

# Ideas into the Cause and Effect of Etiolated Tiller Syndrome

Joseph A. Roberts, James A. Murphy, and  
Bruce B. Clarke  
Rutgers University



# What is it?

- Etiolated Tiller Syndrome
- Mad Tiller
- Ghost Grass (UK)
  
- Rapid elongation of stems
  - Pale or chlorotic appearance due to lack of chlorophyll



# Management Impacts

- Increased operation costs due to employee time and chemical costs
  - Increased mowing frequency needed to maintain playability
  - Aggressive plant growth regulator programs



Photo courtesy of Dave Oatis

# What do we know?

- Problematic during the 1950's in the UK
  - Later observed in Rhode Island in the 1960's
- Observed on *Lolium perenne*, *Poa annua*, and *Agrostis stolonifera*
  - Symptoms most obvious in late summer or early fall
  - Warm periods followed by cold and rainy weather
- Similar symptoms as plants grown under poor light
  - Gibberellic acid (GA) causes excessive foliar growth
- What causes it?

# Bakanae Infection on Rice

- Caused by *Fusarium* spp.
  - Teleomorph – *Gibberella fujikuroi*
  - Fungus produces Gibberellic Acid which causes rapid elongation of infected plants



Photo courtesy of UC IPM Online

# Bakanae

- Infected plants begin to senesce and generally die before maturity or produce empty panicles
  - The fungus eventually emerges from the nodes and produces conidia that infect healthy seeds
- Management for Bakanae
  - Seed treatment to eliminate fungi from infected seed
    - Fungicides
    - Antagonistic Bacteria

# What Causes Mad Tiller in Turf?



# Fungi

- Multiple fungi have been isolated from turf illustrating etiolated tiller syndrome
  - *Fusarium culmorum*, *Fusarium crookwellense*, and *Rhizoctonia solani* isolated from turf in New Zealand (Stewart, 2002)
  - *Fusarium* sp., *Rhizoctonia* sp., *Ascocyta* sp., *Leptoshaerulina* sp., *Dreschlera* sp., and *Pythium* sp. Isolated from turf in the U.S. (Fidanza et al.,2008)

# Other Fusarium diseases

- Foliar Blight



(Photos courtesy of Smiley et al., 2005)

- Root Rot



Many Fusarium species responsible

*F. acuminatum*, *F. culmorum*, *F. Graminearum*, *F. heterosporum*, etc.

# Other Suggested Causes

# Low-Light Conditions

- Symptoms resemble those of grass grown under low light or shady conditions
    - Low light conditions typically induce Gibberellic acid production that can cause elongation of foliage
  - Etiolated tiller syndrome has been observed on all areas of golf courses including shaded and full sun areas
- (Fidanza, 2008)

# Plant Growth Regulators

- PrimoMaxx (trinexepac-ethyl)
  - applications of trinexepac-ethyl or plants growing out of growth regulators
- Observations of etiolated tillers occurred prior the development of Primo (Danneberger, 2007)
- Symptoms have been observed on entire greens that received regular applications of GA-inhibitors (Bigelow, 2007)

# Nutrient Deficiencies

- Previous observations in the 1960's and 70's occurred on  $\text{Mg}^{2+}$  deficient turf
  - Periods of heavy rainfall and ammonium fertilizer applications inhibited  $\text{Mg}^{2+}$  uptake
  - Mg is essential for maintaining green color (central atom for chlorophyll)
  - Epsom salt ( $\text{MgSO}_4$ ) applied at 2 oz 1000 ft<sup>-2</sup> appeared to alleviate the symptoms
- Base cation saturation ratio?

# Bacteria

- Colonization of the xylem by bacteria could be causing over-production of gibberellins as a plant defense response (Fidanza, 2008)
- Numerous bacterial species are known to produce gibberellins in high concentrations
- *Xanthomonas translucens* have been isolated from symptomatic turf
  - *Xanthomonas* spp. cause bacterial wilt in turf

# Research Underway at Rutgers

- Isolation and identification of potential pathogen(s) from turf exhibiting etiolated tillers
- Inoculate healthy turfgrass with isolated pathogen(s) for indication of symptoms
- Determine if pathogen(s) are transmitted through seed by growing infected plants for propagation

# Questions?

