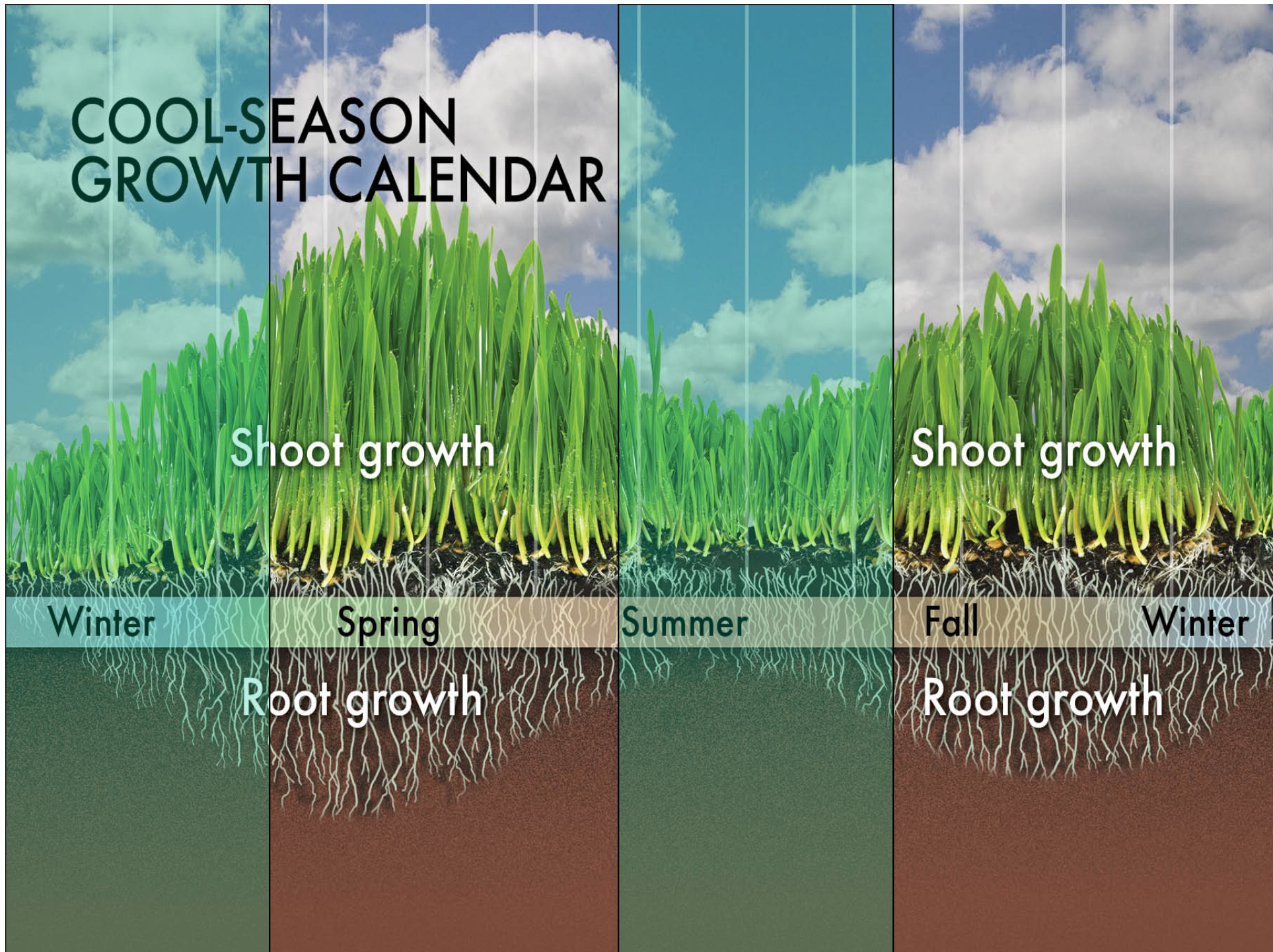


# Susceptible Periods and Weather Patterns

## WARM-SEASON GROWTH CALENDAR



# COOL-SEASON GROWTH CALENDAR



Shoot growth

Shoot growth

Winter

Spring

Summer

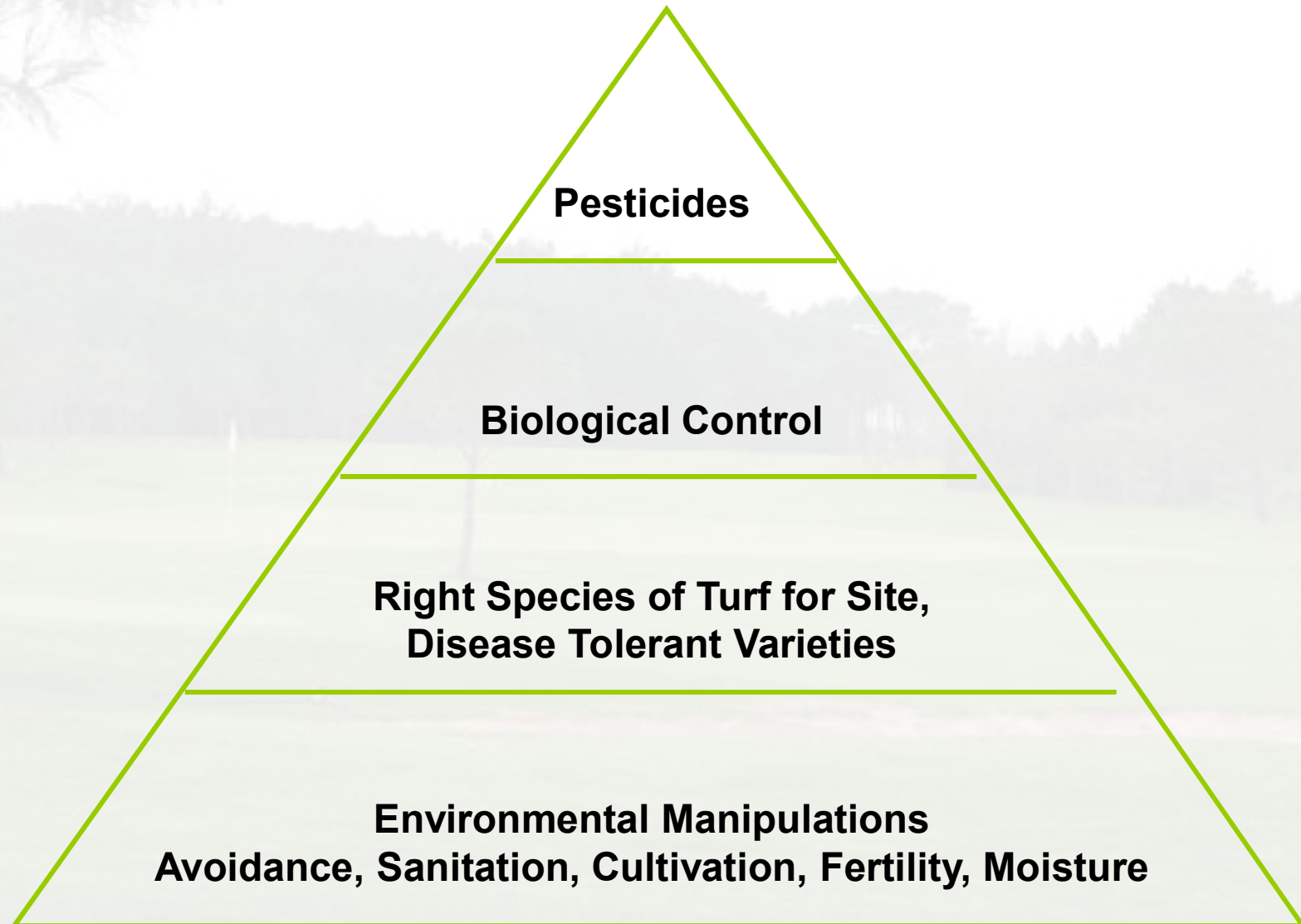
Fall

Winter

Root growth

Root growth

# Disease Management



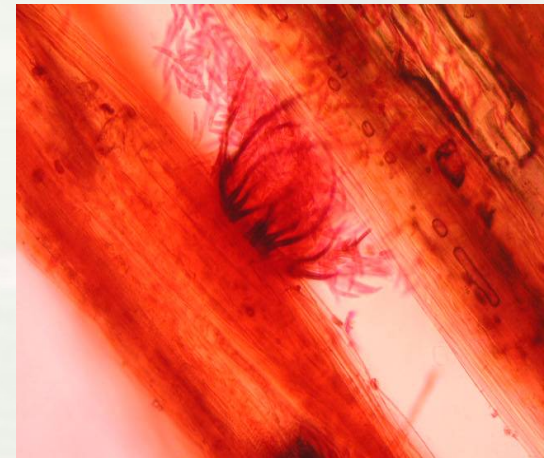
# Mastering the Basics

- Knowledge and evaluation of the area. Profile and site-dependent cultural practices-tailoring
  - Detailed information of the site.
  - Maps, drawings etc indicating soil type (s); irrigation, trees etc that can be an onset for disease development
  - Solid knowledge of turfgrass species and varieties to implement annual activities and avoid potential disease activity
  - Vulnerable areas
  - Areas that require active and continuous monitoring



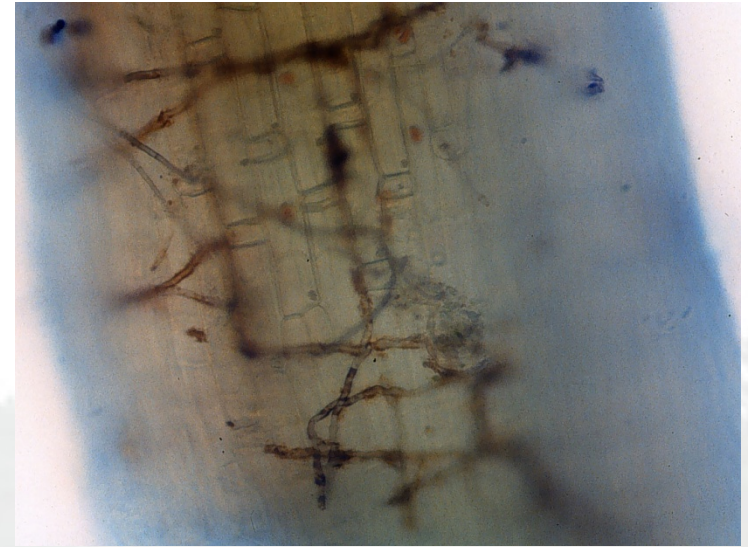
- FERTILITY

- Off-balanced fertility increases susceptibility to certain diseases
- Dollar spot; Nitrogen and Potassium deficiency. Rust=Low Nitrogen
- Bipolaris leaf spot on warm season grasses =Potassium deficiency
- Anthracnose= Stress, low fertility
- Should be addressed based on soil test



- SOIL

- PH. Levels should be in range of turf growing species. High pH (more than 6.4) increases the susceptibility to Root decline, spring dead spot/other diseases
- Compaction
- Thatch build up
- Nutrient levels
- Physical characteristics (sandy vs loam-other and leaching)



- Irrigation

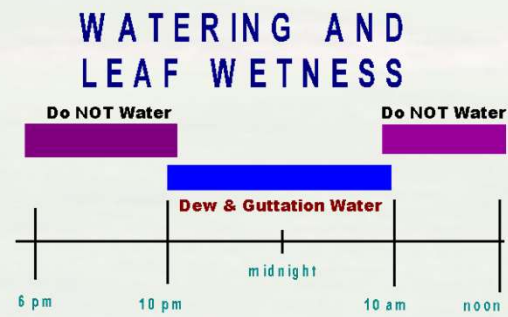
- Moisture extremes (Saturated Soil/Flooding or Standing Water; Insufficient)
- Excess: Increases possibility of root diseases, sulfide accumulation, root disintegration, gaseous exchange. High humidity on foliage-foliar diseases. Favors fungal sporulation. Nutrient leaching
- Deficiency: weakens turf, loss of turgidity, photosynthesis reduction, desiccation, diminishes fungicide activity.





