Cultural controls:

How to minimize leaf spot and melting-out damage

by Dr. Eric B. Nelson

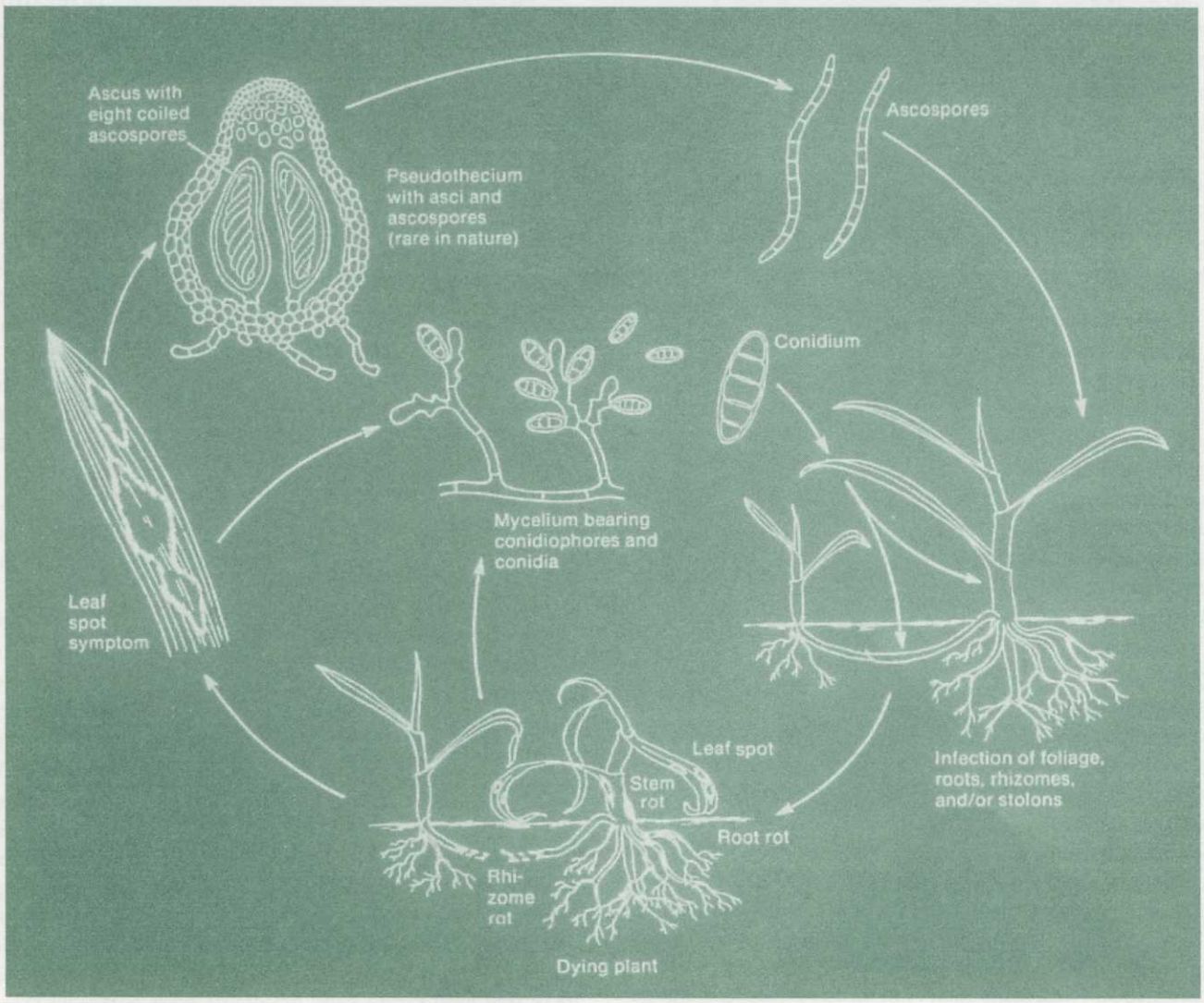
Cultural control practices, for just about any turfgrass disease, are based on a thorough knowledge of the disease cycle of the causative pathogen. A particular practice may be aimed at reducing the spore production by the fungus or it may be targeted at reducing the germination of the fungal spores. Alternatively, a practice may indirectly affect the growth of the fungus inside the plant or affect the response of the plant to the infection by affecting the overall health and vigor of the turfgrass plants. Regardless of how cultural control practices work, an understanding of the disease cycle of the pathogen is critical.

