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Turf Grass TRENDS

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Dreschlera and Pyrenophora: leaf-spotting diseases

by Dr. Eric B. Nelson

The names of the agents of leaf-spotting diseases have changed over the years but the diseases themselves remain among the more serious: leaf-, crown-, and root-rotting diseases affecting cool-season turfgrasses world-wide. Among the most important diseases caused by members of this group are: "leaf spotting" and "melting out" of Kentucky bluegrass caused by *Dreschlera poae*. There are also: "leaf spot," "leaf blight" and "foot rot" of perennial ryegrass caused by *Dreschlera siccans*. Finally, "net blotch" and "leaf blight" of perennial ryegrass and tall fescue are caused by

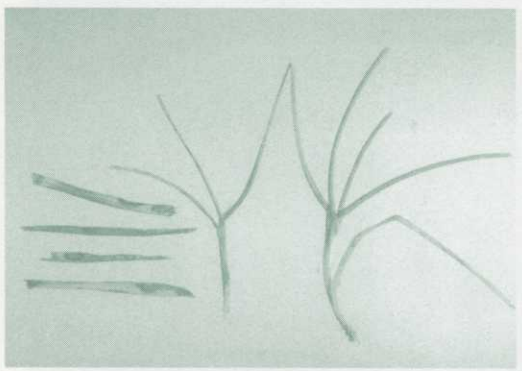

Photo provided by Dr. Eric B. Nelson, Cornell University
Leaf spot on Kentucky bluegrass

Pyrenophora dictyoides, and "red leaf spot" of creeping bentgrass is caused by *Pyrenophora erythrospila*. (See Table 1 on page 2.)

These diseases, caused by the important fungal genera *Dreschlera* and *Pyrenophora*, were previously known as the 'Helminthosporium' diseases of turfgrasses. The *Dreschlera* and *Pyrenophora* species share nearly all of the same identifying characters used by taxonomists to distinguish between fungal species. So many characteristics, in fact, that some species of *Pyrenophora* were formerly misclassified as *Dreschlera* species. The main difference between the two genera is that species of *Pyrenophora* possess reproductive properties not found in *Dreschlera.*

All these pathogens share the common properties of requiring prolonged leaf wetness and cool temperatures for infection. Only *D. erythrospila* and *D. gigantea* require warm temperatures for optimum disease development. Additionally, all of these pathogens can infect leaf, crown, and root tissues, depending on how advanced the disease becomes and on environmental conditions.

Despite expressing themselves as multiple diseases across the spectrum of cool-season turfgrass species, many of the *Dreschlera* and *Pyrenophora* species will only infect specific turfgrass species. Although symptoms are quite similar, regardless of the grass species infected, subtle differences do exist in disease expression

Photo provided by Dr. Eric B. Nelson, Cornell University
Leaf spot on Kentucky bluegrass

that often allow for accurate field diagnoses. However, the only definitive diagnosis of diseases caused by these pathogens is by microscopic observation and comparison of the sizes and shapes of the spores produced on and in leaf, crown, rhizome, and root lesions. Various aspects of each of the most important diseases are detailed below.

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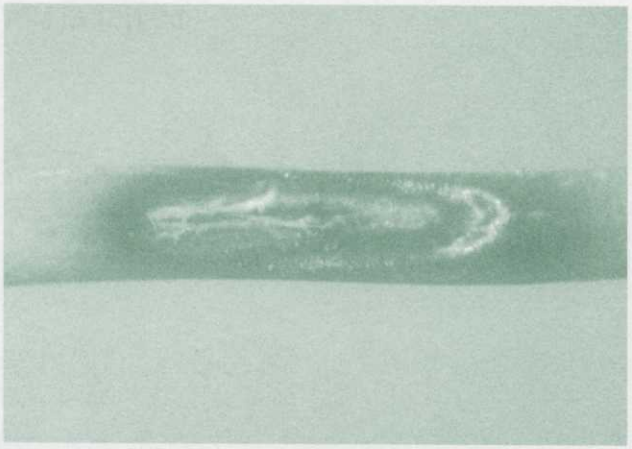


Photo provided by Dr. Eric B. Nelson, Cornell University

Leaf spot on Kentucky bluegrass

Leaf spot and melting-out of Kentucky bluegrass

The symptoms: The most conspicuous leaf-spotting symptoms of this disease can be found in the early spring through early summer and in the autumn through early winter. The margins of the small (about 1 mm diameter) lesions appear purplish-black to reddish-brown with white to tan centers. See photos on page 1.) As the lesions increase in size and number, usually along the longitudinal axis of the leaf, the leaf blades begin to yellow then gradually become extensively blighted. As the disease progresses, the crowns, roots, and finally the rhizomes become infected, resulting in a blackish to reddish-brown appearance on the rotted tissues. (See adjacent photos.)

