Bacterial Decline on Creeping Bentgrass—North & South Perspectives

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Characteristics of the bacterial decline of creeping bentgrass

“Not much is known about the association of bacteria with turf.”

To date, the search for a solution to the bacterial problem has produced...

- lots of anecdotal information
- few plausible explanations
- no real solutions

R. Latin
Professor of Plant Pathology,
Purdue University
Bacterial decline facts

The new disease on creeping bentgrass caused by Acidovorax is different from the bacterial wilt of annual bluegrass caused by Xanthomonas.

The Acidovorax disease occurs on creeping bentgrass – stressed CBG!

Only a few turf pathology labs are prepared to readily identify the nature of bacterial pathogens on turf. (NCSU, Clemson, URI, MSU, Purdue)

No one has been able to isolate the pathogen AND inoculate CBG AND replicate ALL symptoms in the field.
### Historical record of bacterial disease on turf

<table>
<thead>
<tr>
<th>Disease and Pathogen</th>
<th>Turf host</th>
<th>Conditions associated with outbreak</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria (associated)</td>
<td>CBG cv Toronto</td>
<td>Spring/Fall... Precip + cool nights</td>
<td>Roberts, et al., 1981</td>
</tr>
<tr>
<td>Bacterial Wilt <em>Xcg</em></td>
<td>ABG</td>
<td>Not described</td>
<td>Roberts, et al., 1985</td>
</tr>
<tr>
<td>Bacterial Wilt <em>Xcampestris</em></td>
<td>ABG</td>
<td>May/June... severity reduced w/dry conditions</td>
<td>Dernoeden, et al., 2003</td>
</tr>
<tr>
<td>Bacterial Wilt <em>Xtranslucens</em></td>
<td>ABG</td>
<td>Warm/Wet for spread...heat drought for damage</td>
<td>Mitkowski, 2005</td>
</tr>
<tr>
<td>Bacterial Brown Stripe <em>Acidovorax</em></td>
<td>CBG</td>
<td>Not described</td>
<td>Furuya., et al., 2009</td>
</tr>
<tr>
<td>Bacterial “Disease” <em>Acidovorax</em></td>
<td>CBG</td>
<td>Hot, droughty conditions</td>
<td>Giordano, et al., 2010</td>
</tr>
<tr>
<td>Bacterial “Disease” <em>Acidovorax</em></td>
<td>CBG</td>
<td>Summer stress conditions</td>
<td>2010-2012 Numerous observations</td>
</tr>
</tbody>
</table>

*Xcg = Xanthomonas campestris subsp. graminis*
Bacterial decline of creeping bentgrass

Recent history

2009 - 2010
-- damage observed at Quail Hollow CC in Charlotte, NC.
-- fungal pathogens and abiotic factors eliminated
-- Michigan State group isolates several bacteria

2011
-- although only a few cases were confirmed, there were 100’s of “diagnoses” of a bacterial disease on CBG
• Chlorosis is the only consistent symptom from field reports. Sometimes it progresses to necrosis. Sometimes it is associated with etiolated tillers. Sometimes there is a wilt symptom. Often, bacterial streaming can be observed.
Reports are almost exclusively from intensively maintained turf—very high profile golf courses. Maintenance of those putting greens is most aggressive. Tolerance to damage—even cosmetic changes in color—is extremely low. Environmental stress is a significant component in all of the reports. 2010-2012 have been either hot or dry or both.
Suspicious samples often exhibit signs and symptoms of other disease problems.
How did Acidovorax come to reside on my putting green?

a) Airborne bacteria were introduced with storms?

b) Mechanical introductions...equipment, golfers shoes?

c) Infested seed?

d) It was always there?
If the bacteria were always there, then why have I not seen it before 2010?

- Other problems seemed to mask the presence of Acidovorax.
- Periodic changes in management practices made turf more vulnerable.
- Weather during the last three summers was unusual.
Bacteria behave differently than fungi

In most cases, bacteria and turf plants live in relative harmony...even when bacteria find their way into plant tissues through natural openings in leaf surfaces.

Bacteria may be spread by mowing...and by other mechanical operations that result in wounded leaf tissues.
There is no pattern (seed lot / cultivar) among cultivars to suggest seed transmission.

The presumption is that the pathogen is part of the natural environment.

There is only anecdotal evidence suggesting that the disease (or at least symptoms) occurred in the past -- (unreliable).

Disease is reported more frequently on a few modern cultivars. However, reports exist where more traditional cultivars are involved.

