Integrated Pest Management for Kentucky Bluegrass

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Turfgrass Specialist
Oregon State University
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Background

- Master of Science (2003 to 2006)
  - Crop and Soil Science
    - Turfgrass Management
      - Leaf litter disposal as an organic weed control method
Background

- Ph.D. (2006 to 2010)
  - Crop and Soil Science
    - Turfgrass Management
      - Cost effective athletic field renovation process
Background

- Operational Consultant
  - 2008 Olympic Games
    - Beijing, China
Background

- August 2010 to Dec 2012
  - Assistant Professor
    - Environmental Horticulture
  - Abraham Baldwin Agricultural College
    - Tifton, GA
Background

• Summer employment
  • University of Georgia Turfgrass Breeding Program
    • Research Scientist
Background

- Dec 2012
  - Turfgrass Specialist
    - Oregon State University
Beaver Turf Update

• [www.beaverturf.com](http://www.beaverturf.com)
  • Register for our newsletter
    • Beaver Turf News: New Faces at OSU

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2012 Evaluation of Syngenta Fungicides and Fungicide Rotation Programs for the Control of Anthracnose and Effects on Turf Quality on an Annual Bluegrass Putting Green

Mr. Brian McDonald, Research Assistant
Oregon State University

Final Report – October 4, 2012

Introduction

The purpose of this trial was to evaluate the effectiveness of various fungicides and fungicide rotations in controlling anthracnose (Colletotrichum cereale) and maintaining plot quality on an annual bluegrass (Poa annua) putting green.

Materials and Methods

The trial was initiated on June 18th, 2012. All treatments were applied at rates on a two-week interval with the last treatment date being August 1st. The trial was conducted on an annual bluegrass putting green located at the OSU Law and Forestry Horticulture Farm in Corvallis, Oregon which is approximately 60 miles north of Portland. The green was built in April of 2009 using the California Method (12” of USDA sand placed over a soil sub grade). Flat drainage was installed on top of the sub grade. Annual bluegrass certification comes from Emerald Valley Golf Course in Creswell, Oregon were planted on top of the sand, and then rolled, topdressed, irrigated and mowed until smooth. Disease samples from Emerald Valley’s Poa annua putting greens were tested by the U.C. Riverside Disease Laboratory (Dr. Frank Wong) and were confirmed to have Cologen.
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Integrated Pest Management

• Primary Cultural Practices
  • Mowing
  • Fertilization
  • Irrigation

• Cultivation and inter-seeding

• Management of...
  • False dandelion
  • White clover

• Establishment from seed
Primary Cultural Practices

1. Mowing
2. Fertilizing
3. Irrigation
Primary Cultural Practices
Primary Cultural Practices
Primary Cultural Practices

Mowing

Irrigation

Turfgrass
Primary Cultural Practices
Primary Cultural Practices

- Fertilizer
- Mowing
- Irrigation
MOWING
Mowing

- The one-third rule
Mowing

- The one-third rule
Mowing

- The one-third rule
Mowing

• The one-third rule
  • Prevent scalping

• Scalping...
  • Causes a brown appearance
  • Stops growth and development
  • Depletes carbohydrates
  • Makes turf susceptible to environmental stress
Mowing

• The one-third rule
  • Prevent weed seed germination
Mowing

- The one-third rule
  - Prevent weed seed germination
Mowing

- Raise your mowing height
  - Adhere to the one-third rule
  - Improve rooting

Higher mowing of turfgrass promotes a good root system - Sir Walter results are similar to above.
Mowing

• Raise your mowing height

  • Raising the height from 1.5” to 3.0”
    • Improved turfgrass quality
    • Reduced weed populations
      • Crabgrass cover by up to 52%
      • Dandelion populations by up to 45%
      • White clover by up to 58%
Mowing

- Increase your mowing frequency
  - Adhere to the one-third rule
  - Increase turfgrass density
- Weed control
  - Lambsquarter
  - Ragweed
  - Purslane
  - Garlic mustard
Mowing

• Increase your mowing frequency
  • Adhere to the one-third rule
  • Increase turfgrass density
• Weed control
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  • Purslane
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49 days
Mowing

- Weeds that indicate your mowing height is too low...
  - Annual bluegrass
  - Crabgrass
  - Dandelion
MOWING
FERTILIZATION
Fertilization

• Select a fertilizer designed for turfgrass
  • Primary nutrient (N-P-K)
    • High N
    • Low P
    • 10:1
Fertilization

