Hardy bermudagrasses sought with resistance to spring dead spot

Cultivars vary in their susceptibility to spring dead spot.


Spring dead spot is a serious disease of bermudagrass on golf courses in its northerly range as well as in other regions where bermudagrass goes dormant in winter. The disease not only reduces the beauty of the course, but it also produces bad lies when golf balls land in diseased patches of turf. Patches appear when bermudagrass would otherwise green up, and they can take 30 days or more to fill in, depending on the individual cultivar's speed of recovery and local growing conditions.

Patch size can range from 4 inches to more than 3 feet in diameter. Shoot survival within the patches varies greatly from cultivar to cultivar (1) and from site to site. Presumably, better survival in the patches would result in a more rapid recovery from spring dead spot. The disease affects common (Cynodon dactylon) and hybrid bermudagrasses.

At least three root-rotting fungi, including Ophiosphaerella herpotricha, O. korrae, and O. narmari (2,4,7,9, 10,11), are thought to cause the disease. Ophiosphaerella herpotricha is the most common cause of spring dead spot in Kansas, Oklahoma and Texas (9).

More than 24 seeded bermudagrasses were commercialized from 1990 through 2000. Superintendents need to

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- Yukon seeded bermudagrass offers improved visual quality, spring dead spot resistance and winter hardness.
- Raising mowing heights does not always reduce spring dead spot disease severity.
- Bermudagrasses mowed at 0.5 vs. 1.5 inches often green up earlier in spring and have better late-season color retention.
know about the performance and fit of these grasses on golf courses. Data on visual and functional quality, as well as spring dead spot and winterkill resistance, are crucial.

The seeded bermudagrasses Mirage, Yukon, and Jackpot performed admirably in the 1992-1996 National Turfgrass Evaluation Program study on 22 U.S. test sites. These grasses ranked highest among seeded bermudagrasses for overall turf quality (6). In a separate 1994-1996 trial conducted in Oklahoma under simulated fairway conditions, Mirage resisted spring dead spot better than Jackpot and had less winterkill (1). Because Yukon was not included in that trial, the objectives of this work were to evaluate Jackpot, Mirage, and Yukon collectively for spring dead spot resistance as well as other turf performance characteristics.

**Materials and methods**

Plots were seeded on July 5, 1995, at Oklahoma State University in Stillwater using 1 pound of pure live seed per 1,000 square feet. The soil was a silty clay loam with a pH range of 6.9 to 7.0. Grasses were planted in a randomized complete block design with three replications. Individual 12.5-by-15-foot subplots were mowed two to three times per week at 0.5 and 1.5 inches, simulating a golf course fairway and clubhouse grounds or rough in the southern Great Plains. Plots received 1 pound of nitrogen per 1,000 square feet per month from May to September each year using urea (46-0-0). Mean phosphorus and potassium soil test levels were kept in the optimal range for turf growth, with average measures of 41 and 167 parts per million, respectively.

**Spring dead spot inoculation**

Grasses were inoculated in September 1996 with a known virulent isolate of the fungus *O. herpotricha* (1,8), which was originally collected from the test site.

### Variety vs. mowing

Regardless of mowing height, the cultivar Yukon had fewer spring dead spots than the other two cultivars, as well as superior shoot survival in the dead spots.

<table>
<thead>
<tr>
<th>Variety</th>
<th>0.5 inch</th>
<th>1.5 inches</th>
<th>Average</th>
</tr>
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<tbody>
<tr>
<td>Mirage</td>
<td>195a</td>
<td>186b</td>
<td>191b</td>
</tr>
<tr>
<td>Yukon</td>
<td>104b</td>
<td>144b</td>
<td>124c</td>
</tr>
<tr>
<td>Jackpot</td>
<td>180a</td>
<td>270a</td>
<td>225a</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Year</th>
<th>1997</th>
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<th>1999</th>
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<tbody>
<tr>
<td>Mirage</td>
<td>20a</td>
<td>153ab</td>
<td>398a</td>
</tr>
<tr>
<td>Yukon</td>
<td>8b</td>
<td>138b</td>
<td>228b</td>
</tr>
<tr>
<td>Jackpot</td>
<td>20a</td>
<td>211a</td>
<td>445a</td>
</tr>
</tbody>
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<table>
<thead>
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<th>Percent survival in dead spots</th>
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<tr>
<td>1997</td>
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<tr>
<td>-----</td>
</tr>
<tr>
<td>Mirage</td>
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<tr>
<td>Yukon</td>
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<tr>
<td>Jackpot</td>
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Within each column, numbers followed by the same letter are not significantly different.
Bermudagrass varieties are inoculated in the fall of the year with the causal agent of spring dead spot disease using oats infected with the fungus.

From each subplot, six soil-turf plugs were removed to a depth of 4 inches using a cup cutter. Next, 0.4 ounce of oat grain (*Avena sativa*) infested with the fungus was placed into three of the holes, with the remaining holes receiving an equal amount of sterile oats without the fungus.