The leaf spot diseases of cool-season turfgrasses, caused by the fungal species *Dreschlera* and *Pyrenophora*, exhibit a characteristic disease cycle. (See figure above.) The pathogens survive either in infected turfgrass plants or in thatch as ascospores, as is the case for *Pyrenophora*-species caused diseases, or, in the case of *Dreschlera* species, as conidia and mycelium. These fungi are also seed-borne where they can survive quite readily and be inadvertently introduced into uninfected sites.

The cycle begins in spring

In the spring, as turfgrass plants emerge from dormancy and winds and rain are frequent, ascospores or conidia can be readily dispersed to adjacent healthy plants. As mowing begins, the dispersal of infected leaf blades will also disseminate the pathogen.

Once the spores land on susceptible leaf blade tissue, they can quickly germinate and penetrate the cuticle of the leaf. At this stage it is critical for the fungus that plenty of water be available on the leaf surface, as, without water,



Dreschlera and *Pyrenophora* disease cycle

conidia and ascospores fail to germinate. Once germinated, an emerging germ tube will penetrate the leaf blade cuticle and inject fungal matter and begin the process of killing cells. After enough cells have been killed, symptoms of the disease, characteristic lesions on the leaf, will appear. As more and more cells die, the lesions become larger. At this point, under conditions that are not completely understood, the fungus produces a new "crop" of conidia or propagation structures. These can then be spread by the action of wind, water, and clippings dispersal to susceptible plants, where, under the right conditions, spores can germinate and begin the cycle all over again. Later in the season, in the case of the *Pyrenophora* pathogen, ascospores will form and survive on infected plant tissues over the winter months.

Successful cultural management of these diseases requires not only an understanding of the disease cycle, but an understanding of the factors that contribute to each of the cycles steps. Once these factors are known then managers can manage their turf sites to minimize these factors.

Leaf spot ratings of Kentucky bluegrass cultivars from the 1990 National Turf Evaluation Program

Variety	Mean Rank	Percent Increase in Resistance
Blacksburg	8.3	830
Cobalt	7.7	770
Touchdown	5.3	530
Merit	4.3	430
Baron	4.0	400
Kenblue	1.7	170
S.D. Certified	1.0	0

S.D. Certified and Kenblue, both common varieties, show very little resistance to leaf spotting diseases. Touchdown, Merit, and Baron, a group of older hybrids, show substantially improved resistance when compared to the common varieties. The newest hybrid varieties, Blacksburg and Cobalt, show improvements in leaf spot resistance that exceeds the older hybrids almost by a factor of one.

Water controls spore germination and plant infection

Clearly, water availability is the most important factor controlling spore production, germination, and successful infection of susceptible plant varieties by species of *Dreschlera* and *Pyrenophora*. Many of these fungal species require leaf wetness periods of from 24 to 72 hours before spores residing on the leaf surface will germinate. So cultural control practices that reduce the period of leaf wetness can have a significant effect on disease expression. Such practices as selectively removing trees or shrubs to increase air flow and reduce turf canopy humidity levels will be beneficial. This selective removal can be used to increase light penetration and duration at shaded locations. Sites with high light levels consistently have fewer problems with leaf spotting pathogens. The use of wetting agents, applied to leaf surfaces to help water movement through resistant soil profiles, has shown some success. Reports from Kansas have indicated that wetting agents can play a significant role in reducing *Pythium* blight occurrences. At selected sites, during times of optimal conditions for disease infection, fans or blowers have been used to dry leaf surfaces.

Not only how much water is available, but the way in which water is applied to an infected site can play a role in the ultimate expression of disease symptoms. Irrigation can also be an important way in which *Dreschlera* and *Pyrenophora* spores are disseminated. That is because the splashing action of water droplets dislodges spores from the body of the fungus. Suspending irrigation during periods of maximum spore development or limiting irrigation to no more than that required to keep the plants from suffering from moisture stress can help. Applying wetting agents to the leaf surfaces through the irrigation system may reduce the surface tension of the droplets so that dispersal of spores is reduced. Wetting agents will reduce the runoff from saturated soils and therefore prevent spores from moving to uninfected areas. Cultural practice that will reduce leaf

wetness and water splash will reduce spore germination and dispersal and thus reduce the disease severity as will strategies to reduce winds across a disease-prone turfgrass site.

