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Dollar Spot: Getting Tougher to Manage in Creeping Bentgrass

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Dollar spot (*Sclerotinia homoeocarpa*) is widespread and extremely destructive to turfgrasses. The taxonomy of *S. homoeocarpa* is unclear, and this fungus may be referred to as an unknown species of either *Moellerodiscus* or *Lanzia*. **Dollar spot is known to attack most turfgrass species**, including annual bluegrass (*Poa annua*), bentgrasses (*Agrostis* spp.), fescues (*Festuca* spp.), Kentucky bluegrass (*Poa pratensis*), perennial ryegrass (*Lolium perenne*), bermudagrass (*Cynodon* spp.), zoysiagrass (*Zoysia* spp.), centipedegrass (*Eremochloa ophiuroides*), and St. Augustinegrass (*Stenotaphrum secundatum*).

Symptoms. The symptomatic pattern of dollar spot varies with turfgrass species and cultural practices. Under close mowing conditions, as with intensively maintained bentgrass, annual bluegrass, bermudagrass or zoysiagrass, **the disease appears as small, circular, straw-colored**

spots of blighted turfgrass about the size of a silver dollar (4 cm diameter). With coarser-textured grasses that are suited to higher mowing practices, such as Kentucky bluegrass or perennial ryegrass, the blighted areas are considerably larger, and **straw-colored patches range from 3 to 6 in. (7.6–15.2 cm) in diameter.** Affected patches frequently coalesce and involve large areas of turf.

Grass blades often die from the tip, and have straw-colored or bleached-white lesions that are shaped like an hour glass. The hour-glass banding on leaves is often made more obvious by a definite narrow brown, purple, or black band, which borders the bleached sections of the lesion from the remaining green portions. Hour-glass bands may not appear on warm-season grasses, and are difficult to find on close-cut bentgrass or annual bluegrass on putting greens. On close-cut putting greens and warm-season grasses, the lesions are oblong or oval-shaped, but there is a brown band of tissue where the tan or white lesion and green tissue meet. Tip die-back of leaves is common and blighted tips appear tan to white in color, and also have a brown band bordering dead and green leaf tissue. A fine, white, cobwebby mycelium covers the diseased patches during early morning hours when the fungus is active and leaf surfaces are wet.

Environmental Influences. The disease is **favored by warm and humid weather, and when night temperatures are cool long enough to permit early and heavy dew formation.** In cool-season grasses, disease severity usually peaks in late spring to early summer and again in late summer to early autumn. In the upper Midwest, however, the disease tends to be most damaging during autumn. In some regions, dollar spot can remain active during mild periods throughout autumn and into early winter.

Dollar spot was widely regarded as a disease favored by warm days and cool nights. Therefore, in most regions in the United States it was generally believed to be primarily a problem from late spring to early summer and autumn in cool-season grasses. In 1999 in the Mid-Atlantic region, however, dollar spot was extremely active in July and August, and there were serious outbreaks as late as

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November and early December. July and August weather conditions were hot and rain-free in most of the eastern United States in 1999, creating the need for daily irrigation (usually nighttime). Dollar spot was especially a chronic problem in annual bluegrass and creeping bentgrass turf on golf courses. **Why this dramatic change in the incidence and severity of dollar spot during hot and dry weather?** Although not clearly understood, some reasons may include: (1) more frequent night irrigation, which extended leaf wetness duration periods; (2) lower inputs of nitrogen; (3) lower mowing heights, more frequent mowing, and the removal of clippings; (4) intense play and wear, especially where mowers turn in fairways or approaches and in cupping areas; and (5) a lack of good thatch and soil compaction control programs on fairways and tees.

Species-Cultivar Susceptibility. For some golf courses, the greatest contributing factor was the seeding of creeping bentgrass cultivars highly susceptible to dollar spot, such as "Crenshaw," "SR 1020," and "Backspin." Undoubtedly, another factor was the overload of inoculum (i.e., the parts of the pathogen that cause disease). As disease severity increased over the season the amount of inoculum (i.e., mycelium of the dollar spot fungus, which does not produce spores) increased to very high levels. This resulted not only in an increase in the incidence and severity of the disease (even in cultivars with improved dollar spot resistance), but also longer periods of time when the disease remained active.

