Towards more sustainable use of pesticides on golf courses - Integrated disease management for turf

NGF Conference 23 November 2011

Simon Watson
Technical Manager Turf & Landscape EAME
Integrated Turf Management

- Fungicides
- Aeration
- Plant growth regulator
- Botanical composition
- Nutrition
- Light
- Air movement
- Mowing regime
- Organic matter management

Turf Health and Playability
Development of disease

Microdochium patch (*Microdochium nivale*)

- Disease population builds to a critical point
- Correct environmental conditions = exponential growth of the disease population

Courtesy of Professor Karl Danneberger (Ohio State University)
Integrated disease management

Microdochium patch (*Microdochium nivale*)

- Reduce initial levels of disease in turf
- Change environmental conditions
- Delay outbreak

Courtesy of Professor Karl Danneberger (Ohio State University)
Know your enemy
Know your enemy – Microdochium patch

**Scientific name: Microdochium nivale**

- Survives in infected plants and dead debris in thatch and soil
- When conditions are conducive spores germinate and mycelium grow from dead debris to infect plants
- Disease spreads rapidly under wet overcast conditions
- Temperature range 0 - 16°C
- Most severe in slow growing turf:
  - High humidity
  - High levels of thatch
  - Under snow cover
  - Repeated frosts
  - Cold fogs
  - Drizzly rain
Fusarium risk factors.....

GRASS SPECIES
Poa annua = highest risk

WEATHER AND GROWING CONDITIONS
High risk = wet and humid conditions
Turf able to grow away from disease

PLANT HEALTH AND NUTRITION
Healthy grass is best able to resist Fusarium
Under-fertilization increases risk
Over-fertilization increases risk

THATCH
Source of inoculum, reduces air and water movement
Fungicide choice and timing
Select the right fungicide for the right disease

Leaf Spot

Microdochium Patch

Dollar Spot

Anthracnose
## Contact or Systemic?

<table>
<thead>
<tr>
<th>Active growth</th>
<th>Slow/zero growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>April/October</td>
<td>Nov/March</td>
</tr>
<tr>
<td>Systemic</td>
<td>Contact</td>
</tr>
</tbody>
</table>

Classification: Public
Preventative Vs curative strategies

Trials have shown that carefully timed fungicide applications can:

- Achieve better control
- Provide longer lasting control
- Mean less surface scarring
- Reduce the number applications
- Improve time management
Preventative applications reduce turf stress

Classification: Public
The hidden enemy
Stages of disease outbreak

Microdochium patch (*Microdochium nivale*)

1\textsuperscript{st} stage Fusarium patch – small water soaked patches

2\textsuperscript{nd} stage Fusarium patch – development of discoloured patches
Stages of disease outbreak

Microdochium patch (*Microdochium nivale*)

3rd stage Fusarium patch – spreading patches in conducive weather conditions

4th stage Fusarium patch – large spreading patches
STRI trial: The power of preventative fungicide application

Note: Numbers above bars represent number of Heritage applications made. Applications were made at 28 day intervals. Applications made prior to disease symptoms were made at high disease risk as predicted by GreenCast.
STRI GreenCast Trial

Untreated Plot
STRI GreenCast Trial

Heritage applied monthly
– 4 applications –
STRI GreenCast Trial

Heritage applied at high disease risk (GreenCast) – 2 applications –
Timing fungicide application!

- **Soil temperatures:**
  Soil and air temperature consistently above 8 - 10°C for 5 days or more

- **Indicator green** on golf courses

- [www.greencast.co.uk](http://www.greencast.co.uk)
Disease forecasting.....

Disease Risk Index

<table>
<thead>
<tr>
<th></th>
<th>Friday 23/10</th>
<th>Saturday 24/10</th>
<th>Sunday 25/10</th>
<th>Monday 26/10</th>
<th>Tuesday 27/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthracnose Foliar Risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dollar Spot Risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dollar Spot Risk (Irrigated)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fusarium Patch High Risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fusarium Patch Risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poa Annua Germination Risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poa Annua Seedheads Risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take All Patch Risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take All Patch Risk (Irrigated)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend
- No Risk
- Some Risk
- Medium Risk
- Medium/High Risk
- High Risk

Ground Spraying

| Hours of the Day: | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|-------------------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Friday 23/10      |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Saturday 24/10    |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Sunday 25/10      | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Monday 26/10      | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tuesday 27/10     | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Colours Legend
- Night time
- Day time
  - Spraying Recommended
  - Restricted Recommendation
  - Not Recommended

Ground Spraying
Historical data.....

Cambridge Cambridgeshire East Anglia

Start: 01/10/2010  End: 30/11/2010

Historic Disease Risk for 'Cambridge Cambridgeshire East Anglia'
Alt.: 15m asl 01/10 to 30/11 (61 days)

Copyright © Syngenta Agronomic Information Services

Fusarium Patch High Risk 2010
GreenCast is not only for disease prediction but much more...