- The holiday plan
  - 3-5 lbs N 1000 ft² year

- Memorial day
  - 1.0-1.5 lbs N 1000 ft²

- 4th of July
  - 0.5-1.0 lbs N 1000 ft²

- Labor day
  - 0.5-1.0 lbs N 1000 ft²

- Thanksgiving
  - 1.0-1.5 lbs 1000 ft²
    - Willamette Valley
Fertilization

• The holiday plan
  • 3-5 lbs N 1000 ft² year

• Memorial day
  • 1.0-1.5 lbs N 1000 ft²

• 4th of July
  • 0.5-1.0 lbs N 1000 ft²

• Labor day
  • 0.5-1.0 lbs N 1000 ft²

• Halloween
  • 1.0-1.5 lbs 1000 ft²
    • High desert
Fertilization

• The holiday plan
  - Cool-season turfgrass species
    - Kentucky bluegrass
    - Perennial ryegrass
    - Fine fescue
    - Tall fescue
Fertilization

- The holiday plan
  - Reduced weed populations
    - White clover cover by up to 62%
    - Reduced dandelion populations by up to 66%
    - Reduced crabgrass cover by up to 35%
Fertilization

- Low fertility weeds include...
  - White clover
  - Plantain
  - Black medic
Fertilization

- Other signs of low fertility...
  - Rust
Fertilization

• Other signs of low fertility...
  • Rust
Fertilization

• Other signs of low fertility...
  • Rust
Fall conditions (cool and wet), low fertility (sand-based fields) and slow turf growth.
Fertilization

- Pest Triangle
  - Pest
    - Rust
  - Plant
    - Kentucky bluegrass
  - Environment
    - Fall
    - Low fertility (N)
    - Slow growth
Fertilization

- Make a nitrogen application
  - ½ lb N per 1,000 ft²
    - Urea (26-0-0)
    - Ammonium nitrate (33-0-0)
FERTILIZATION
Irrigation

- Adjust your rates with the seasons
  - Spring
    - 0.0-0.75 inch week
  - Summer
    - 0.75-1.5 inch week
  - Fall
    - 0.0-0.75 inch week
Irrigation

• Check your rates
  • 20 minutes
    • 0.1 inch
    • 0.25 inch
    • 0.5 inch
Irrigation

- Twice as much is not twice as good
  - Moss
Irrigation

• Twice as much is not twice as good
  • Increased disease incidence

Dollar spot
Pythium blight
Brown patch
Irrigation

• Twice as much is not twice as good
  • Leaching pesticides and fertilizers
  • Waste of water and money
Irrigation

- Weeds associated with drought conditions...
  - Summer annuals
    - Knotweed
    - Wood sorrel
    - Crabgrass
Irrigation

• Weeds associated with over irrigation...
  • Annual bluegrass
  • Rough bluegrass
CULTIVATION & INTER-SEEDING
Cultivation

• What is your objective when cultivating the turfgrass?
Cultivation

- Objectives
  - Relive compaction
    - Improves gas exchange and drainage
  - Remove organic matter
    - Decreases potential for disease
    - Improves drainage
  - Prepare for seeding
    - Ensures seed to soil contact
Cultivation

- Cool-season turfgrass
- Warm-season turfgrass

Graph showing shoot growth over spring, summer, and fall.
Cultivation

- Cool-season turfgrass
- Warm-season turfgrass

Shoot Growth

Spring | Summer | Fall

[Images of people working on a lawn with machinery]
Cultivation

- Core cultivation
  - 20% affected surface area
    - Tine diameter (1/4-5/8”)
    - Tine spacing (1” x 1” – 2” x 2”)

3/8” diameter tine

5/8” diameter tine
### Cultivation

**Table 1**

The impact of tine size and spacing on the amount of surface area impacted by core aerification and dethatching

<table>
<thead>
<tr>
<th>Tine Size Diameter (inches)</th>
<th>Spacing (inches)</th>
<th>Number of Holes per Square Foot</th>
<th>Surface Area Impacted by One Tine (square inches)</th>
<th>Percent Surface Area Impacted</th>
<th>Number of Aerifications Needed to Reach 20% of Surface Area Impacted</th>
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<tbody>
<tr>
<td>3/8</td>
<td>1 × 1</td>
<td>144</td>
<td>0.110</td>
<td>11.04%</td>
<td>1.8</td>
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Cultivation

- Excessive organic matter causes necrotic ring spot
Cultivation

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Cultivation

• Excessive organic matter causes necrotic ring spot
• Develops in cool-wet conditions fall and following spring
• During this time the pathogen compromises the rooting system
• Symptoms are not expressed until hot/dry weather when the turf is stressed
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Cultivation

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Fertilization

• Pest Triangle
  • Pest
    • Necrotic ring spot
  • Plant
    • Kentucky bluegrass
  • Environment
    • Organic matter accumulation
    • Develops in the fall
    • Symptoms in the summer
Cultivation

• Excessive organic matter causes necrotic ring spot
• Develops in cool-wet conditions fall and following spring
• During this time the pathogen compromises the rooting system
• Symptoms are not expressed until hot/dry weather when the turf is stressed

Systemic fungicides:
• DMI
  • propiconazole
• Strobilurins
  • azoxystrobin
Cultivation

