Fungicide Selection and Timing for *Rhizoctonia* Large Patch Control
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**Objective**
Determine which fungicide(s) and application schedules are most effective against *Rhizoctonia* Large Patch

**Rationale**
An important constraint to widespread use of zoysia is *Rhizoctonia* large patch (RLP) caused by *Rhizoctonia solani* (Kuhn AG 2-2). This pathogen infects zoysia grown in the transitional climate of United States and Asia, but this is a different group of *Rhizoctonia solani* than the group that causes brown patch in cool-season grasses. RLP symptoms are present in the fall and spring as zoysiagrass goes into or comes out of winter dormancy. The disease expresses itself as large circular patches with orange borders (Figs 1 and 2). The fungus will not completely kill zoysia, but causes considerable thinning leading to encroachment of bermudagrass and other weeds. This decreases performance and increases maintenance costs.

RLP is favored by high thatch and moist soils, and thus zoysiagrass grown on poorly drained, compacted soils common in the transition zone are particularly susceptible to this pathogen. Commonly recommended cultural controls are to avoid mowing turf when wet, control thatch, avoid spring fertilization, use slow-release forms of nitrogen and raise mowing heights. However, cultural controls cannot be implemented during the winter when no maintenance is done to zoysia. Therefore, fungicides are often used to minimize RLP. Purdue research, supported by empirical evidence, demonstrates that aggressive fungicide use can adequately control RLP. However, questions remain for maximizing control while minimizing fungicide inputs and costs. We are often approached by superintendents maintaining zoysiagrass who are unsure which fungicide to apply for RLP control and equally unsure when to apply. Which fungicide(s) and the timing of application are two questions that need answered.

**How it was Done**
The experiment was initiated in the fall of 2003 on an established stand ZEN-400 zoysiagrass with a mowing height of 0.5 in at the William H. Daniel Turfgrass Research and Diagnostic Center. The stand used in this study was uniformly infected by the *Rhizoctonia* large patch pathogen. Four fungicides [propiconazole (Banner MAXX®), azoxystrobin (Heritage®), PCNB (Turfcide® 400), and flutolanil (Prostar® 70WP)] were initially evaluated at four different application timings (before winter dormancy, after winter dormancy, before spring green-up and after spring green-up). Timings are based on the growth of the plant instead of calendar dates, so
that the results can be applied nationwide and not just locally. Applications were evaluated during
the spring and early summer to determine which fungicides and timings provided best control. An
untreated check was included for comparison.

**Fungicides and application rates**
- **Banner MAXX**® @ 4 oz/1000 ft²
- **Heritage**® @ 0.4 oz/1000 ft²
- **Prostar® 70WP** @ 2.2 oz/1000 ft²
- **Turfcide® 400** @ 24 oz/1000 ft²

**Application timings (see Table 1 for actual application dates)**
- before winter dormancy (anticipated application timing Sept 15)
- after winter dormancy (anticipated application timing Oct 15)
- before spring green-up (anticipated application timing April 15)
- after spring green-up (anticipated application timing May 15)

Data were collected every two weeks starting at the first spring application timing using digital
image analysis (digital camera and SigmaScan software).

**Results to date**
- Plots treated with Heritage before or after spring green-up and plots treated with Prostar
  before spring green-up produced more green zoysiagrass coverage than the check on 17 June
  (Table 2).
- Plots treated with Heritage before or after spring green-up, Prostar before spring green-up and
  Banner Maxx before spring green-up produced more green zoysiagrass coverage than the
  check on 24 June (Table 2).
- Spring applications (before and after green-up) allowed faster spring green-up than fall
  applications (before and after dormancy) (Figure 3).

**Table 1. 2003 and 2004 site and turf conditions**

<table>
<thead>
<tr>
<th>Application date</th>
<th>Zoysia status</th>
<th>Air temperature (°F)</th>
<th>Soil temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Sept 2003</td>
<td>before dormancy</td>
<td>66</td>
<td>68</td>
</tr>
<tr>
<td>24 Oct 2003</td>
<td>after dormancy</td>
<td>46</td>
<td>53</td>
</tr>
<tr>
<td>15 Apr 2004</td>
<td>before green-up</td>
<td>52</td>
<td>43</td>
</tr>
<tr>
<td>5 May 2004</td>
<td>after green-up</td>
<td>51</td>
<td>53</td>
</tr>
</tbody>
</table>

**Table 2. Effects of fungicide selection and timing on control**b of *Rhizoctonia* large patch (digital
image analysis).**

<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Application timinga</th>
<th>17Jun</th>
<th>24Jun</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Banner Maxx</strong></td>
<td>12 Sept 2003</td>
<td>86.4</td>
<td>65.3</td>
</tr>
<tr>
<td><strong>Banner Maxx</strong></td>
<td>24 Oct 2003</td>
<td>86.2</td>
<td>72.1</td>
</tr>
<tr>
<td><strong>Banner Maxx</strong></td>
<td>15 Apr 2004</td>
<td>91.9</td>
<td>79.2</td>
</tr>
<tr>
<td><strong>Banner Maxx</strong></td>
<td>15 May 2004</td>
<td>89.9</td>
<td>73.2</td>
</tr>
<tr>
<td><strong>Heritage</strong></td>
<td>12 Sept 2003</td>
<td>89.5</td>
<td>68.9</td>
</tr>
<tr>
<td><strong>Heritage</strong></td>
<td>24 Oct 2003</td>
<td>85.1</td>
<td>71.5</td>
</tr>
<tr>
<td><strong>Heritage</strong></td>
<td>15 Apr 2004</td>
<td>94.6</td>
<td>79.8</td>
</tr>
<tr>
<td><strong>Heritage</strong></td>
<td>15 May 2004</td>
<td>94.8</td>
<td>80.8</td>
</tr>
<tr>
<td><strong>Prostar</strong></td>
<td>12 Sept 2003</td>
<td>73.4</td>
<td>52.9</td>
</tr>
</tbody>
</table>
Prostar 24 Oct 2003  80.2  64.3  
Prostar 15 Apr 2004  93.6  82.6  
Prostar 15 May 2004  92.0  78.5  
Turfcide 12 Sept 2003  79.8  63.2  
Turfcide 24 Oct 2003  81.6  63.6  
Turfcide 15 Apr 2004  90.0  76.6  
Turfcide 15 May 2004  92.1  78.4  

untreated check  84.0  68.3  

LSD (0.05)  8.3  10.7  

*a 10 Apr = before dormancy, 24 Oct 2003 = after dormancy, 15 Apr 2004 = before green-up, 15 May 2004 = after green-up  
*b Green zoysiagrass coverage was determined using digital images and SigmaScan software.
Figure 1. Effects of application timing on green zoysiagrass coverage. Mean value of all fungicides (n=16). Spring applications before or after zoysiagrass green-up increase green-up compared to fall fungicide applications before or after zoysiagrass winter dormancy.