Disease is reported almost exclusively on turf maintained at greens height. However, we recently isolated Acidovorax from fairway height CBG.
Pre-disposing factors

Heat
Drought
Aggressive grooming
Mowing
Traffic
PGR?
N-stress

Root diseases

Other predisposing factors?
Bacteria Decline in Bentgrass – Southeast Perspectives

Bruce Martin, Ph.D.
Clemson University
Realities of Diagnostics

• Finding any particular pathogen does not necessarily show cause and effect
• Biology is complex, but remember the disease triangle: host, pathogen, and environment interactions result in disease
• In golf turf, environment effects... both man-made and natural, are extremely important to recognize
• Acidovorax and other bacteria pathogens require years of focused research before their role in bentgrass decline is elucidated
Realities of Diagnostics and Bentgrass Management

• Recent problems with decline associated with bacteria have occurred in years of RECORD BREAKING heat
• Problems have been mostly associated with high-budget courses with high demands
• Besides the environmental stress, we have reduced cutting heights, increased PGRs, reduced fertility, etc.
• ‘More’ in the case of inputs does not necessarily equate to ‘Better’
So, what do we do?

- Try to stop the bleeding – evaluate practices and products that may help
- Continue to attempt to reproduce the symptoms in the field
- Avoid throwing $ at the problem as a ‘management’ practice
- Remember the fundamentals of bentgrass plant physiology in heat stress environments
Not much of a fan....
Best fungicide evaluated in recent years...

Now, that’s a fan!
ATTEMPTS TO STOP THE BLEEDING
G-2, Charlotte NC

- **Signature (8 oz)**
- **Dac Action (3.6 oz)**
- **Mycoshield (3.7 oz)**
- **Ningnanamycin (1 oz)**
- **Untreated**

**Disease Severity (0 to 9)**

- **June 13**
- **June 20**
- **June 27**
- **July 5**

Treatments applied June 13, June 20, and June 27
Summary of Management Research

- sanitation of turfgrass leaves prior to aerification, topdressing, or other abrasive practices warrants further investigation
- besides being illegal, antibiotics are phytotoxic to bentgrass and should not be used
- no products tested in field trials have provided effective or consistent control of bentgrass etiolation
- Signature, Daconil Action, and copper products have helped to reduce turf thinning and decline
- biostimulants did not enhance and Primo applications suppressed etiolation symptoms
2012 Field Research from Clemson and Univ. Rhode Island

3 locations in southeast (Clemson):
Quail Hollow, Eagle Point, Belfair

3 locations in Northeast (URI)
## Treatments – 2 week intervals

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Rates/1000 sq ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Untreated (26GT or Daconil + Pythium )</td>
<td></td>
</tr>
<tr>
<td>2. Daconil Action</td>
<td>3.5 fl oz</td>
</tr>
<tr>
<td>3. Chipco Signature</td>
<td>4 oz</td>
</tr>
<tr>
<td>4. Chipco Signature</td>
<td>8 oz</td>
</tr>
<tr>
<td>5. Program with Daconil Weatherstik</td>
<td>Various, but 4 apps of Dac WS</td>
</tr>
<tr>
<td>6. Program with Daconil Action</td>
<td>Same as ‘5’, but 4 apps of DacAction</td>
</tr>
<tr>
<td>7. Primo</td>
<td>0.125 fl oz</td>
</tr>
<tr>
<td>8. Primo</td>
<td>0.250 fl oz</td>
</tr>
<tr>
<td>9. Trimmit</td>
<td>0.19 fl oz</td>
</tr>
<tr>
<td>10. Cutless 50WP</td>
<td>0.2 oz</td>
</tr>
<tr>
<td>11. Mycoshield</td>
<td>10 lb/acre</td>
</tr>
<tr>
<td>12. Curative (26 GT or Dac + Pythium)</td>
<td></td>
</tr>
</tbody>
</table>
Turf Quality, Quail Hollow, before Tournament

* Non fungicide treatments getting 4 oz 26GT or DacWS + Pythium control

April 23, 2012
% Decline, after Tournament, Quail Hollow

- Curative
- Mycoshield
- Trimmit
- Cutless
- Primo 0.250
- Primo 0.125
- Program DWS
- Program DA
- Signature 8 oz
- Signature 4 oz
- Daconil Action
- Untreated

April 23, 2012
Turf Quality, Quail Hollow

- DacACT + Sig
- Mycoshield
- Trimmit
- Cutless
- Primo 0.250
- Primo 0.125
- Program DWS
- Program DA
- Signature 8 oz
- Signature 4 oz
- Daconil Action
- DacWS + Sig

July 26, 2012
Suggestions

• Stick to the fundamentals and consider simplifying concerning inputs
• Among the inputs, don’t forget fertility
• Design a reasonable disease control program
• Don’t apply illegal pesticides – any benefits (not proven) do not offset the risks
• Ultradwarf bermudagrass can provide an excellent putting surface