- Excessive dew/foliar wetness

- High relative humidity
- Slow evapotranspiration
- Guttation
- All these factors favor development, penetration and sporulation of fungal diseases



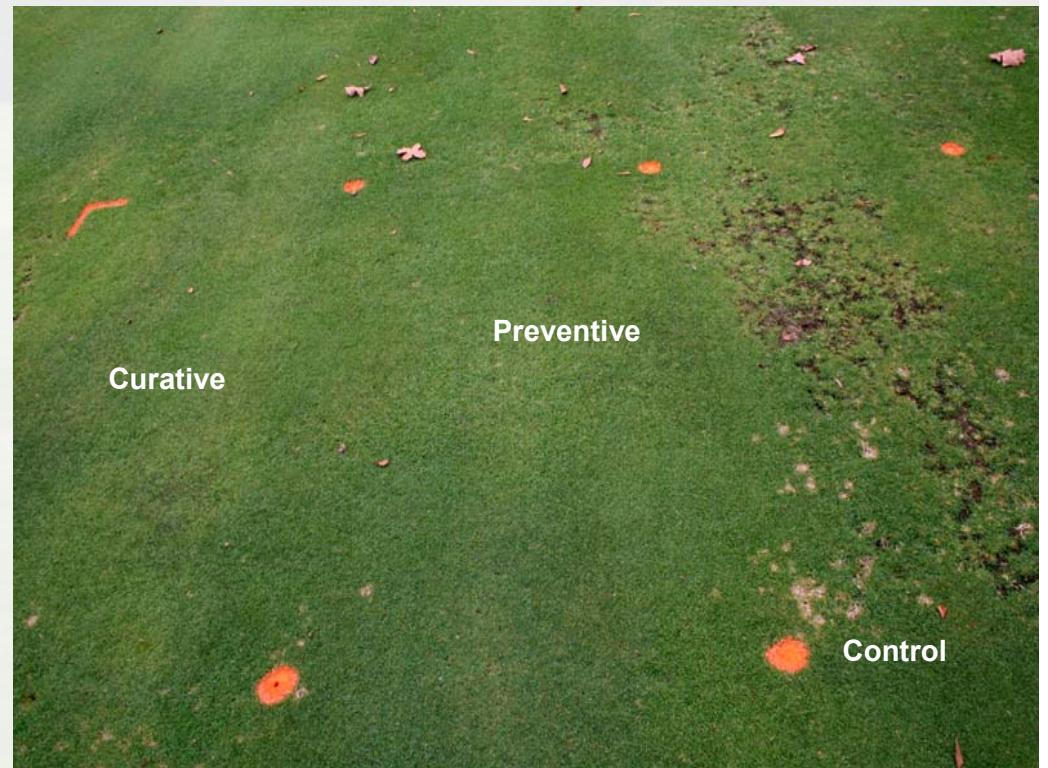
- Mowing

- Height of cut
- Frequency
- Sharpness of blades
- Compaction
- Pattern
- Improve turfgrass growth conditions to lessen pathogen attack



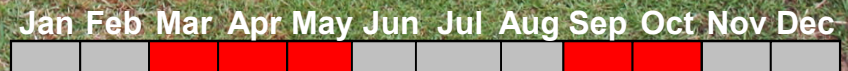
- Chemical control

- Proper fungicide selection
- Pathogen to control
- Rate
- Preventive-Curative
- Timing of fungicide
- Coverage-foliage
- Pathogen attack (roots, crown foliar)
- Fungicide formulation
- Time of application
- Chemical group



LARGE PATCH (*RHIZOCTONIA SOLANI*) OF ZOYSIAGRASS  
(*ZOYSIA JAPONICA*)

*Rhizoctonia solani*  
(strain AG 2-2 LP)



# LARGE PATCH

Rhizoctonia on Warm Season Grasses

*Rhizoctonia solani*

(strain AG 2-2 LP)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grey	Grey	Red	Red	Red	Grey	Grey	Grey	Red	Red	Grey	Grey

*R. solani* on warm season grasses



- **Caused by the fungus *Rhizoctonia solani***
- **Disease symptoms are circular patterns of dead grass**
  - **Turf turns brown and grass blades rot off**
  - **Brown Patch can spread in an area from 1-50'.**
  - **New leaves may emerge in the center of the circular patch giving the diseased areas a doughnut-shaped appearance.**



# Best Management Practices for Rhizoctonia

- **Scout: Early detection is key for disease prevention/control**
- **Avoid excessive Nitrogen fertilization (Maintain adequate Nitrogen levels)**
  - **Water Timely and Deeply (After midnight/before 11 AM)**
    - **Avoid frequent light irrigation to reduce humidity**
    - **Allow time during the day to allow plant canopy to dry**
      - **Increase air circulation**
- **Reduce thatch (no more than 1 inch thick) Excessive thatch: (Restricts water and air movement; Promotes shallow root growth; Promotes an ideal environment for pathogens)**



# Chemical Control- Rhizoctonia

www.georgiaturf.com

**GEORGIA TURF** Search

Weather Help Site Map

Athens Griffin Tifton

**Updates and Additions**

- [2015 Turfgrass Pest Control Recommendations for Professionals](#)
- [Turfgrass Management Smartphone Application](#)
- [Designing, Constructing, and Maintaining Bermudagrass Sports Fields](#)
- [Weeds of Southern Turfgrasses](#)
- [Best Management Practices for Landscape Water Conservation](#)
- [Avid Special Local Needs Approval & Label](#)
- [MSMA](#)

**Calendar of Events**

2015	Oct. 28	<a href="#">Sod Producers Field Day</a>	Perry, GA
	Dec. 9-10	<a href="#">EDGE Expo</a>	Gwinnett, GA

**GEORGIA TURF** Search

Weather Help Site Map

Athens Griffin Tifton

Home : [Publications](#) : Pest Control Recommendations for Professionals

## 2015 Turfgrass Pest Control Recommendations for Professionals

Prepared By:  
*The University of Georgia*

Content Provided By:  
*Patrick McCullough and Clint Waltz  
Crop and Soil Science  
Kris Braman and Will Hudson – Entomology  
Alfredo Martinez – Plant Pathology*

Compiled By:  
*Clay Bennett and Alan Wise*

To download the full 2015 Turfgrass Pest Control Recommendations for Professionals please [click here \(1.4MB\)](#).

### Table of Contents

All files are in PDF format and require the use of Adobe® Reader®. If you do not have this software installed you can [download Adobe® Reader® for free from the Adobe® website](#).

[Key Points: Georgia's Turfgrass Industry and UGA's Turfgrass Program](#)

[Turfgrass Industry Facts in Georgia](#)

[Basic Turfgrass Management for Georgia](#)