- Product information
- Environment - Operation Pollinator
- Ground spraying conditions
- Application:
  - Nozzle selection/calibration
  - Education Podcasts
  - Record Keeping/Calculators
- Weather
- Disease notes & ITM

Classification: Public
Effective chemistries at all stages of disease attack

- Fludioxonil: Highly effective
- Azoxystrobin: Lower effect
- Propiconazole: Lower effect

First visible signs of disease:
- Spore germination: Preventative
- Penetration: Curative
- Mycelial growth: Eradicant
- Blistering: Anti-Sporulant
- Sporulation: Optimum timing for fungicide application to protect turf quality
Rotate your chemistry

Mode of action:
QoI/DMI

Mode of action:
DMI

Resistance management

Mode of action:
Phenylpyrrole

Mode of action:
QoI/DMI
Four questions to ask for successful disease control:

1. Which disease is present/am I trying to control?
2. At what stage of infection is the disease at?
3. What time of year is it?
4. Which fungicide will give me best control?
The role of Plant Growth Regulator in ITM
Primo Maxx promotes healthy turf that reduces winter disease susceptibility

There may be several physiological explanations for the suppressive effect of Primo MAXX on snow mold infection, but most likely it was due to higher accumulation of carbohydrates in plant tissue before winter.

Source: Bioforsk Report 2009
Primo Maxx promotes healthy turf that reduces winter disease susceptibility

Source: Finland, Lepaa green trial, spring 2008
Reduced over-winter disease on greens with a Primo Maxx programme

% Spring Snow Mould infection

Potential to get greens into play sooner in spring

Source: Bioforsk Lepas, Finland. Assessed 11-4-2008.
Applied 6 times in previous season – last application 4-10-2007. LSD 5% = 4.

Classification: Public
Reduced over-winter disease on fairways with a Primo Maxx programme

% Spring Snow Mould infection

Source: Bioforsk Lapaa, Finland Assessed 11-4-2008
Applied 6 times in previous season - last application 4-10-2007 LSD 5% = 5
Species conversion Trial – STRI UK 2009 - 2010

Aim
To determine the potential of an integrated approach to:

- Reduce subsurface organic matter
- Improved playing quality
  - Smoothness
  - Moisture content
  - Firmness
- Establishing seedlings
- Change sward species composition
Improved seedling density with Primo Maxx

Seedling density 6 weeks after July 2010 sowing

STRI 2009-2010
Playability improved......

Smoothness 10 July - 7 days after aeration and oversowing treatments

<table>
<thead>
<tr>
<th>Smoothness (mm/m)</th>
<th>No Primo Maxx</th>
<th>Primo Maxx</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Average rooting depth Oct 10

STRI 2009-2010

Average rooting depth (cm)

- No Primo Maxx
- Primo Maxx
Microdochium patch August 2010

STRI 2009-2010

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Microdochium patch (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No oversowing</td>
<td>13</td>
</tr>
<tr>
<td>Graden</td>
<td>8</td>
</tr>
<tr>
<td>Broadcast</td>
<td>9</td>
</tr>
</tbody>
</table>
Improved surface after just two seasons.....

- Organic matter reduced by 67%
  - Graden exchange d OM more quickly
  - No increase in recovery time by double pass with scarifier

- Using Primo Maxx
  - Increased seedling establishment
  - Increase surface smoothness
  - Improved turf colour
  - Increased average root depth

- Over-seeding prevented *Poa* ingress
  - Seeding attachment improved establishment

Improved playability
Firmer, drier and smoother surface

Improved botanical composition
Less disease
Application – where do we have issues?

Timing (water volumes)

First visible signs of disease

Spore germination  Penetration  Mycosial growth  Blistering  Sporulation

Preventative  Curative  Eradicant  Anti-Sporulant

Optimum timing for fungicide application to protect turf quality

Coverage/Target  Drift  Accuracy

GreenCast

Classification: Public
The importance of stewardship?

- Responsible use of plant protection products
- Maximising efficacy of plant protection products
- Minimising loss to environmental
- Retention of active ingredients
- **Enable & Promote Best Practice!**
Syngenta Foliar nozzle – Air inclusion nozzle

Recommended for:

• All foliar **Fungicide** application

• **Primo Maxx** growth regulator application
Excellent coverage and superior penetration of thatch

Standard flat fan nozzle

Turf foliar nozzle
Reduced drift!
Integrated Turf Management

- Fungicides
- Light
- Air movement
- Aeration
- Mowing regime
- Organic matter management
- Plant growth regulator
- Botanical composition
- Nutrition

Turf Health and Playability
Thank You!