Managing spring dead spot of bermudagrass

Superintendents can select fertilizers that will reduce soil pH and thatch.

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Spring dead spot is the most destructive disease of bermudagrass wherever winter conditions are cold enough to induce dormancy of this warm-season grass.

The disease is usually most serious under high maintenance (high nitrogen fertility and low mowing height), although moderate to severe outbreaks sometimes develop under low-maintenance conditions. Fungi apparently cause the disease by reducing the winter hardiness of patches of bermudagrass turf.

Although complete cures are unknown, researchers have identified several practices that allow golf course superintendents to slow the disease:

- Increase the root zone’s acidity
- Avoid late-summer nitrogen applications
- Maintain adequate potassium fertility
- Raise mowing heights in late summer
- Reduce thatch aggressively
- Consider late-summer and early-fall fungicide applications on infected bermudagrass greens.

Symptoms

Spring dead spot occurs as softball-sized to beach-ball-sized patches of bermudagrass that fail to green up in the spring in turfs that appeared healthy the previous autumn. These dead patches have a bleached, white color, becoming tan to brown as the dead tissue ages. Inspection reveals that the roots, stolons and rhizomes in the patches have a brown to black rot.

Often, bermudagrass will slowly recolonize the dead patches during the summer. Complete recovery of affected areas may take the entire growing season. In some cases, weeds or cool-sea-

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son grasses may colonize the patches. Regrown bermudagrass patches will usually not exhibit disease symptoms until the following spring.

Spring dead spot patches tend to recur in the same spots for several years. After two to three years, the centers of active patches can develop a tuft of healthy turf, sometimes called a “frog-eye.” As these patches continue to expand over the years, they may transform into rings or arcs of dead turf evident during the spring.

Spring dead spot typically does not develop until several years after establishment of a turf. This suggests thick thatch layers may favor the disease. Disease severity occasionally subsides after three or four years with no change in management practices. This may result from a buildup of natural biological agents in the soil.

**Disease cycle**

Several soilborne fungi — *Ophiostoma herpotricha*, *O. korrae* and *O. namari* — cause this disease in the United States and elsewhere (5). The soilborne fungus *Gaecumannomyces graminis graminis* has also been associated with this disease in the southeastern United States (5). These fungi share many common biological features.

They are thought to be most active in autumn and spring when temperatures are cool and the soil is moist. The fungi grow over the surfaces of bermudagrass roots by producing dark-brown microscopic filaments called hyphae. Roots are infected when hyphae penetrate and grow within the vascular tissues of the root. *O. herpotricha* and *O. korrae* infections are likely at soil temperatures from about 50 F to 75 F, with greatest fungal activity at about 60 F. Bermudagrass roots grow extremely slowly at or below 60 F, so the infectious fungi have a competitive advantage over the plant at cool temperatures.

The crowns of infected bermudagrass plants are more sensitive to cold winter temperatures than are those of uninfected plants (7,8). Thus, spring dead spot is most severe in the coldest regions of adaptation of bermudagrass. Damage is evident only when foliar growth resumes in the spring. Activity of the infectious fungi during the autumn, therefore, leads to the occurrence of the dead patches in the spring. Springtime infections may slow the regrowth of bermudagrass into the dead patches, but these do not cause new patches to appear.

**Management starts with soil pH**

There is no magic bullet for spring dead spot. Several studies strongly suggest, however, that a management program should be based on low soil pH, with a target pH of 5.2 to 5.3 (extracted in distilled water).

Why does reducing the soil pH reduce turfgrass diseases caused by root-infecting ectrotrophic fungi? We don’t really know. These fungi grow quite well in laboratory cultures in the range of 5 to 5.3, so acidity in this range is not directly toxic to them.

Pete Dernoeden, Ph.D., along with colleagues at the University of Maryland, showed that long-term use of ammo-
Sulfur boosts acidity

Spring dead spot of bermudagrass can be reduced through application of sulfur, according to results of applications made in September 1993 (plots assessed in May 1994).

<table>
<thead>
<tr>
<th>Treatment and rate per 1,000 square feet</th>
<th>Soil pH</th>
<th>Percent of plot with SDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur at 10.4 lb</td>
<td>5.3 a</td>
<td>2 a</td>
</tr>
<tr>
<td>Sulfur at 6.9 lb and MnSO₄·H₂O at 0.1 lb</td>
<td>5.3 a</td>
<td>5 a</td>
</tr>
<tr>
<td>K₂O at 4.6 lb</td>
<td>5.5 b</td>
<td>12 b</td>
</tr>
<tr>
<td>Lime at 136 lb</td>
<td>6.1 c</td>
<td>10 b</td>
</tr>
<tr>
<td>Untreated</td>
<td>5.5 b</td>
<td>10 b</td>
</tr>
</tbody>
</table>

Numbers within a column followed by the same letter are not significantly different.

