Getting the Most for your Fungicide Dollar: Improving the Control of Dollar Spot on Fairways with Good Cultural and Chemical Practices

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Dollar Spot
Dollar Spot

Pathogen: *Sclerotinia homoeocarpa*

(Rutstroemia spp. or Poculum spp.)

Grasses Affected: Annual Bluegrass, Bahiagrass, Bentgrass, Bermudagrass, Centipedegrass, Fine-leaved Fescue, Kentucky Bluegrass, Ryegrasses, Tall Fescue, Zoysiagrass
Dollar Spot

Conditions Favoring Disease:
- Overwinters as Sclerotia / Mycelium
- Resumes Growth at 59° F
- Optimum Disease 70 – 84° F
- High RH (> 85% Night)
- Thick Thatch (> 0.5 – 0.75 in.)
- Low Soil Moisture
- Extended Dew
- Low N Fertility
Cultural Management of Dollar Spot

- Maintain balanced N,P,K fertility
- Maintain adequate N when dollar spot is active
- Light, frequent N applications
- Avoid drought stress
- Do not irrigate toward dusk
- Remove dew by mowing, poling, or rolling
- Remove trees to provide good air circulation
- Aerify to reduce compaction and thatch
Dragging fairways
Dollar Spot Creeping Bentgrass Putting Green
Clarke, et. al. - Rutgers University - 2005

Denotes significant difference b/w DewCure and untreated control
DewCure applications made at 14 d intervals
Organic fertilizers and composts can reduce dollar spot but this is due more to increased N availability than to enhanced microbial activity in the soil (Dernoeden, 2003).

Some biocontrol agents have been shown to reduce dollar spot in the field (\textit{Enterobacter cloacae} and \textit{Bacillus subtilis}).

Microbial products containing \textit{Trichoderma harzianum} (Root Shield), \textit{Bacillus licheniformens} (Ecoguard), and \textit{Pseudomonas aureofaciens} strain TX-1 can reduce dollar spot but often not to commercially acceptable levels alone.

Use new improved bentgrass cultivars whenever possible.
Dollar Spot Ratings of Creeping Bentgrass Cultivars at 9 Locations Evaluated in 2003 NTEP

<table>
<thead>
<tr>
<th>Cultivar or Selection</th>
<th>Dollar Spot Rating</th>
<th>Cultivar or Selection</th>
<th>Dollar Spot Rating</th>
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<tr>
<td>Declaration</td>
<td>8.1</td>
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<td>1-3M</td>
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<td>5.3</td>
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<td>007</td>
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<td>Independence</td>
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<td>Penn A-1</td>
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<td>Penncross</td>
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<tr>
<td>Most Tolerant</td>
<td>Moderate Tolerant</td>
<td>Moderate Susceptible</td>
<td>Highly Susceptible</td>
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<td>Century</td>
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<td>L-93</td>
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<td>Penn A-4</td>
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<td></td>
<td>Seaside II</td>
<td>Penn G</td>
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<td>Southshore</td>
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<td></td>
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<td>SR 1119</td>
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</table>

*Table developed from data from NTEP and bentgrass trials at Rutgers University*
Chemical Control of Dollar Spot

I. Benzimidazoles
   - Fungo, Cleary 3336

II. Demethylation Inhibitors (Sterol Inhibitors)
   - Banner, Bayleton, Eagle, Rubigan, Triton
   - Trinity, Tourney

III. Dicarboximides
   - Chipco 26GT
   - Curalan, Touche, Vorlan

IV. Dithiocarbamates
   - Fore, Dithane, Pentathlon, Protect

V. Nitriles
   - Daconil, Echo, ChloroStar

VI. Carboximides
   - Emerald

VII. Qol (strobilurins)
   - Insignia, Disarm
## Control Dollar Spot Control on Creeping Bentgrass Fairway – Rutgers 2007

<table>
<thead>
<tr>
<th>Product</th>
<th>Rate</th>
<th>Lesion Center/Plot</th>
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<tbody>
<tr>
<td>Emerald 70WG 0.13 oz</td>
<td>a (14 day)</td>
<td></td>
</tr>
<tr>
<td>Emerald 70WG 0.18 oz</td>
<td>a (21 day)</td>
<td></td>
</tr>
<tr>
<td>Trinity 1.67SC 1.0 fl oz</td>
<td>a (14 day)</td>
<td></td>
</tr>
<tr>
<td>Spectator 1.3EC 1.0 fl oz</td>
<td>a (14 day)</td>
<td></td>
</tr>
<tr>
<td>Trinity 1.67SC 1.5 fl oz</td>
<td>a (21 day)</td>
<td></td>
</tr>
<tr>
<td>Curalan 50EG 1.0 oz</td>
<td>a (14 day)</td>
<td></td>
</tr>
<tr>
<td>Daconil 6F 2.0 fl oz</td>
<td>a (14 day)</td>
<td></td>
</tr>
<tr>
<td>Insignia 20WG 0.9 oz</td>
<td>ab (14 day)</td>
<td></td>
</tr>
<tr>
<td>Spectator 1.3EC 2.0 fl oz</td>
<td>a-c (21 day)</td>
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<tr>
<td>Disarm 480SC 0.36 fl oz</td>
<td>b-c (14 day)</td>
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<tr>
<td>Daconil 6F 3.6 fl oz</td>
<td>b-d (21 day)</td>
<td></td>
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<tr>
<td>Untreated check</td>
<td>d</td>
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<tr>
<td>Heritage TL 0.8ME 1.0 fl oz</td>
<td>e (14 day)</td>
<td></td>
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</tbody>
</table>