# Chemical Control- Rhizoctonia

www.georgiaturf.com

Brown/Large Patch ( <i>Rhizoctonia solani</i> ) and Dollar Spot ( <i>Sclerotinia homoeocarpa</i> )	azoxystrobin (Heritage 50WG, Heritage G, Heritage TL)	0.2 - 0.4 oz. at 14 - 28 day intervals 2 - 4 lbs. at 14-28 day intervals Heritage TL: 2 fl. oz.	(Trinity, Triton)		
	azoxystrobin + chlorothalonil (Renown)	2.5 - 4.5 fl. oz. at 7 - 28 day intervals	triticonazole + chlorothalonil (Reserve)	3.2 - 5.4 oz. at 14 - 28 day intervals	
	azoxystrobin + difenconazole (Briskway)	BP/LP = 0.3 - 0.725 fl. oz. at 14 - 28 day intervals DS = 0.3 to 0.725 fl. oz. at 14- 21 day intervals	Brown/Large Patch ( <i>Rhizoctonia solani</i> ) and Dollar Spot ( <i>Sclerotinia homoeocarpa</i> )	azoxystrobin (Heritage 50WG, Heritage G, Heritage TL)	0.2 - 0.4 oz. at 14 - 28 day intervals 2 - 4 lbs. at 14-28 day intervals Heritage TL: 2 fl. oz.
	azoxystrobin + propiconazole (Headway)	0.75-3 oz. at 14 - 28 day intervals		azoxystrobin + chlorothalonil (Renown)	2.5 - 4.5 fl. oz. at 7 - 28 day intervals
	boscalid (Emerald)	0.13 - 0.18 oz. at 14 - 21 day intervals		azoxystrobin + difenconazole (Briskway)	BP/LP = 0.3 - 0.725 fl. oz. at 14 - 28 day intervals DS = 0.3 to 0.725 fl. oz. at 14- 21 day intervals
	<i>bacillus licheniformis</i> (EcoGuard SB 3086)	Up to 20 oz. at 3 - 14 day intervals		azoxystrobin + propiconazole (Headway)	0.75-3 oz. at 14 - 28 day intervals
	<i>bacillus subtilis</i> Strain QST713 (Rhapsody, Sonnet)	2.0 - 10 fl. oz. at 7 - 10 day intervals		boscalid (Emerald)	0.13 - 0.18 oz. at 14 - 21 day intervals
	<i>bacillus subtilis</i> Strain GB03 (Companion)	4.0 - 6 fl. oz. at 14 - 28 day intervals		<i>bacillus licheniformis</i> (EcoGuard SB 3086)	Up to 20 oz. at 3 - 14 day intervals
(Trinity, Triton)			<i>bacillus subtilis</i> Strain QST713 (Rhapsody, Sonnet)	2.0 - 10 fl. oz. at 7 - 10 day intervals	
	triticonazole + chlorothalonil (Reserve)	3.2 - 5.4 oz. at 14 - 28 day intervals	Supplemental 2(ee) label recommendations may be available for some listed		
Brown/Large Patch ( <i>Rhizoctonia solani</i> ) and Dollar Spot ( <i>Sclerotinia homoeocarpa</i> )	azoxystrobin (Heritage 50WG, Heritage G, Heritage TL)	0.2 - 0.4 oz. at 14 - 28 day intervals 2 - 4 lbs. at 14-28 day intervals Heritage TL: 2 fl. oz.	Brown/Large Patch ( <i>Rhizoctonia solani</i> ) and Dollar Spot ( <i>Sclerotinia homoeocarpa</i> ) (cont.)	fluoxastrobin + fyclobutamil (Disarm M)	0.25 - 1.0 oz. at 14-28 day intervals
	azoxystrobin + chlorothalonil (Renown)	2.5 - 4.5 fl. oz. at 7 - 28 day intervals		iprodione (18 Plus, Armor Tech IP233, Chipco 26GT, Chipco 26019, Iprodione Pro 2SE, Iprodione SPC, Ipro2SE, Raven)	2-4 fl. oz. in 2-10 gals. water. Apply every 14-21 day. 1.5 oz. = 9 tbsp. 1.5-2.0 oz. at 14-21 day intervals 3-4 fl. oz. at 14-28 day intervals
	azoxystrobin + difenconazole (Briskway)	BP/LP = 0.3 - 0.725 fl. oz. at 14 - 28 day intervals DS = 0.3 to 0.725 fl. oz. at 14- 21 day intervals		iprodione + thiphanate methyl (26/36, ArmorTech TMI 2020, Dovetail, Lesco Twosome, TM + IP SPC)	1-4 oz. at 14-21 day intervals
	azoxystrobin + propiconazole (Headway)	0.75-3 oz. at 14 - 28 day intervals		iprodione + trifloxystrobin (Interface)	4-6 oz. at 14- 21 day intervals
	boscalid (Emerald)	0.13 - 0.18 oz. at 14 - 21 day intervals		mancozeb + copper hydroxide (Junction)	2-4 oz. at 7-14 day intervals
	<i>bacillus licheniformis</i> (EcoGuard SB 3086)	Up to 20 oz. at 3 - 14 day intervals		maneb, maneb + zinc sulfate, mancozeb (Dithane, Fore, Protect T/O, Tersan LSR, etc.)	<b>Preventive:</b> 3-4 oz. in 3-5 gals. water at 7-10 day intervals <b>Curative:</b> 6-8 oz. in 3-5 gals. water at 7-10 day intervals 3 oz. = 10 tbsp.
	<i>bacillus subtilis</i> Strain QST713 (Rhapsody, Sonnet)	2.0 - 10 fl. oz. at 7 - 10 day intervals		metconazole (Tourney)	Dollar Spot – 0.18-0.37 oz. at 14-21 day intervals
	<i>bacillus subtilis</i> Strain GB03 (Companion)	4.0 - 6 fl. oz. at 14 - 28 day intervals			

# Fungicides for Brown Patch/Large Patch (Rhizoctonia)

## Commercial

- Triadimefon (Bayleton) (1-2 oz per 1000 sq ft once or twice on early spring or fall)  
(more if disease active every 21 days)
- Thiophanate Methyl (Cleary's) (1-2 oz/1000 sq ft once or twice on early spring or fall)
  
- Azoxystrobin (Heritage) (0.2-0.4 oz once in spring)
  - Propiconazole (Banner) (1-2 fl. oz )
  - Myclobutanil (Eagle) (0.6 oz)
  - Pyraclostrobin (Insignia) (0.5-0.9)
  
- Armada (Bayer) (Bayleton, Trifloxystrobin) (0.6-1.2 oz/1000 sq ft)
- Prostar (Flutolanil) (2.2 oz per 1000 sq ft) Spring or Fall (Large Patch)

[http://extension.uga.edu/publications/files/pdf/C%201088\\_2.PDF](http://extension.uga.edu/publications/files/pdf/C%201088_2.PDF)

<http://extension.uga.edu/publications/detail.html?number=C1088>

*Identification and Control of*  
**Rhizoctonia**  
**Large Patch**  
*in Georgia*

*Alfredo Martínez-Espinoza, Department of Plant Pathology, Griffin Campus*  
*Elizabeth Little, Department of Plant Pathology, Athens Campus*  
*Tim Daly, UGA Extension, Gwinnett County*  
*Brian Vermeer, Department of Plant Pathology, Griffin Campus*



# GRAY LEAF SPOT

caused by

***Magnaporthe grisea***

***(Pyricularia grisea)***





- Tan, oval or round lesions with dark brown border
- With high humidity lesions accentuate to gray and produce profuse amounts of spores
- Severely affected leaf blades wither and turn

***Magnaporthe grisea***

## **Susceptible grasses**

---

**Cool Season= Tall Fescue and Perennial Ryegrass**

**Warm Season= St. Augustinegrass**



## *Magnaporthe grisea*

### Favorable Environment

---

- Night temperatures  $\geq 75^{\circ}$  F and day temps  $< 95^{\circ}$  F.
- More than 10 hrs. of leaf wetness per day for several days.
- Disease is severe on turf overfertilized with nitrogen





**Photo Umass Extension**

**A. Martinez**



A close-up photograph of green grass blades. Several blades show distinct brown, necrotic lesions characteristic of gray leaf spot. The lesions are elongated and have a slightly irregular, dark brown border. The grass is otherwise healthy and green. The text "GRAY LEAF SPOT" is written in red, bold, uppercase letters across the middle of the image, and "MANAGEMENT" is written in a larger, red, bold, uppercase font below it.

**GRAY LEAF SPOT**  
**MANAGEMENT**

# **GRAY LEAF SPOT**

## **Resistant Species and Cultivars**

---

- **St. Augustinegrass is more resistant than cool season grasses**
- **Perennial ryegrass is highly susceptible**
- **Tall fescue has an intermediate susceptibility**
- **Appear that Roselawn and Tamelawn St. Augustinegrass Cultivars are less susceptible**

# GRAY LEAF SPOT

## Cultural Controls

---

- **Manage leaf wetness**
- **Decrease shade and increase air circulation.**
- **Avoid irrigation in late afternoon and early evening**
- **Avoid mowing when turf is wet, Magnaporthe produces large amounts of and can be easily spread through mowing.**

**Proper fertility during the summer according to grass species (cool vs warm)**

# **GRAY LEAF SPOT**

## **Chemical Controls**

---

**Preventive control is best in cool season grasses (Perennial rye and tall fescue)**

**Strobirulins (azoxystrobin etc)**

**DMI (DeMethylation Inhibitors)- (propiconazole etc)**

**Benzimidazole-Thiophanate methyl**

**Usually at 14 to 21 day intervals**

## Latest Developments on Turfgrass Fungicides 2019

Common name	Active Ingredient	Type of A. I.	Rate	Fungi	Areas	Company
Xzemplar	Fluoxapyroxad	Carboxamide Succinate-Dehydrogenase Inhibitor (SDHI) systemic	0.16-0.26 fl oz 1000 sq ft	Wide Range of Fungi (we tested it on Dollar spot (bent and seashore), anthracnose (bent), summer patch (bent), R. zeae (bent))	Golf, residential, commercial, Institutional, Municipal, Recreational, Parks, sport fields, sod, Cementeries	BASF
Lexicon Intrinsic	Fluoxapyroxad + Pyraclostrobin	Carboxamide Succinate-Dehydrogenase Inhibitor (SDHI) systemic + Strobirulin	0.34-0.47 oz 1000 sq ft	Wide Range of Fungi (we tested it on Dollar spot (bent and seashore), anthracnose (bent), summer patch (bent), R. zeae (bent))	Golf, residential, commercial, Institutional, Municipal, Recreational, Parks, sport fields, sod, Cementeries	BASF



## Latest Developments on Turfgrass Fungicides 2019

Common name	Active Ingredient	Type of A. I.	Rate	Fungi	Areas	Company
Briskway	Azoxystrobin + Difenconazole	Strobilurin-Systemic + DMI systemic	0.3-0.725 fl oz 1000 sq ft	Wide Range of Fungi	Golf only	Syngenta
Secure	Fluazinam	Multi-site, Pyridinamine, contact	0.5 oz 1000 sq ft	Wide range of fungi	Golf only	Syngenta
Daconil Action	Chlorothalonil + Acibenzolar	Strobilurin-Systemic + Plant Defense Mechanism	1-5.4 fl oz 1000 sq ft	Wide Range of Fungi	sod farms; turf on golf courses, professional and collegiate athletic fields; and lawns around commercial and industrial buildings.	Syngenta

## Latest Developments on Turfgrass Fungicides 2019

Common name	Active Ingredient	Type of A. I.	Rate	Fungi	Areas	Company
Velista	Penthiopyrad	Carboximide	0.3 -0.7 oz 1000 sq ft	Wide Range of Fungi	golf courses	SYNGENTA
MIRAGE STRESSGUARD	TEBUCONAZOLE	DMI	1-2 fl oz	Wide range on fungi	Golf courses	BAYER
FIATA STRESSGUARD	PHOSPHONATE	PHOSPHONATE	5-15 FL OZ	PYTHIUM	sod farms; turf on golf courses, athletic fields; and lawns around commercial Residential sites	

## COMMERCIAL TURFGRASS BIOFUNGICIDES IN THE US UNTIL 2019

PRODUCT	ACTIVE INGREDIENT	TYPE
ECOGUARD	Bacillus licheniformis	Biological control agent
RHAPSODY	Bacillus subtilis qst 711	Biological control agent
ARMORTECH SONNET	Bacillus subtilis qst 711	Biological control agent
Companion	Bacillus subtilis GB3	Biological control agent
Double Nickel LC	Bacillus amyloliquefaciens	Biological control agent
Actinovate	Streptomyces lydicus WYEC	Biological control agent

## COMMERCIAL TURFGRASS BIOFUNGICIDES IN THE US UNTIL 2019

PRODUCT	ACTIVE INGREDIENT	TYPE
Biojet spot-lesst	<i>Pseudomonas aureofaciens</i> TX-1 strain	biological control agent
Turfshield	<i>Trichoderma harzianum</i>	biological control agent
Endorse	Polyoxin D	cell wall inhibitor
Civitas	Mineral oil derivative	host defense activator
Regalia	<i>Reynoutria sachalinensis</i>	plant extract
SC27 Turf and shrub	12 <i>Streptomyces</i> sp + <i>B. subtilis</i> + 2 Endomycorrhizal	Plant Health Activator, Soil Inoculant

