Wetting Agents and Moisture in Sand-Based Putting Greens

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Hydrophobic Rootzone Publications

- Since 1883, > 1200 publications
- Native sandy grasslands (CA, FL, and Australia)
- Currently, 200 pub’s per 5 years. (Dekker et al.)
- Golf greens – 1964 (Dorman et al.)
What Causes Localized Dry Spots?
LDS on Sand-Based Greens

- Water repelled by “waxy” coatings on sand grains
- Water drop penetration time: 5s - >10m
Cause of LDS

**Organic coatings on sand grains**
Wetting Agent Efficacy - Golf Course DePan, NL

This golf course was established on native sandy soils. Which half of the fairway was treated with a wetting agent?
How Do Wetting Agents Work?
Wetting Agent Function

- Acts as a **bridge** between waxy sand coatings and water droplet
- Eventually leach or decomposed by microbes
- Sand remains hydrophobic: **TEMPORARY FIX**
Wetting Agent in Action

- Lower surface tension, less dew formation
Figure 8. WDPT in seconds averaged over depths of 0.5, 1.5 and 2.5 centimeters (0.2, 0.6 and 1 inch) and over all sampling dates for 2004. Different letters indicate significant differences among wetting agents.
Can Wetting Agents Reduce Irrigation Requirements?
Irrigation Frequency & Wetting Agent Effects on LDS and Moisture Distribution
Treatment Structure

- **Irrigation threshold (vol. soil moisture)**
  1. 12% (~ daily)
  2. 10% (~ 2-3 x / week)
  3. 8% (~ 1-2 / week)
  4. 6% (~ extreme drought stress)

- **Wetting agent (Revolution)**
  1. untreated control
  2. label rate (6 oz / 1000 ft² / per month)
Irrigation threshold = 12% soil moisture (daily)
Irrigation threshold = 10% soil moisture (2-3x per wk)
Irrigation threshold = 8% soil moisture (1-2 x per wk)
Irrigation threshold = 6% soil moisture (< 1 / wk)
Surface Soil Moisture

- Weekly measurements on a 1 x 1 ft. grid
- Average moisture values
- Moisture variability within plots
Surface soil moisture (vol. %)

Irrigation thresholds are displayed in sub-plot receiving wetting agent treatment
Surface soil moisture (vol. %)

Irrigation thresholds are displayed in sub-plot receiving wetting agent treatment.
Surface soil moisture (vol. %)

Irrigation thresholds are displayed in sub-plot receiving wetting agent treatment.
Are There Differences Among Wetting Agents?
Wetting Agent Effects on Putting Green Moisture Distribution

- Commonly-used products tested within the same trial
- Tested during frequent, moderate, and infrequent irrigation frequencies
- Evaluated LDS and soil moisture at 3 depths

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Description</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Control</td>
<td>Untreated control</td>
<td></td>
</tr>
<tr>
<td>2. Cascade Plus</td>
<td>2 app's @ 8oz/ 1000 ft² (7 days apart)</td>
<td>Precision Labs, Inc. (Waukegan, IL)</td>
</tr>
<tr>
<td>3. Magnus</td>
<td>4 oz/ 1000 ft² monthly</td>
<td>Precision Labs, Inc. (Waukegan, IL)</td>
</tr>
<tr>
<td>4. TriCure AD</td>
<td>6 oz / 1000 ft² monthly</td>
<td>Mitchell Products (Millville, NJ)</td>
</tr>
<tr>
<td>5. Revolution</td>
<td>6 oz / 1000 ft² monthly</td>
<td>Aquatrols, Inc (Paulsboro, NJ)</td>
</tr>
<tr>
<td>6. Primer Select</td>
<td>4 oz / 1000 ft² monthly</td>
<td>Aquatrols, Inc (Paulsboro, NJ)</td>
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</tbody>
</table>
GCSAA Wetting Agent Trial
University of Arkansas
Fayetteville, AR

Untreated border areas

control

control

Picture taken 08/04/08
GCSAA Wetting Agent Trial
LDS – August 26, 2009
Volumetric water content at 3 inch depth (%)

Irrigation regime
- Control
- Cascade Plus
- Magnus
- Primer
- Revolution
- Tricure

GCSAA Wetting Agent Trial - 2008
Effect of Cascade Plus Timing on Season-Long Control of Localized Dry Spot

- **Label:** 2 applications 7 d
  - Has not provided season long control in previous studies
- **Experimental timing treatments:**

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<td>1. Control</td>
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<tr>
<td>2. 7 DAIT</td>
<td>Cascade Plus May 9 and May 16</td>
</tr>
<tr>
<td>3. 60 DAIT</td>
<td>Cascade Plus May 9 and July 9</td>
</tr>
<tr>
<td>4. 7, 60, 90, and 120 DAIT</td>
<td>Cascade Plus May 9 and 16, July 9, Aug. 9, and Sept. 9</td>
</tr>
</tbody>
</table>
Other Wetting Agents Warrant Consideration

Amega Sciences Trial

Helena Trial
Summary Points

- Most wetting agent products tested reduced LDS and improved moisture uniformity w/o adversely affecting moisture content

- Many wetting agent products available
  - Find product resulting in uniform and desirable moisture content (get a moisture probe!)
  - Univ. of Arkansas will continue WA research

- Make wetting agents more effective!
  - Couple w/ reduced irrigation frequency to:
    - ↓ summer stress decline
    - ↓ surface organic matter content
    - ↓ summer disease
    - ↓ moss and algae
    - ↓ water budget
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