• Objectives
  • Relive compaction
    • Improves gas exchange and drainage
  • Remove organic matter
    • Decreases potential for disease
    • Improves drainage
  • Prepare for seeding
    • Ensures seed to soil contact
Inter-seeding

- Perennial ryegrass
  - Germination
    - 7 to 10 days
  - Inter-seeding rate
    - 8 to 11 lbs/1,000 sq ft

- Kentucky bluegrass
  - Germination
    - 21 to 28 days
  - Inter-seeding rate
    - 1 to 2 lbs/1,000 sq ft
Inter-seeding

- Annual weeds
  - Pre-emergent herbicides
    - Non-selective
      - Pendulum (a.i. pendimethalin)
        - $54/54,000 sq ft
  - Inter-seeding
    - $1,440/54,000 sq ft
      - 600 lbs
CULTIVATION & INTER-SEEDING
WEED MANAGEMENT
Weed Management

• Common turf weeds...
  • 1. false dandelion
  • 2. white clover
FALSE DANDELION
False dandelion

- Scouting and ID
  - Perennial weed
  - Spring seeding
  - Drought tolerant
Fertilization

• Pest Triangle
  • Pest
    • False dandelion
  • Plant
    • Kentucky bluegrass
  • Environment
    • Drought stress
    • Low mowing height
False dandelion

- Post emergence herbicides (curative)
  - 3-way broadleaf herbicide
    - Trimec Classic
      - 2,4-D
      - MCPP
      - Dicamba

Common dandelion

Broadleaf plantain

Sow thistle
**False dandelion**

- Post emergence herbicides (curative)
  - 3 or 4-way broadleaf herbicide
    - SpeedZone
    - 2,4-D
    - MCPP
    - Dicamba
    - Carfentrazone

**Common dandelion**

**Broadleaf plantain**

**Sow thistle**
False dandelion

- Apply in the fall (October 4 = 10/4 Good Buddy)
False dandelion

- Apply in the fall (October 4 = 10/4 Good Buddy)
False dandelion

- Follow up applications...
  - Apply and then apply again 2-4 weeks later
FALSE DANDELION
WHITE CLOVER
White clover

- Perennial weed
- Nitrogen deficient soil
- White flower
- Circular leaves
Fertilization

• Pest Triangle
  • Pest
    • White clover
  • Plant
    • Kentucky bluegrass
  • Environment
    • Low fertility (N)
    • Low mowing height
White clover

- Post emergence herbicides (curative)
  - Triclopyr
    - Weed B Gone Chickweed...
      - Triclopyr and 2,4-D
  - T Zone
    - Triclopyr
    - Sulfentrazone
    - 2,4-D
    - Dicamba

Chickweed

English daisy

Wild violet
White clover

- Post emergence herbicides (curative)
  - Triclopyr
    - Weed B Gone Chickweed...
    - Triclopyr and 2,4-D
  - T Zone
    - Triclopyr
    - Sulfentrazone
    - 2,4-D
    - Dicamba
False dandelion

- Apply in the fall (October 4 = 10/4 Good Buddy)
- Apply and then apply again 2-4 weeks later
WHITE CLOVER
Establishment
Establishment

• Kentucky bluegrass
  • Germination
    • 21 to 28 days
  • Seeding rate
    • 1 to 2 lbs/1,000 sq ft
Establishment

- Summer annuals
  - Crabgrass
  - Knotweed
  - Woodsorrel
Establishment

- Summer annuals
  - Crabgrass
  - Knotweed
  - Woodsorrel
Irrigation

- Weeds associated with drought conditions...
  - Summer annuals
    - Knotweed
    - Wood sorrel
    - Crabgrass
Establishment

- Apply glyphosate (Round-up)
- Irrigate the site for 2 weeks
- Apply glyphosate again
Establishment

• **Herbicide Treatments:**

  • mesotrione (Outplay® 4 SC) @ 0.56 L ha\(^{-1}\)
    • Day of seeding
  
  • siduron (Tupersan® 4.6 G) @ 97.63 kg ha\(^{-1}\)
    • Day of seeding
  
  • quinclorac (Drive® 75 DF) @ 1.12 kg ha\(^{-1}\)
  
  • methylated seed oil @ 0.25% v/v
    • 30 DAS
  
  • dithiopyr (Dimension® 40WP) @ 1.40 kg ha\(^{-1}\)
    • 30 DAS
  
  • control (no herbicide)
Figure 1: Effect of preemergence herbicides, mesotrione and siduron, applied the day of seeding (30 May 2006), and postemergence herbicides, quinclorac and dithiopyr, applied 30 days after seeding, on percent crabgrass cover, Hancock Turfgrass Research Center, East Lansing, Mich.

Means followed by the same letter do not significantly differ.
Effect of mesotrione (left) in comparison to the control (right) on overall turfgrass color, Hancock Turfgrass Research Center, East Lansing, Mich., 27 July 2006, 58 days after seeding.
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