A low pH isn’t a cure-all for the disease. Even in bermudagrass plots with pHs below 5, we have recorded as much as 10 to 22 percent of turf killed in certain “hot spots.” Also, for highly calcareous soils, it may be difficult to reach these low pHs.

Ammonium vs. sulfur

In soils with high pH, reductions should be done incrementally. This is only possible in bermudagrass swards not receiving frequent applications of high-pH irrigation water. Superintendents have a choice of methods for reducing soil pH: use of ammonium fertilizer or sulfur applications. The choice will influence soil acidity in very different ways.

Ammonium fertilizers such as ammonium sulfate and ammonium chloride can provide a gentle, long-

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term reduction in soil pH in the rhizosphere. When the plant root absorbs an ammonium ion (NH₄⁺) from the soil, it releases a proton (H⁺) into the soil. This lowers the pH specifically where it is needed most: in the rhizosphere.

Ammonium fertilizers should be the foundation of a spring dead spot management program. Avoid fertilizers containing nitrate as the only nitrogen source, such as sodium nitrate. These raise the pH in the rhizosphere. Studies suggest the effect of urea and sulfur-coated urea on spring dead spot development is intermediate between ammonium-based fertilizers and nitrate-based fertilizers (1,3).

Ammonium fertilizers do not quickly reduce soil pH. Golf course superintendents are cautioned to measure success and benefits with photographs and field notes collected over at least three years.

Ammonium sulfate has a high salt index and can cause leaf injury when in contact with wet foliage during warm temperatures (80°F or above). Under such conditions, irrigate immediately after application to wash fertilizer off the leaves.

Flowers of sulfur offer a more heavy-handed approach to pH reduction because sulfur reduces the pH of the bulk soil, not just the soil in the rhizosphere. Once applied, sulfur combines with water to form a weak sulfuric acid, which obviously will reduce soil pH. Most of the acidity may be confined to the top ½ to 1 inch of soil, so monitor the soil pH by sampling the top ½ to 1 inch.

If a superintendent is interested in aggressively suppressing a spring dead spot problem by using flowers of sulfur, an incremental approach is still recommended. Initiate a fertilization program using ammonium fertilizers, then apply flowers of sulfur lightly (2 pounds per 1,000 square feet) to areas with the disease. Evaluate the results for a year or two before deciding whether to treat again.

A target pH of 5.0 to 5.3 (extracted in distilled water) has worked for us in Kentucky.

Heavier applications of sulfur in our studies led to slow spring green-up and temporary turf thinning, particularly in soils with little organic matter.

**Other fertility practices**

In addition to soil acidity, other factors influence the severity of spring dead spot:

- **Nitrogen applications** in August or later may increase damage from spring dead spot (2). Make the last nitrogen application by mid-July, and avoid slow-release nitrogen fertilizers at that time. The objective is for the turf to run out of available nitrogen by early September.

- **Deficiencies of potassium** can reduce winter hardness of bermudagrass and can contribute to more severe spring dead spot. If soil levels are adequate, potash applications alone have had little or no direct effect on spring dead spot severity in field studies (1,3,10,11). However, some spring dead spot studies suggest a trend of slightly better turf quality under a long-term program of both

Complete recovery of spring dead spots may take an entire growing season.
ammonium fertilizers and potash (1). So even when soil tests indicate a high level of potassium, we recommend an application of approximately 80 pounds of K₂O per acre applied in late autumn, at least under conditions similar to those in Kentucky.

- **Higher moving heights** in late summer and early fall should result in higher levels of carbohydrate reserves in roots and crowns. This may decrease damage from the disease by enhancing winter survival. It also may provide more insulation from severe winter weather.

- **Excessive thatch** may increase susceptibility to spring dead spot (6). One or two aggressive aeration treatments (by coring) during the summer will increase juvenile growth and tiller production, and can reduce thatch accumulation.

Researchers haven’t yet identified cultivars that are highly resistant to spring dead spot. Winter-hardy cultivars may be somewhat less susceptible to the disease, however, and may also recover more quickly in summer.

**Do fungicides help?**

Several fungicides are labeled for spring dead spot management. However, fungicidal control of this disease has been generally inconsistent. Quite a few of the pioneering studies with fungicides showed little to no benefit from fungicides unless applied frequently at high rates (6). Products tested in the University of Kentucky turf research program have given little to no control, even when applied as early as the second week in September (9,12).

For fairways, turf managers are encouraged to rely on cultural practices rather than fungicides for managing spring dead spot. Applications may be justified on greens, but treatments should begin in early September for best results, at least in the northernmost range of bermudagrass adaptation. If using fungicides, irrigate the product into the root zone with ¼ to ½ inch of water immediately after application, before the product has a chance to dry on the leaf surface.

**Acknowledgments**

Thanks to Ned Tissere, Ph.D., at Kansas State University, and A.J. Powell Jr., Ph.D., at the University of Kentucky, for reviewing a draft of this article.

**Literature cited**


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