## Latest Developments on Turfgrass Nematicides 2019

Common name	Active Ingredient	Type of A. I.	Rate	Pathogen	Areas	Company
Nortica	Bacillus firmus	Bacteria-Soil Inhabitant	0.7-2.3 lb 1000 sq ft	Sting, Lesion, Lance, Root knot, Sheath, Spiral, Stunt	Turf, Lawns, Sod Farms, and Golf Courses (Greens, Tees, Fairways and Roughs)	Bayer
Econem	Pasteuria usgea	Soil Inhabitant-Bacteria	2-10 lb 1000 sq ft	Belonolaimus longidorus (Sting Nematode)	Most turfgrasses	Pasteuria Bioscience
Multiguard protect	Furfural		0.184 gal 1000 sq ft	Plant Parasitic nematodes	Golf and sod	Agriguard

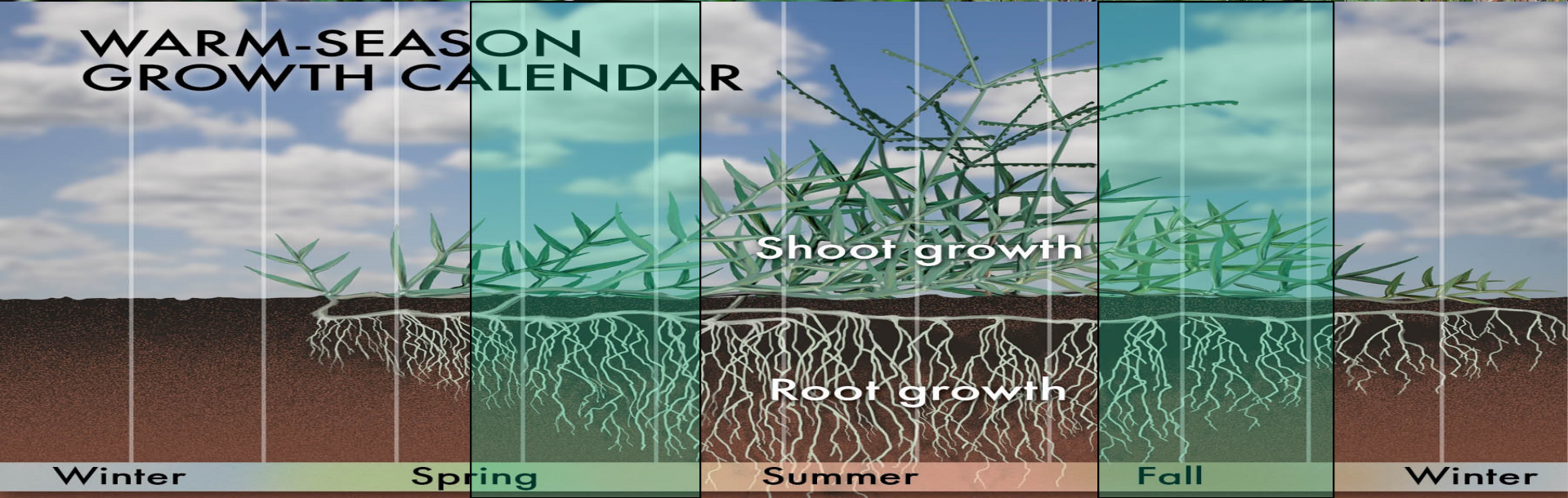
## Latest Developments on Turfgrass Nematicides 2019

Common name	Active Ingredient	Pathogen	Areas	Company
NIMITZ PRO G	FLUENSULFONE	ENDO AND ECTO PARASITIC	Most turfgrasses Most turfgrasses	QUALI PRO
INDEMNIFY	FLUOPYRAM	BROAD SPECTRUM	Most turfgrasses	BAYER
NEO-TEC	SESAME OIL	Plant Parasititc nematodes	Most turfgrasses	BRANDT
DIVANEM	ABAMECTIN	Plant Parasititc nematodes	Most turfgrasses	Syngenta

**DOLLAR SPOT (*Sclerotinia*  
*homoeocarpa*)**



•Symptoms on seashore paspalum.  
Increased fitness/aggressiveness?





- Infection requirements

- 50°F – 80°F (Anytime on bermudagrass /more common on Early Spring Late Fall)

- >10 hrs leaf wetness/day

- Dry Soils

- Low Nitrogen/Potassium (fertility) promotes growth of the fungus



# Best Management Practices for Dollar spot

- Maintain adequate Nitrogen levels (low Nitrogen promotes the disease)
- Avoid drought stress (dry soils promote the disease)
- Water deeply
- Avoid extended moisture on leaves /remove dew in morning
- Increase air circulation
- Mow at recommended height

# FUNGICIDES FOR DOLLAR SPOT CONTROL 2018

CHEMICAL AND FORMULATION	RATE PER 1000 sq ft	Chemical group
azoxystrobin + acibenzolar Heritage Action	0.2 to 0.4 oz Supression Only	Strobilurin + Host Plant Defense Induction
azoxystrobin + difenconazole Briskway	0.3 to 0.725 fl oz	Strobilurin + DMI
azoxystrobin + tebuconazole Zoxi-T	0.75 to 1.5 fl oz	Strobilurin + DMI
Fluoxapyroxad Xzemplar	0.16 to 0.26 fl oz depending on the interval (14 to 28 days)	Carboximide SDHI
fluoxapyroxad +pyraclostrobin Lexicon	0.34 to 0.47 fl oz	Carboximide SDHI + Strobilurin
fluazinam Secure	0.5 fl oz	Dinitro anilines
penthiopyrad Velista	0.3 to 0.5 fl oz	Carboximide SDHI
tebuconazole Mirage Stressgard	1.0 to 2.0 fl oz	DMI



**TURFGRASS DISEASES IN GA: IDENTIFICATION AND CONTROL**

<http://pubs.caes.uga.edu/caespubs/pubcd/B1233.htm>

**ABIOTIC DISEASES AND INJURIES OF TURFGRASSES IN GA**

<http://pubs.caes.uga.edu/caespubs/pubcd/B1258.htm>

**2012 GEORGIA PESTICIDE HANDBOOK**

<http://www.ent.uga.edu/pmh/>

**2018 TURFGRASS PEST CONTROL RECOMMENDATIONS FOR PROFESSIONALS**

[http://www.griffin.uga.edu/caes/turf/Publicat/1640\\_Recommendations.htm](http://www.griffin.uga.edu/caes/turf/Publicat/1640_Recommendations.htm)

# FAIRY RING

Circular or arc rings of dark green grass  
10-20 cm wide mushrooms maybe present.



- Different Basidiomycetous fungi
- Mushroom (basidiocarp) producing fungi
- In Nature, wood-rooting
- Circular or semi-circular band



- **Affects all turf types**
- **Most common and damaging on Centipede, Zoysiagrass and St. Augustinegrass.**
- **Most on sandy soils of low fertility**
- **Also favored by heavy thatch**
- **Sometimes associated with buried debris**



<i>Agaricus arvensis</i>	<i>Hydnellum suaveolens</i>	<i>Marasmius oreades</i>
<i>Agaricus campestris</i>	<i>Hydnum compactum</i>	<i>Marasmius siccus</i>
<i>Agrocybe pediades</i>	<i>Hygrocybe coccinea</i>	<i>Marasmius rotula</i>
<i>Bovista dermoxantha</i>	<i>Hygrocybe psittacina</i>	<i>Marasmius urens</i>
<i>Bovista plumbea</i>	<i>Hygrocybe reae</i>	<i>Melanoleuca melaleuca</i>
<i>Calocybe carnea</i>	<i>Hygrophoropsis aurantiaca</i>	<i>Melanolueca garmopodia</i>
<i>Calvatia cyathiformis</i>	<i>Lactarius insulsus</i>	<i>Nolanea staurospora</i>
<i>Camarophyllus pratensis</i>	<i>Lactarius piperatus</i>	<i>Panaeolina foenicicii</i>
<i>Campanella subdendrophora</i>	<i>Lactarius torminosus</i>	<i>Panaeolus campanulatus</i>
<i>Chlorophyllum molybdites</i>	<i>Lepista nuda</i>	<i>Paxillus involutus</i>
<i>Clarulinopsis corniculata</i>	<i>Lepista personata</i>	<i>Scleroderma verrucosum</i>
<i>Clitocybe infundibuliformis</i>	<i>Lepista sordida</i>	<i>Suillus grevillei</i>
<i>Clitocybe rivulosa</i>	<i>Leucoagaricus naucinus</i>	<i>Trechispora alnicola</i>
<i>Collybia butryacea</i>	<i>Leucopaxillus giganteus</i>	<i>Tricholoma columbetta</i>
<i>Coprinus comatus</i>	<i>Lycoperdon marginatum</i>	<i>Tricholoma panoeolum</i>
<i>Coprinus kubickae</i>	<i>Lycoperdon perlatum</i>	<i>Tricholoma terreum</i>
<i>Cyathus stercoreus</i>	<i>Lycoperdon pusillum</i>	<i>Vascellum curtisii</i>
<i>Dentinum repandum</i>	<i>Lycoperdon spp.</i>	<i>Vascellum pratense</i>
	<i>Macrolepiota procera</i>	
	<i>Marasmius graminum</i>	