Plainly, any water management strategy that has the potential to reduce leaf wetness to less than the time required by the infecting pathogen to enter plant tissues should be considered or tried. The efficacy of the various water management cultural practices at reducing disease incidence will be subject to site specifics, including the availability of susceptible turf species, as well as how diligently these practices are followed and the consistency with which they are applied.

Reduced air flow, proper mowing helps

Other cultural practices that may show some success include reducing air flow over affected sites. Altering the landscape on the windward side of a chronically infected site can reduce the amount of spore dispersion. This can be accomplished by planting a vegetation wind screen, or a fence, or changing the topography of the site to reduce air flow. However, these kinds of changes should be carefully considered so as not to increase leaf wetness at the site.

Water and wind affect the germination and the dissemination of spores, but mowing practices even more influence the severity of leaf spot diseases. Dispersing the pathogen's spores by failing to collect infected clippings plays a very large role in the spreading of this disease from one area to another.

Not only mowing clipping dispersal but equipment and human traffic will spread spores. So, managing clipping disposal and prudent traffic restrictions in small infected areas can dramatically reduce disease expression over large areas.

Improper mowing may greatly stress plants by making them more susceptible to infection. Close mowing of Kentucky bluegrass and fine fescues, in particular, greatly increases leaf spot and net blotch severity on susceptible cultivars. Maintaining mowing heights at two inches or higher and supplying adequate fertilizer during periods of optimum fungal growth will greatly reduce the severity of these symptoms. Closely mowed turf often exhibits the telltale signs of leaf spot infections because the characteristic lesions exist on a leaf tissue surface that may be as little as 10% of the available tissue of higher-cut plants.

Role of fertilization practices are not clear

There is some controversy about the relationship of fertilization practices and the severity of *Dreschlera* and *Pyrenophora* leaf spot diseases. A New Jersey study found that Kentucky bluegrass maintained under a high fertilization program suffered less leaf spot damage from *Dreschlera poae* in the spring than that maintained on a moderate to low fertilization program. On the other hand, increased fertilization from the wrong nutrient can result in increased root damage and higher incidences of the melting-out symptoms on infected turf. Other studies, however, have shown that high nitrogen fertilization will enhance the severity of *D. poae* leaf spot symptoms.

In yet other studies, nitrogen applications were not shown to influence leaf spot on perennial ryegrass caused by *Pyrenophora dictyoides*, but did greatly enhance leaf spot caused by *Dreschlera siccans*. Still, results of other studies contradict those results. Nitrogen fertilization is the nutrient component that has produced the controversy. Potassium and phosphorus applications have not had any significant effect on leaf spot severity.

Leaf sugar contents may hold the key

For other leaf spotting pathogens of turfgrasses, such *Cochliobolus sativus*, a clear relationship between the above fertilization factors and disease severity has been established. The discrepancies between some of these studies may lie in the differences in leaf sugar contents. Generally, the lower the leaf sugar content, the greater the severity of melting-out. Studies have shown that mowing Kentucky bluegrass turf at one inch and maintaining it in shade results in a lower leaf sugar content and higher disease incidence than turf maintained at two inches in full sun.

Improved varieties may help

Whatever the cause may be, further work is necessary to clarify this relationship between the *Dreschlera* and *Pyrenophora* diseases and their plant hosts. As a rule, infections of nearly all of the leaf-spotting diseases on turfgrasses can be effectively managed using appropriate cultural control practices coupled with the use of improved disease-tolerant cool-season turf cultivars. An examination of the table on page 8, first published in the Sept./Oct. 1992 *Turf Grass Trends* will illustrate this point.

The successful introduction, in whole or in part, of any of the latest generations of hybrid Kentucky bluegrass cultivars into sites where cultural practices alone have not been able to control disease symptoms, should go a long way to eliminating the *Dreschlera* and *Pyrenophora* diseases as major disease pests at that site. Additionally, the introduction of resistant perennial ryegrass species into 100% Kentucky bluegrass stands can help by reducing the actual leaf count of vulnerable plant cultivars, thereby reducing the potential for disease spread.

Cultural control practices should always be the first line of defense in combating the *Dreschlera* and *Pyrenophora* diseases. The proper employment of cultural control practices, in the overall management of a site, along with the implementation of best possible management strategies, can be designed to minimize the stresses on prized turfgrass stands. This will go a long way toward eliminating leaf spot diseases without having to resort to costly fungicide applications. ■