A similar phenomenon occurred with red thread when perennial ryegrass was introduced on a large scale onto golf courses in the early 1980s. At that time, red thread (*Laetisaria fuciformis*) disease was primarily a problem on fine-leaf fescues in maritime climates of New England and the Pacific Northwest. Red thread, however, also is a common disease of perennial ryegrass, which, as previously noted, was not generally grown on golf courses before 1980. As the years progressed, red thread first appeared in and severely damaged ryegrass in roughs. As inoculum (a combination of *L. fuciformis* mycelium, sclerotia, and spores) built up, the disease spread to ryegrass on tees, fairways, and collars. By the 1990s, red thread was attacking Kentucky bluegrass and tall fescue, two species once believed to be very resistant if not immune to red thread.

Hence, a similar phenomenon may now be occurring with dollar spot in creeping bentgrass. This is especially true in the Mid-Atlantic region, where bentgrass is rapidly replacing perennial ryegrass as the preferred grass for tees and fairways. **The inoculum load is now so great on some courses that dollar spot is causing severe prob-**

lems in Pennncross, Procup, Southshore, and other cultivars reported to have moderate to high dollar spot resistance.

Cultural Management. Dollar spot tends to be most damaging to poorly nourished turfs, particularly if humidity is high or a heavy dew is present. On putting greens, the removal of dew and leaf-surface exudates by poling, dragging, or whipping can be beneficial. Mowing greens early in the morning will speed surface drying, and has been linked to reduced dollar spot. In poorly nourished turf, an application of nitrogen (50% water-soluble plus 50% slow release) will stimulate shoot growth and mask the disease. Subsequent applications at low rates of water-soluble nitrogen (i.e., 0.1 to 0.125 lb N/1000 ft²; 5–6 kg N/ha) in spoon-feeding programs throughout the golf season also helps to suppress dollar spot. Potassium, and to a lesser extent phosphorus, can help to reduce dollar spot, so it is important to maintain a balanced N-P-K fertility program.

Raising mowing height is among the most effective cultural approaches to minimizing dollar spot injury. Rolling (no more than 3 times weekly) has been shown to reduce dollar spot, whereas wear from turning mowers can increase dollar spot. Thatch layers and soil compaction long have been recognized to promote disease. **Hence, core cultivation to alleviate soil compaction and to control thatch should assist in reducing dollar spot.**

Avoid light and frequent irrigation, especially when programming overhead irrigation systems for nightly applications of water. When soils become too dry, irrigate deeply to the root zone depth during early morning hours. Irrigating between 5 A.M. and 8 A.M., when dew is present on leaves, does not extend the fungal infection period. Hence, where water use is restricted to the hours between sundown and sunup, predawn irrigation will not promote disease and will not violate local watering laws.

Avoid using highly susceptible turfgrass cultivars, such as Crenshaw or SR 1020, for fairways, where the most acres of turf are maintained on golf courses. According to the 1994–1997 bentgrass NTEP trials, L93, Pennlinks, Providence, and Pennncross ranked high in dollar spot resistance.

Chemical Management. The fungicides commonly used for dollar spot control are shown in Table 1. Except for Daconil® (chlorothalonil), all are penetrants representing three different chemical classes each with different modes-of-action: (a) sterol inhibitor/dimethylene inhibitor (SI/DMI), (b) thiophanate, and (c) dicarboximide. Tank mixing a fungicide with 0.1 and 0.125 lb nitrogen per 1000 ft² (5–6 kg N/ha) from urea is associated with improved dollar spot control. The nitrogen stimulates growth, en-

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abling plants to produce shoot tissue faster than the fungus can cause disease, and helps to speed recovery of injured plants.