Rated on 23 August
14 day = 22 DAT
21 day = 29 DAT

Applied 23 May – 25 July (21 d)
and 23 May - 1 Aug (14 d)
Improving Fungicide Performance

- Predictive Models
- Water Volume / Dew Removal
- Water pH / Wash-Off
- Nozzle Selection

Dollar Spot
How Does Water Volume and Dew Removal Affect Fungicide Efficacy?
Influence of Water Volume on Fungicide Efficacy: Dollar Spot

- Daconil Ultrex (1.8 oz) – Applied after dew removal.
- In general, the contact fungicide provided better dollar spot control when applied at 1.2 gal/1,000 sq ft under low to moderate disease severity.
- 21 days after last treatment.
Influence of Dew Removal on Fungicide Efficacy: Dollar Spot

- Daconil Ultrex (1.8 oz) – 1.2 gal/1,000 sq ft water carrier
- This contact fungicide provided **better dollar spot control** when **dew was first removed** in the AM
- Dew prevents contact fungicides from spreading over the leaf to provide complete protection.
- 21 days after last treatment.
Influence of Dew Removal on Fungicide Efficacy: Dollar Spot

- Banner MAXX (0.5 fl oz) – 1.2 gal/1,000 sq ft water carrier
- Dew had **no effect on the efficacy of this penetrant fungicide**
- 21 days after last treatment.
Effects of Water Volume on Dollar Spot Under Very High Disease Pressure – Bent Green

![Bar graph showing the effects of water volume on dollar spot under very high disease pressure. The graph compares untreated plots and plots treated with different volumes of DuPont product. The untreated plot has significantly more lesions than the treated plots, with the highest reduction seen in the plot treated with 3.2 oz of DuPont product in 1 gallon of water.]

Rutgers University - 2002
Effects of Water Volume on Dollar Spot Very Under High Disease Pressure – Bent Green

![Bar graph showing effects of water volume on dollar spot under high disease pressure.](chart)

- Untreated
- DU 1.6 oz 2.0 gal
- DU 3.2 oz 2 gal

Rutgers University - 2002
• For contacts, use 1.0 – 2.0 gallons per 1,000 sq ft of water carrier for optimum disease control.

• Remove dew to improve the performance of contact fungicides (e.g., chlorothalonil), but not Sterol-inhibiting fungicides (e.g., propiconazole).

• The tank mixture of contact (chlorothalonil) and penetrant (propiconazole) to provide better disease control than either applied alone under high disease pressure.

• Under very severe dollar spot pressure, use maximum rates and 2.0 gallons water / 1,000 sq ft.
What Impact does Nozzle Selection have on Fungicide Efficacy?
Spray Coverage

Excellent

XR Nozzle
Fine to Medium

Turbo TeeJet
Medium to Coarse

Air-induction
Course to Very Coarse

TurfJet
Extremely Coarse

Raindrop
Extremely Coarse

Poor
Nozzle Coverage

Water sensitive paper – turns blue when it makes contact with water

- Raindrop
- XR nozzle
- TurfJet
- Air-induction

50 GPA = 1.15 gallons per 1000 sq. ft.
Drift Control

Excellent

- Raindrop
- TurfJet
- Air-induction
- Turbo TeeJet

Poor

- XR nozzle
AI/AIC TeeJet Nozzles

• Advantages
  – Good coverage
  – Uses Venturi-air technology
  – Drift control
    • Even at very high pressure
  – Works best at >40psi
  – Canopy penetration

• Disadvantages
  – Not useable at low pressures (<30 psi)
  – Wear tolerance
What Impact does Water Volume and Nozzle Type have on Fungicide Efficacy?
Impact of Water Volume and Nozzle Type on Dollar Spot Control - 2005

0.5 gal/1000 ft² (Daconil Ultex @ 1.8 oz/ M)

Fidanza: Research Conducted for Rutgers Field Day - 2005
Impact of Water Volume and Nozzle Type on Dollar Spot Control - 2005

Number of lesion Centers

<table>
<thead>
<tr>
<th>Nozzle Type</th>
<th>Number of lesion Centers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al</td>
<td>10</td>
</tr>
<tr>
<td>Turbo</td>
<td>12</td>
</tr>
<tr>
<td>XR</td>
<td>5</td>
</tr>
<tr>
<td>Del.</td>
<td>25</td>
</tr>
<tr>
<td>Untr.</td>
<td>30</td>
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</table>