*Hebeloma crustuliniforme*

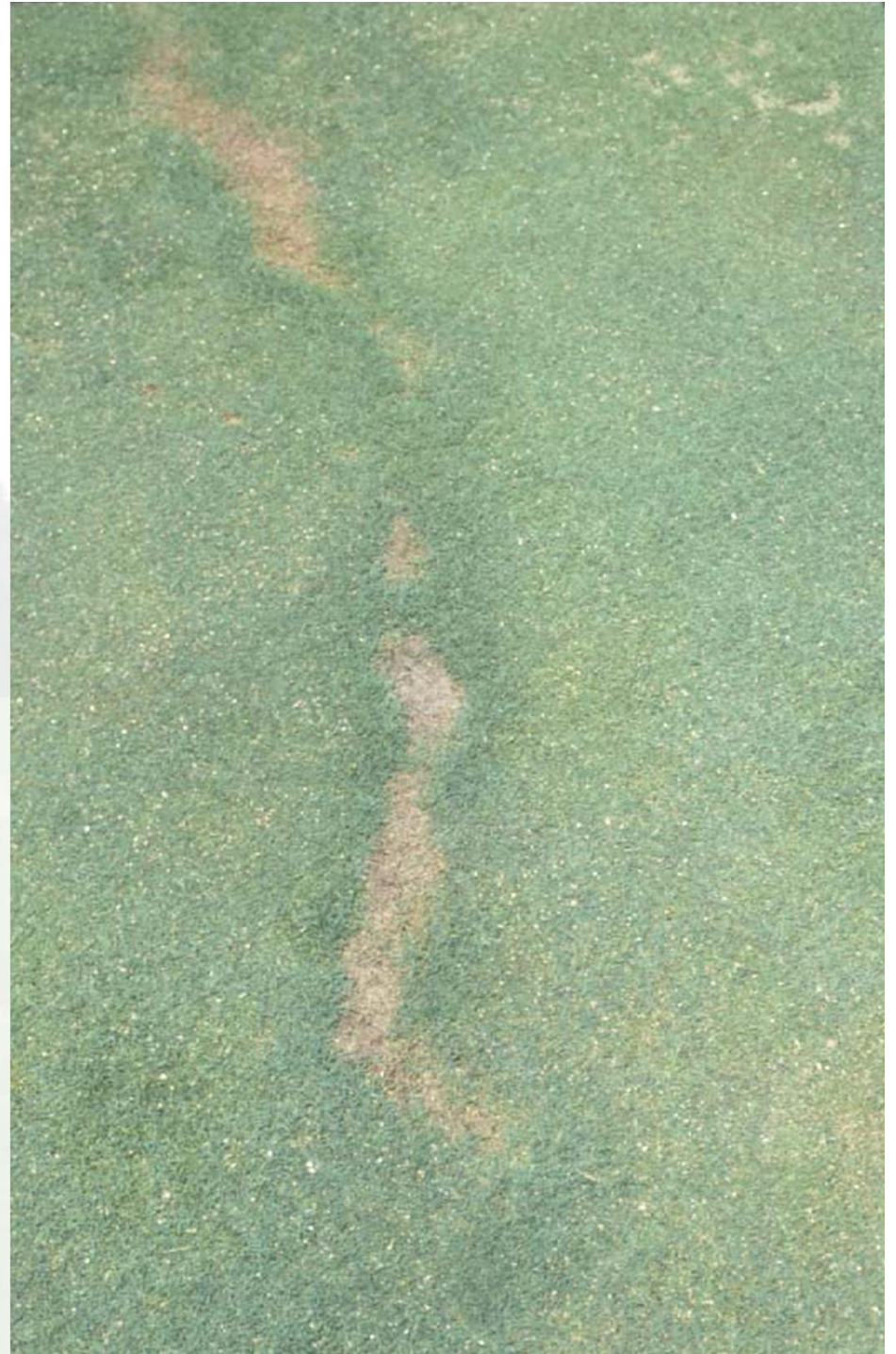
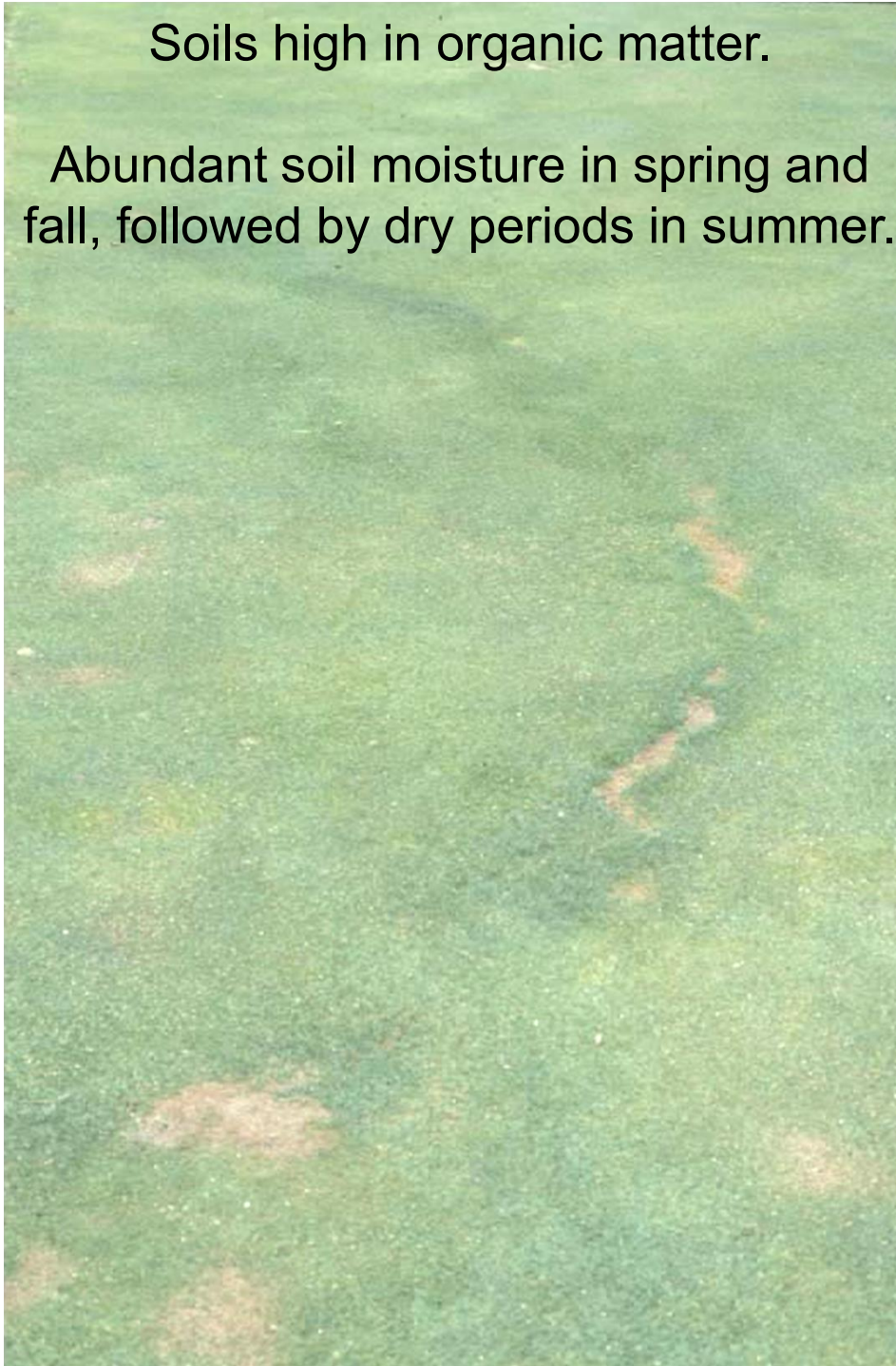
**Agaricus sp.**  
**Coprinus sp.**  
**Marasmius oreades**  
**Bovista dermoxantha**  
**Bovista plumbea**  
**Lycoperdon perlatum**  
**Lycoperdon pusillum**  
**Vascellum curtisii**  
**Vascellum pratense**

**Modified from Dr. L. Miller**

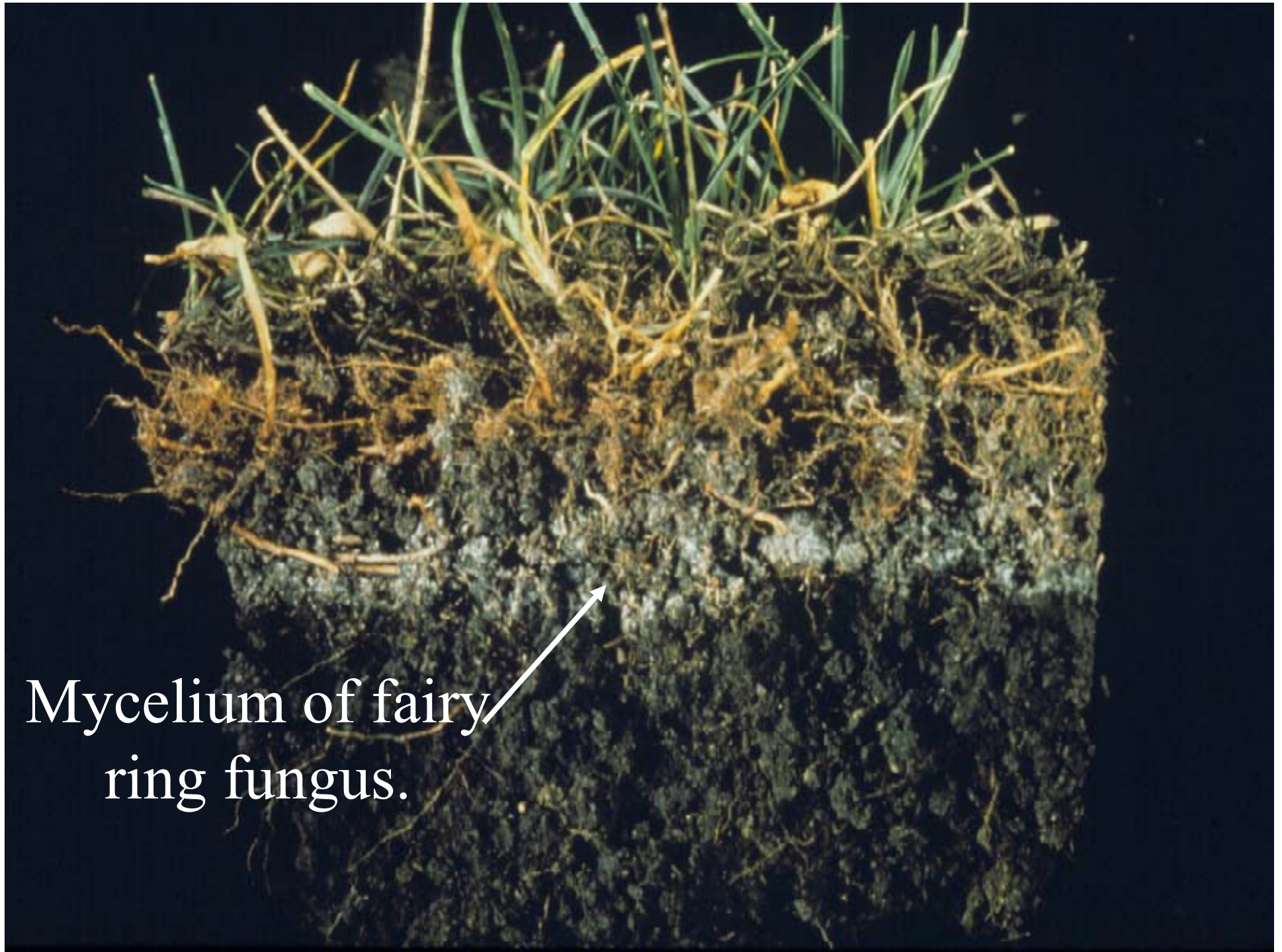


Soils high in organic matter.

Abundant soil moisture in spring and fall, followed by dry periods in summer.







Mycelium of fairy  
ring fungus.