Plugs were then replaced and turf irrigated to prevent drought stress. Inoculation sites were mapped for subsequent disease assessment. Disease was evaluated in May 1997, April 1998 and April 1999. The diameter of each patch was measured in two directions, and the average radius was used to calculate disease area (1). Shoot survival in diseased patches and shoot density in healthy turf were determined on each rating date.

**Quality assessment**

By scoring turf in a range from 1 (dormant) to 9 (fully green), we rated plots for green-up in March 1997, April 1998 and March 1999, whereas late-season color-retention ratings from 1 (brown) to 9 (completely green) were collected in November 1996, October 1997 and December 1998.

Winterkill occurred the winter of 1998-1999, so a visual estimate of the percentage of winterkill (zero for no kill, 100 for complete kill) was made in April 1999. Overall visual quality was rated monthly from June to September 1996 and from May to September from 1997 to 1999 (on a scale ranging from 1 for very poor turf to 9 for highest quality turf).

**Results and discussion**

As in previous work (1), the field inoculation technique was effective for screening bermudagrasses for resistance to spring dead spot. Following inoculation, patch size of spring dead spot increased in each year of this three-year study.

Yukon was more resistant to *O. herpotricha* than Mirage or Jackpot when patch size of spring dead spot and percent shoot survival in patches were used as indices of spring dead spot resistance. These results were consistent with earlier findings (1) where Mirage had slightly more resistance to *O. herpotricha* than Jackpot.

We did not confirm differences in percent shoot survival in patches between Jackpot and Mirage as previously reported (1). Readers should use...
resistance findings with caution, as these grasses may respond differently to the other causal agents of spring dead spot. More important, no bermudagrasses have been found immune to spring dead spot. Resistance does not mean immunity to the disease.

Patch size of spring dead spot was greater on all cultivars at the higher mowing height. The disease is usually associated with lower mowing heights, and it has been suggested that increasing the mowing height may reduce damage from the disease (5,10). Additional work is needed on the influence of mowing height and spring dead spot severity. Despite the findings in this work, we do not recommend reducing mowing height to manage spring dead spot severity.

Average shoot densities per square inch in nondiseased areas were 14 for Yukon, 11 for Jackpot and 9 for Mirage at the 0.5-inch height of cut and 9 (Yukon), 8 (Jackpot) and 6 (Mirage) shoots per square inch at the 1.5-inch mowing height.

Yukon (with 28 percent winterkill) had greater winter hardiness than Jackpot (76 percent kill) and Mirage (82 percent kill) at the 0.5-inch mowing height following the 1998-1999 winter, with no substantial differences present among cultivars at the 1.5-inch height.

Jackpot provided slightly better quality than Mirage during two of four growing seasons. Yukon provided slightly better quality than Mirage in three of four seasons and better quality than Jackpot in two of four growing seasons. In 1998, Yukon (5.5 rating) greened up earlier than Mirage (4.3 rating) or Jackpot (4.2 rating).

During 1999, Yukon (2.3 rating) provided earlier green-up than Mirage (1.3 rating), but Jackpot (1.8 rating) did not differ significantly from Yukon or Mirage. Overall, Yukon (5.6 rating) had better late-season color retention than Mirage (4.8 rating) or Jackpot (4.8 rating).

In general, turf at the lower mowing height had earlier green-up (3.5 vs. 2.5 rating) and remained green later into autumn (6.2 vs. 3.9 rating) than turf at the higher mowing height. Turfgrass quality, green-up and late-season color retention can be expected to vary based on different management regimes and local climatic factors.

Based on Yukon's performance in this study and elsewhere (6), this cultivar shows promise for use in full sun on well-maintained golf course fairways, clubhouse grounds, roughs and lawns where bermudagrass is adapted, where establishment by seed is demanded and where improved winter hardiness and improved spring dead spot resistance are valued.

We do not believe that Yukon offers the vigor necessary for rapid recovery on golf course tee areas, and it may not be well adapted to the % inch or lower heights found on tee areas. Although the seeded bermudagrasses examined in this work have improvements over older seeded types (6), they do not provide the visual or functional quality of many of the asexually reproduced interspecific hybrid bermudagrasses such as Tifway, Tifgreen or TifSport.

We are often asked to comment on the performance of new seeded bermudagrasses relative to local vegeta-
Aerial photo showing natural infestation of spring dead spot disease on tee and fairway areas of Midlawn hybrid bermudagrass (a), U-3 common bermudagrass (b) and Tifway hybrid bermudagrass (c). As seen in this photo and as shown by previous research using the field inoculation technique, of the two cultivars, Tifway and Midlawn, Midlawn was more resistant to spring dead spot.

Interest in propagated common bermudagrass types that are not in pedigree (certified) sod or sprig production. Because we often see substantial variation in color, texture, density and vigor in these non-pedigree local types, no useful generalizations can be made.

Although cultivar selection is an important first step in managing spring dead spot disease, cultural practices such as reducing soil compaction (5,8), thatch (8) and soil pH (3) can also assist in managing the disease. In some instances fungicides may reduce disease severity, but in our trials in Oklahoma and Kansas, most products have offered very limited suppression of spring dead spot disease.

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Literature cited


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