Research Conducted for Rutgers Field Day
Impact of Water Volume and Nozzle Type on Dollar Spot Control - 2005

Fidanza: Research Conducted for Rutgers Field Day - 2005
Impact of Stimulated Rainfall
Dollar Spot Control: Rutgers 2009

• Five Fungicide Treatments
  – Daconil Ultrex (1.8)
  – Chipco 26GT (3.0)
  – Trinity (1.0)
  – Renown (mixture of chlorothalonil and azoxystrobin)
  – Disarm (0.18)

• Half inch rainfall treatments were applied
  – Immediately following application (within 5 minutes)
  – Four hours after application
  – 24 hours after application
  – None
CHIPCO 26GT EFFECTS OF STIMULATED RAINFALL

NO WATER

0.5 inches immediately following
CHIPCO 0.5 INCHES FOUR HOURS AFTER

CHIPCO 26GT EFFECTS OF STIMULATED RAINFALL

Untreated

CHIPCO 26GT
3.0 FL OZ/1000 FT²
0.5 IN RAIN
4 HOURS
What Impact of Water pH on Fungicide Efficacy?
What is the Impact of pH on the Control of $-Spot$?

- Most pesticides stable at pH 4 to 6
- Some fungicides “decompose” pH > 7.
  - alkaline hydrolysis
  - loss of pesticide efficacy
  - examples:
    - Polyoxin D (Endorse) fungicide
    - Thiophanate methyl (Cleary’s 3336)

- Refer to product MSDS sheet for pH stability information
Impact of Water pH on Dollar Spot Control with Cleary 3336 50W @ 2 oz/M - 2007

Dollar Spot (\# Infection Centers)

Water Carrier pH

Rutgers, bentgrass green, July 19, 2007.
Impact of Water pH on Dollar Spot Control with Daconil Ultrex (1.8 oz/M) - 2006

Bellewood GC, bentgrass fairway, July 11, 2006  Fidanza (PSU)
Impact of Water pH on Dollar Spot Control with Banner MAXX @ 0.5 fl oz/M - 2006

Bellewood GC, bentgrass fairway, July 11, 2006  Fidanza (PSU)
Fungicide Efficacy

• What is the Impact of Spray Adjuvants on the Control of Dollar Spot with Fungicides?
Rutgers 2005 Dollar Spot Trials - Creeping Bentgrass Fairway

Daconil Ultrex (1.8 oz/M) +/- Sync 0.32 fl oz @ 2 spray volumes, 21 d interval
Potential for Phytotoxicity using DMIs during Hot Weather on Poa annua Green –Rutgers 2007

Application date: May 18, June 1  Phyto (1-5);  (1=0, 2=sl chlor/necrosis, 3=mod, 4=sv, 5=dead)
Rating date: June 13.  0.125 in cut ht
And Last but not Least,
Should You Rethink the Timing of Your Fungicide Program for the Control of Dollar Spot on Fairways?
Photo July 7, 2004

Dr. Mike Boehm, Ohio State Univ

#5 Fairway– No early spring applications
Photo July 7, 2004

Dr. Mike Boehm,
Ohio State Univ

#5 Fairway – with one early spring application

<table>
<thead>
<tr>
<th>Treatment and rate / 1000 sq ft</th>
<th>6 June</th>
<th>20 June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curalan 50EG 1.0 oz</td>
<td>1 a</td>
<td>10 a</td>
</tr>
<tr>
<td>Banner MAXX 1.3ME 1.0 fl oz</td>
<td>6 ab</td>
<td>14 a</td>
</tr>
<tr>
<td>Emerald 70 WG 0.13 oz</td>
<td>9 a-c</td>
<td>19 a</td>
</tr>
<tr>
<td>Bayleton 2SC 1.0 fl oz</td>
<td>11 a-c</td>
<td>19 a</td>
</tr>
<tr>
<td>Chipco 26GT 2SC 2.0 fl oz</td>
<td>18 b-d</td>
<td>30 ab</td>
</tr>
<tr>
<td>Daconil Ultrex 82.5WDG 1.8 oz</td>
<td>33 c-e</td>
<td>54 b</td>
</tr>
<tr>
<td>Insignia 20WG 0.5 oz</td>
<td>46 de</td>
<td>56 b</td>
</tr>
<tr>
<td>Untreated Check</td>
<td>89 f</td>
<td>87 c</td>
</tr>
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</table>

1 Treatments were applied on 13 April, 2006. (6 June = 7.7 WAT; 20 June = 9.7 WAT)

F & N 2007: Kaminski
Delaying the Initial Outbreak and Severity of Dollar Spot on Fairways with Late Fall or Early Spring Applications of Fungicides?

- **One Early Spring Application** - with an effective dollar spot fungicide or a tank mixture of two good dollar spot fungicides after the “Second True Mowing” of the season

- **One to Three Late Fall Applications** - with an effective dollar spot fungicide “4 to 6-wks” before the course typically experiences consistently freezing temperatures