# FAIRY RING IN CROSS-SECTION

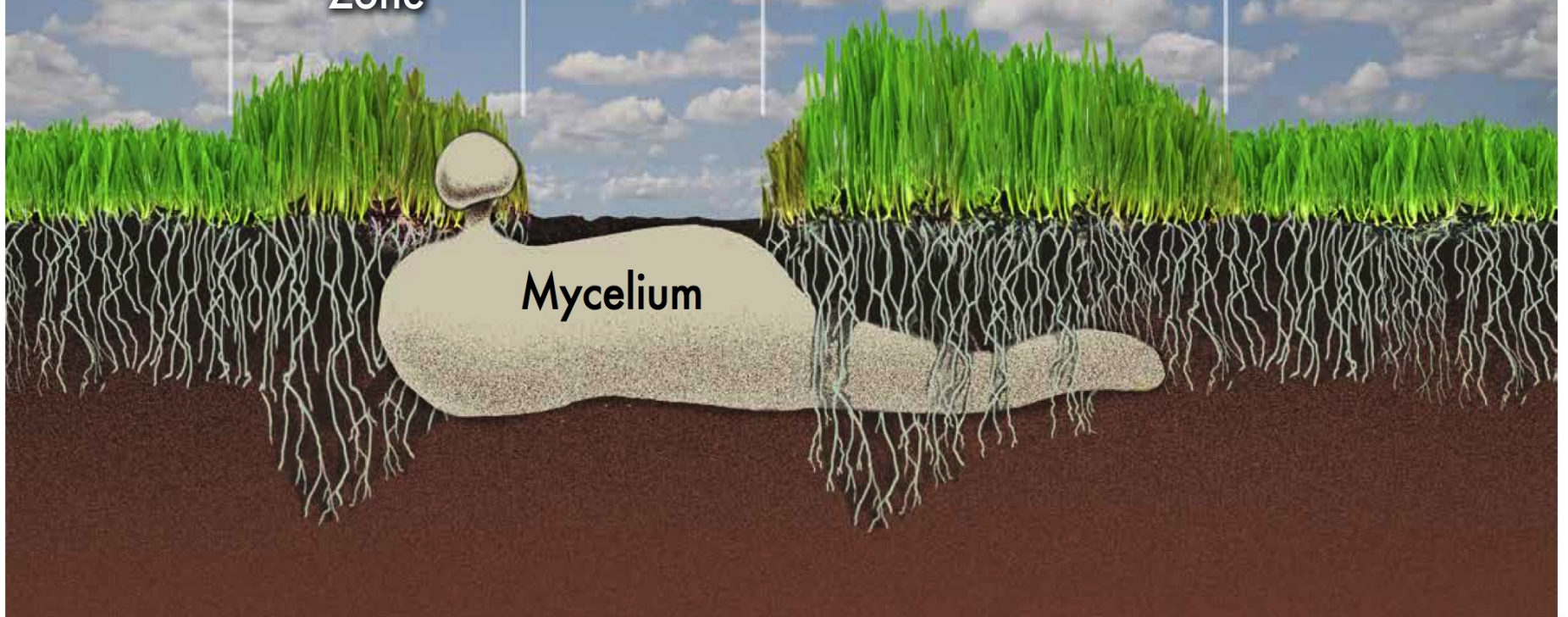
Outside

Outer  
Stimulated  
Zone

Dead Zone

Inner Stimulated Zone

Inside



# Fairy ring control

- **No grass species or cultivars are known to be resistant.**
- **Spike or aerate affected areas**
- **Water heavily**
- **Fungicide treatment**
- **Use of wetting agents**

# NEMATODES IN TURFGRASS





Foto Dr. Bill Crow (UF)



**Green treated with nematicide**

**Without  
nematicide**

Dr. E. Redway (NCSU)



# Species of Nematodes

## Sting Nematodes (*Belonolaimus*)

- Most widespread and destructive nematode of turfgrasses

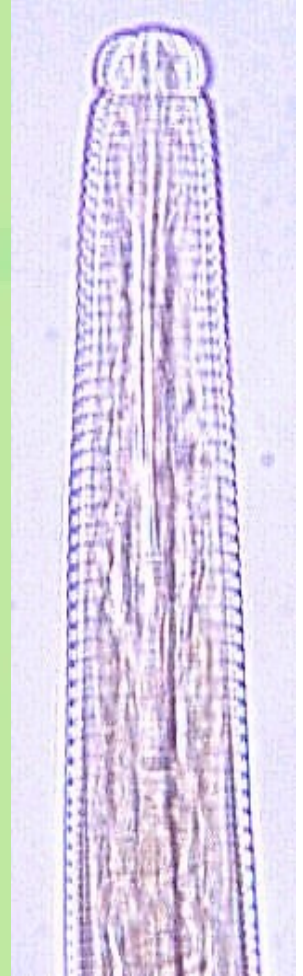
- Affects turf at low populations

- Adults can reach lengths greater than 3 mm, making them one of the largest plant-parasitic nematodes

- 20 or more nematodes in 100 cm<sup>3</sup> of soil sample are considered a problem

- Nematodes can be introduced to new areas on infested turf sod

- Sting nematodes seriously damage turf grown on sandy soils



**Root tips typically cease growing in response to feeding by sting nematodes.**

**Sting nematodes cause particular damage to young plants with a developing root system.**

**Sting nematodes reproduce sexually. After mating the female lays eggs in pairs in the soil and will continue to lay eggs as long as food is available.**

**The eggs hatch after about five days.**

**Once feeding commences the juvenile nematodes grow and undergo three molts before becoming adults.**

**The total life cycle from egg to reproducing adult takes 18 to 24 days**

Lance nematodes (Haplolaimus)

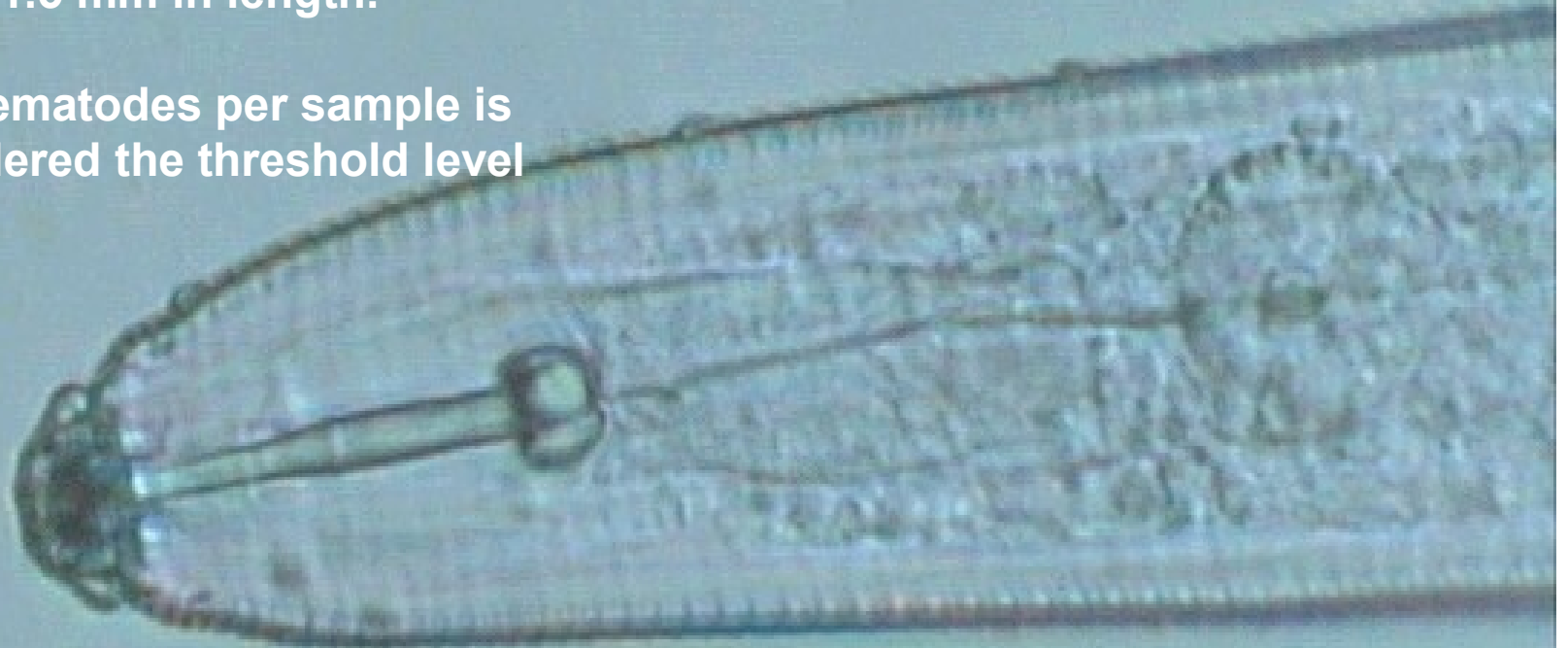
Haplolaimus galeatus  
female head 400X

Scientific name: *Haplolaimus galeatus*

Damages turf at low populations Lincoln Country Club

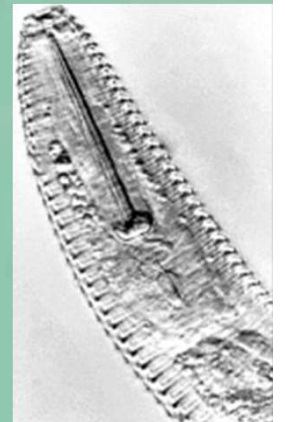
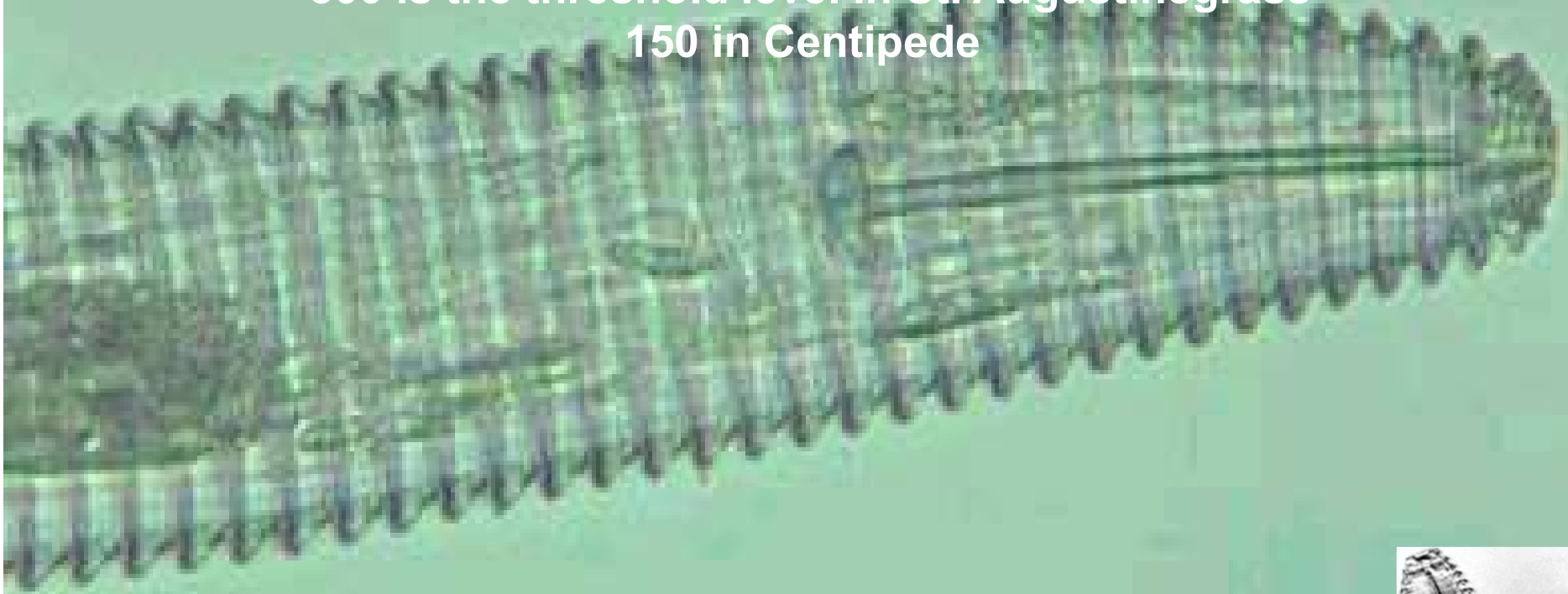
As adults they measure about  
1.5 mm in length.