When targeting dollar spot, it is important to rotate fungicides from each of the three classes. That is, there is no advantage to rotating Banner MAXX[®], Bayleton[®], Eagle[®], or other SI/DMI fungicides. Rotating fungicides with different modes-of-action helps to delay the possible selection of resistant biotypes of the dollar spot pathogen. Because there has never been a report of an *S. homoeocarpa*-resistant biotype of Daconil[®], it is especially important to use Daconil as a tank-mix partner with one of the penetrants or to just rotate it into the spray program often.

Loss of good residual dollar spot control with any particular fungicide does not necessarily mean resistance is developing. The overuse of materials within the same chemical class can result in enhanced microbial degradation. That is, **continuous use of fungicides from within any of the three classes listed could give rise to a buildup of bacteria that use fungicides in that class as an energy source. This results in a more rapid degradation of fungicides, thus reducing their residual effectiveness.** Another common reason for poor residual control is using low water dilutions for spraying. Ideally, fungicides should be applied in at least 90 gallons of water per acre and sprayed through nozzles that will atomize the droplets. There is a trend to water-in fungicides. It is important to note, however, that **there are few if any studies that have shown a benefit from watering-in fungicides for dollar spot control.** For all we know, you may be losing efficacy by watering-in certain products. Daconil[®], because it is a contact fungicide that provides disease control on leaf and sheath surfaces only, should never be watered-in.

Fungicides like ProStar[®] (flutalonil) and Heritage[®] (azoxystrobin) have no activity on dollar spot, and some studies have shown that they can occasionally encourage dollar spot. Research has shown, however, that tank-mixing ProStar[®] or Heritage[®] with either Banner MAXX[®] (propiconazole), Bayleton[®] (triadimefon) and other sterol-inhibitors helps to ensure that dollar spot is not encouraged, nor will dollar spot rebound once the effects of the Banner MAXX[®] or Bayleton[®] dissipate. There is, however, no established link between dollar spot outbreaks and the now common use of the plant growth regulators Primo[®] (trinexapac-ethyl), Scotts TGR/Turf Enhancer[®] (paclobutrazol), or Cutless[®] (flurprimidol). In fact, **Primo[®] has**

been shown to enhance the residual effectiveness of some fungicides, and TGR and Cutless actually have fungicidal activity that reduces the severity of dollar spot.


Ultimately, effective dollar spot suppression is going to involve combining those cultural practices that are known to suppress dollar spot into any fungicide program. In particular, nitrogen should be added to the spray tank (i.e., 0.1–0.125 lb N/1000 ft² from a water-soluble N-source like urea) each time a fungicide is applied for dollar spot control. It is important to mow early in the morning to speed drying of the turf. **Fungicide-treated turf, however, should not be mowed for at least 24 hours after spraying.** Obviously, removal of plant tissues containing fungicides dilutes the total concentration of the product. This is why **using plant growth regulators to reduce mowing frequency can sometimes help to extend residual effectiveness of certain fungicides.** Returning clippings is helpful if they do not interfere with play, because they help to recycle nitrogen and other nutrients. **Avoid frequent night irrigation.** There is an overuse of the overhead irrigation system by some superintendents, and bentgrass fairways in particular should be kept on the dry side through the summer. Core cultivation, topdressing, vertical cutting, and other cultural practices that help reduce thatch and alleviate soil compaction are important to the overall health and playability of golf turf. These cultural practices, however, are best performed during disease-free periods when the bentgrass is actively growing. **Try to minimize wear damage by skipping perimeter mowing one or two days a week.** Avoid other types of mechanical injury (i.e., topdressing, brushing, etc.) during periods when dollar spot is active and bentgrass is not growing vigorously. 

Table 1. Fungicides for dollar spot control.

SI/DMI	Thiophanates
Banner MAXX	CL 3336
Bayleton	Fungo
Eagle	Dicarboximides
Lynx*	Chipco 26GT
Rubigan	Curalan/Vorlan/Touche
Sentinel**	Other
Triton*	Daconil

* Currently not available; registration expected in 2000 or 2001.

** After existing supplies are sold, Sentinel will no longer be available for use on turfgrasses.