100 nematodes per sample is  
considered the threshold level



# Ring Nematodes (Criconemella)

- Damage occurs when high populations present
- 500 is the threshold level in St. Augustinegrass  
150 in Centipede



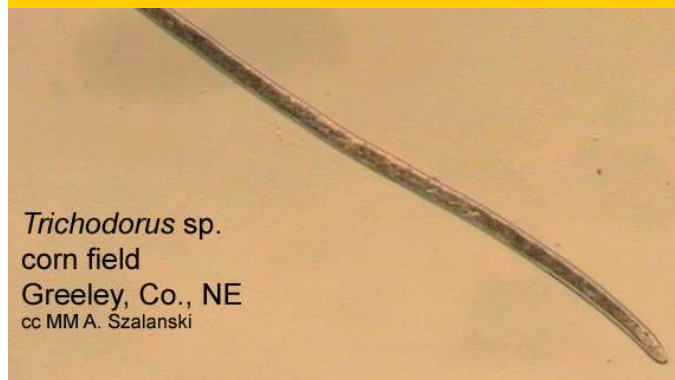
Other

S

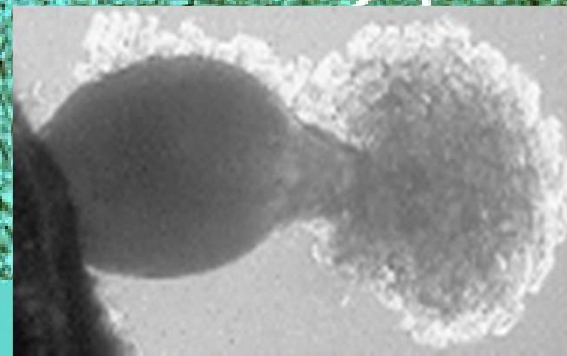
Root-Knot (Meloidogine) 80 or more



Stubby-root Nematode  
(Trichodorus) 100 or more



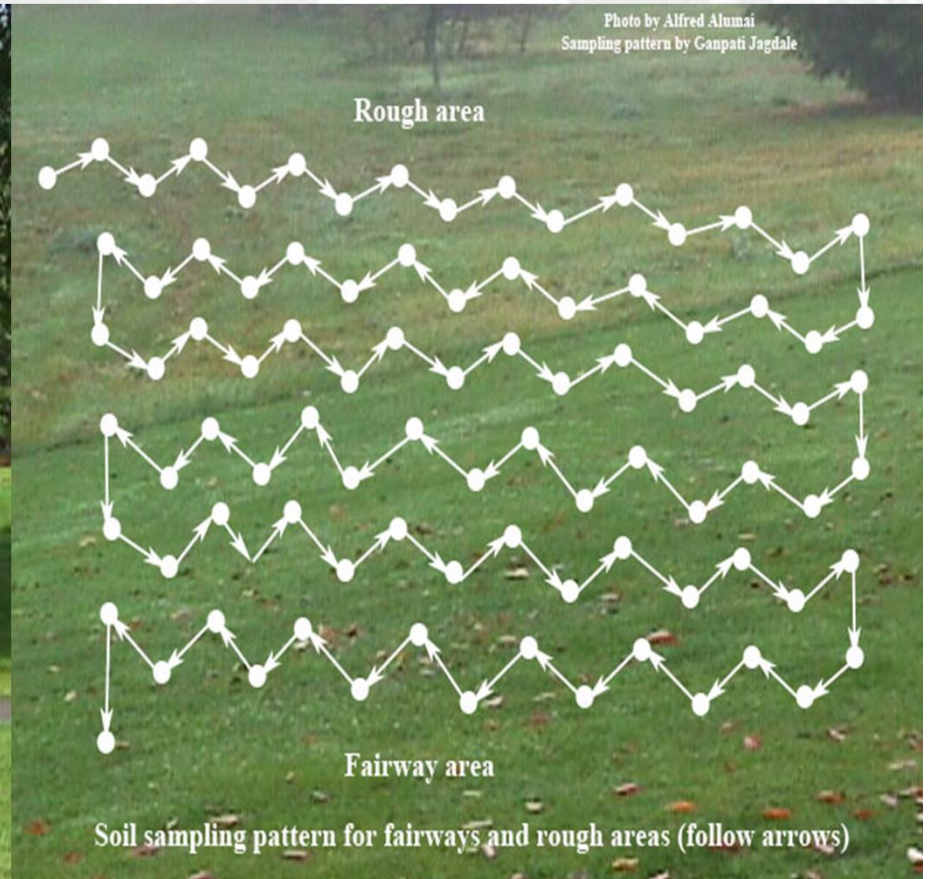
*Trichodorus* sp.  
corn field  
Greeley, Co., NE  
cc MMA. Szalanski



St. Augustine (Heterodera). Present in Florida

# Control

## •Soil Test (Nematodes)



# CULTURAL PRACTICES

## *Fertility:*

**Excessive nitrogen fertilization can increase succulent root growth and encourage rapid foliage growth.**

**Succulent root tips are more susceptible to nematode damage, and the proliferation of root tips can cause nematode population densities to rise dramatically.**

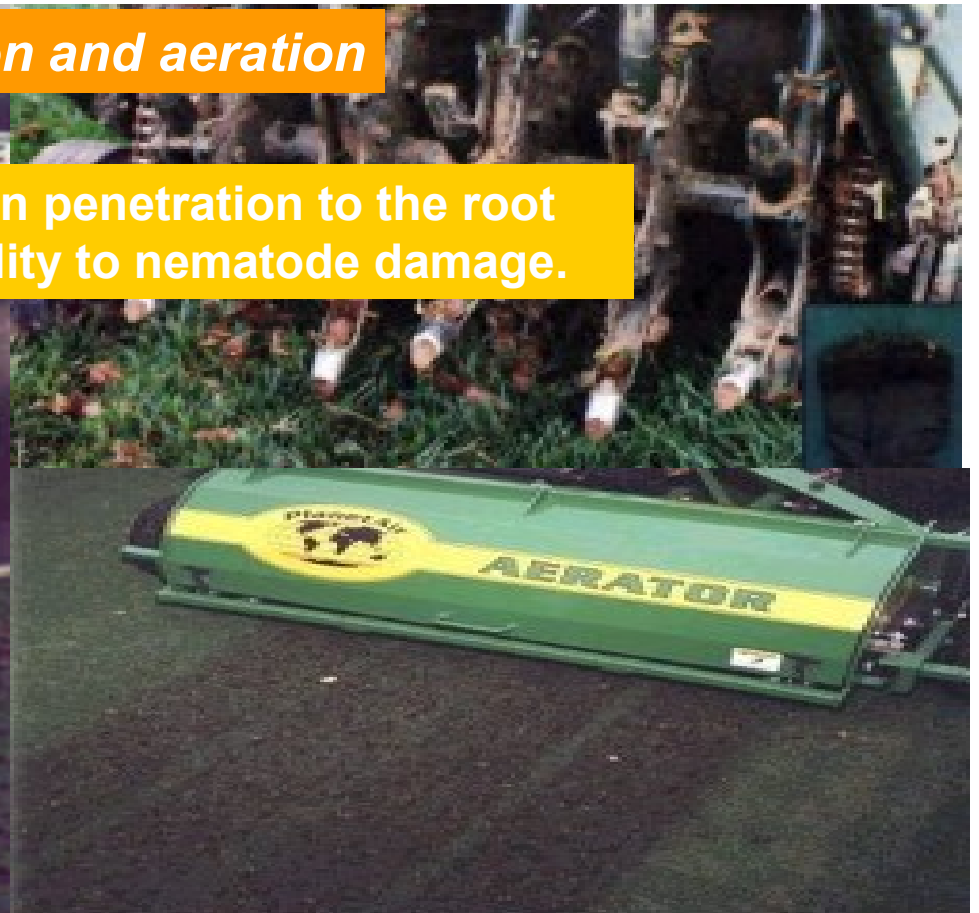
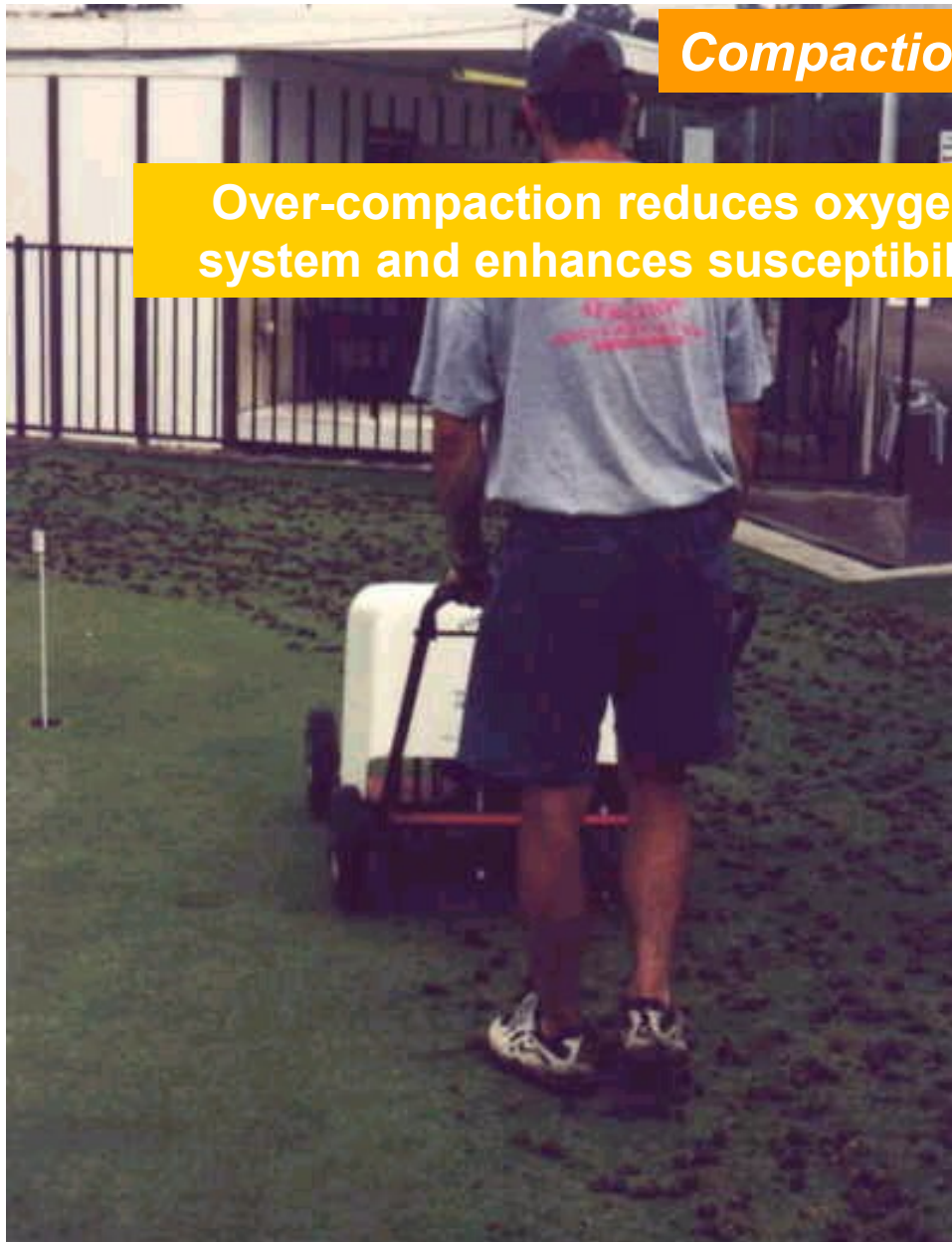
**Rapidly growing foliage drains nutrient reserves from the roots that are needed to compensate for the nematode damage.**

**Under-fertilization should also be avoided. Roots damaged by nematodes will already have a reduced capability to extract nutrients from soil.**

**This makes nutrient deficiencies more pronounced on nematode-infested plants.**

## ***Compaction and aeration***

**Over-compaction reduces oxygen penetration to the root system and enhances susceptibility to nematode damage.**



**Aeration encourages a healthy root system and thereby enhances tolerance to nematodes.**



## Latest Developments on Turfgrass Nematicides 2018

Common name	Active Ingredient	Pathogen	Areas	Company
NIMITZ PRO G	FLUENSULFONE	ENDO AND ECTO PARASITIC	Most turfgrasses Most turfgrasses	QUALI PRO
INDEMNIFY	FLUOPYRAM	BROAD SPECTRUM	Most turfgrasses	BAYER
NEO-TEC	SESAME OIL	Plant Parasititc nematodes	Most turfgrasses	BRANDT
DIVANEM	ABAMECTIN	Plant Parasititc nematodes	Most turfgrasses	Syngenta

## Turfgrass Nematicides

Common name	Active Ingredient	Type of A. I.	Rate	Pathogen	Areas	Company
Nortica	Bacillus firmus	Bacteria- Soil Inhabitant	0.7-2.3 lb 1000 sq ft	Sting, Lesion, Lance, Root knot, Sheath, Spiral, Stunt	Turf, Lawns, Sod Farms, and Golf Courses (Greens, Tees, Fairways and Roughs)	Bayer
Econem	Pasteuria usgea	Soil Inhabitant- Bacteria	2-10 lb 1000 sq ft	Belonolaimus longidorus (Sting Nematode)	Most turfgrasses	Pasteuria Bioscience
Multiguard protect	Furfural		0.184 gal 1000 sq ft	Plant Parasitic nematodes	Golf and sod	Agriguard



**TURFGRASS DISEASES IN GA: IDENTIFICATION AND CONTROL**

<http://pubs.caes.uga.edu/caespubs/pubcd/B1233.htm>

**ABIOTIC DISEASES AND INJURIES OF TURFGRASSES IN GA**

<http://pubs.caes.uga.edu/caespubs/pubcd/B1258.htm>

**2012 GEORGIA PESTICIDE HANDBOOK**

<http://www.ent.uga.edu/pmh/>

**2018 TURFGRASS PEST CONTROL RECOMMENDATIONS FOR PROFESSIONALS**

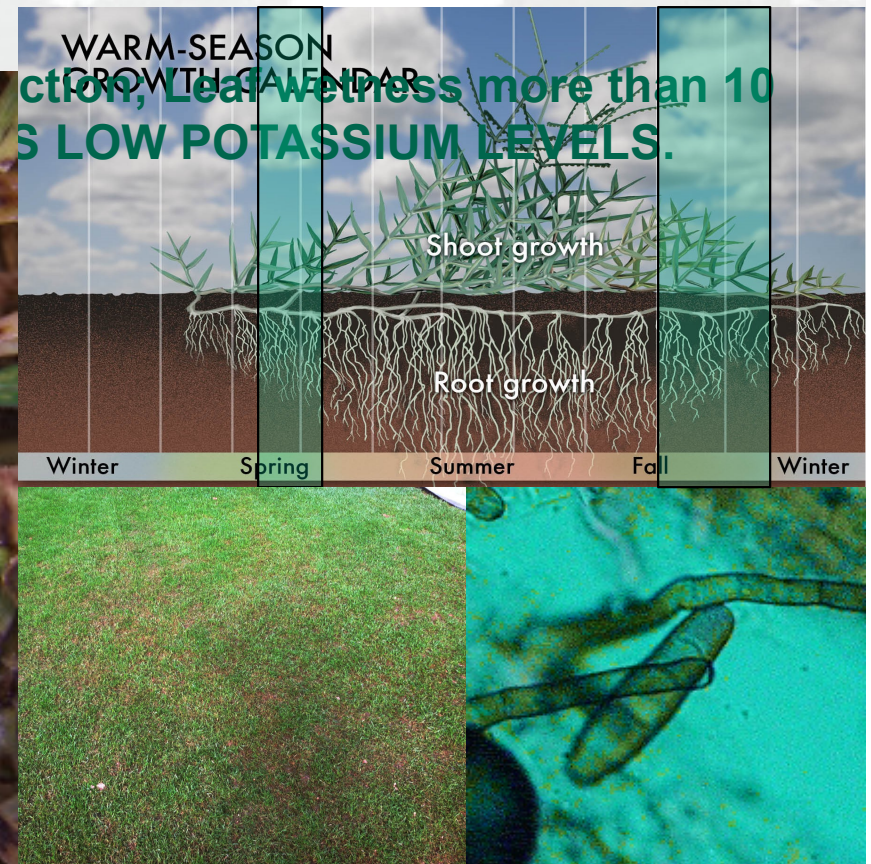
[http://www.griffin.uga.edu/caes/turf/Publicat/1640\\_Recommendations.htm](http://www.griffin.uga.edu/caes/turf/Publicat/1640_Recommendations.htm)

## Bipolaris Leaf Spot and Crown Rot (Bipolaris Leaf Blotch-Melting out).

*Bipolaris cynodontis*; *B. sorokiniana*, *B. specifera*; *Exserohilum*

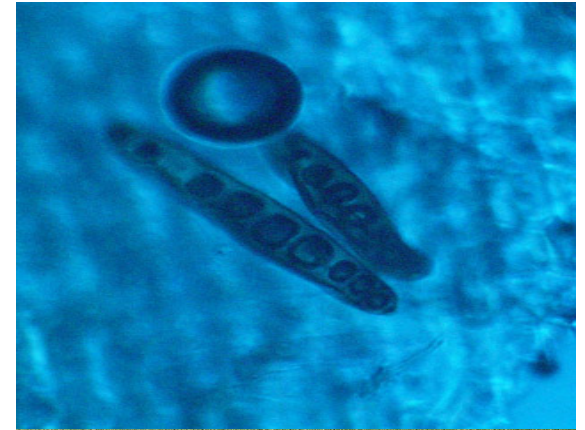
- Observed in bermudagrass but also in cool season grasses especially overseeding. Observed consistently (most active) in the fall before dormancy and during spring at green-up.

Black to brown spot on blades, sometimes tan center, lower leaves on plants are shriveled



## **Bipolaris Leaf Spot and Crown Rot (Bipolaris Leaf Blotch-Melting out).**

- **Early vigilance, diagnosis and fertility are key for management. Avoiding excessive growth will help to reduce the disease**
- **Phosphorous and potassium regimes, avoiding N spikes.**
- **Water management and proper irrigation regimes**
  - **Use lightweight mowing equipment to avoid stress on turf**
  - **Readily produces spores, therefore mowing, traffic etc can spread the disease**



## Bipolaris Leaf Spot and Crown Rot (Bipolaris Leaf Blotch-Melting out).

Fungicide	Class	Efficacy	Products
prodione + thiophanate-methyl**	benzimidazole	++++	26/36, Dovetail, Fluid Fungicide
iprodione**	dicarboxamide	++++	26GT, IPro, Iprodione Pro, Raven
vinclozolin**	dicarboxamide	++++	Curalan, Touche
mancozeb**	dithiocarbamate	++++	Fore, 4 Flowable Mancozeb, Dithane, etc
mancozeb + myclobutanil**	dithiocarbamate + DMI	++++	Manhandle
mancozeb + copper hydroxide**	dithiocarbamate + inorganic	++++	Junction
azoxystrobin + propiconazole	DMI + QoI	++++	Headway
azoxystrobin	QoI	++++	Heritage



## FUNGICIDES FOR LEAF SPOT CONTROL-2015

CHEMICAL AND FORMULATION	RATE PER 1000 sq ft	Chemical group
azoxystrobin + acibenzolar Heritage Action	0.2 to 0.4 oz	Strobilurin + Host Plant Defense Induction
azoxystrobin + difenconazole Briskway	0.25 to 0.725 fl oz	Strobilurin + DMI
azoxystrobin + tebuconazole Zoxi-T	0.75 to 1.5 fl oz	Strobilurin + DMI
fluoxapyroxad +pyraclostrobin Lexicon	0.34 to 0.47 fl oz	Carboximide SDHI + Strobilurin
fluazinam Secure	0.5 fl oz	Dinitro anilines
penthiopyrad Velista	0.3 to 0.5 fl oz	Carboximide SDHI



We are currently working with *Bipolaris* (*Helminthosporium*; *Drechslera*) leaf Spot with new fungicides and a Bermudagrass