Once root and crown infections occur, large areas of turf may rapidly die in a patch-like pattern. This phase of the disease is known as the "melting out". Melting out is generally more common when previously infected plants are stressed during warm, dry periods or in extensive periods of leaf wetness following warm, dry periods. It is during this phase of the disease that severe wilting and foliage drop can occur. In highly symptomatic turfgrass areas, particularly on closely-mown turf, symptoms may appear as small discolored patches, where leaf and stem lesions are more

Photo provided by Dr. Eric B. Nelson, Cornell University

Melting-out symtoms on Kentucky bluegrass

Table 1

Diseases caused by *Dreschlera* and *Pyrenophora* in cool-season turfgrasses

Pathogen	Host turfgrass	Seedborne	Disease
Dreschlera species			
D. biseptata	Fescues	No	Leaf spot
D. catenaria	All cool-season grasses	Yes	Leaf blight, Crown rot
D. dematioidea	Bentgrasses	Yes	Leaf spot
D. fugax	Bentgrasses	No	Leaf mold
D. gigantea	Bentgrasses	No	Zonate leaf spot
D. noblea	Ryegrasses	Yes	Leaf spot
D. poae	Bluegrasses	No	Leaf spot, Melting-out
D. siccans	Ryegrasses, Fescues	Yes	Brown blight, Foot rot
D. triseptata	Bentgrasses	No	Leaf spot
Pyrenophora species			
P. dictyoides	Ryegrasses, Fescues	Yes	Net blotch, Leaf blight
P. erythrospila	Bentgrasses	Yes	Red leaf spot, Leaf blight
P. tritici-repens	Bentgrasses	Yes	Leaf spot, Leaf blight

readily apparent.

The pathogen: The causal agent of this wide spread disease is *Dreschlera poae.* This and other species of *Dreschlera* are characterized by the production of abundant dark-brown multi-cellular spores called conidia within

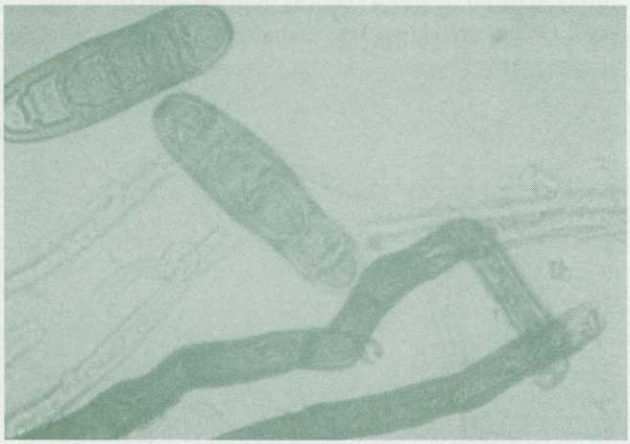


Photo provided by Dr. Eric B. Nelson, Cornell University

Dreschlera conidia

leaf lesions and on other diseased tissues. (See photo above.) These conidia are the primary means of plant infection early in the spring, when each of the 4-5 cells of the conidium can germinate and infect susceptible tissues if the surfaces of the leaves remain wet for prolonged periods. Once formed, these conidia are easily spread by wind, rain, irrigation, traffic or grass clippings.

Under optimal wet, cool and humid conditions, the conidia can germinate on a susceptible grass blade within a matter of minutes while successful infection of the plant tissues generally requires at least 10 hours. Germinated conidia give rise to dark-brown mycelium easily observed with a microscopic examination of infected plant tissues.

Disease development: The pathogen is commonly seed-borne on susceptible Kentucky bluegrass varieties. Nearly all infected seeds give rise to infected plants. The fungus will also grow on dead and decaying leaves and in thatch layers where abundant conidia may be produced. Under moist, cool (50 - 60 F), overcast or foggy conditions, typical of early spring or in shaded areas of a turf site where leaf wetness is a consistent problem, infection levels are often highest leading to most of the leaf destruction that occurs. In large areas of severely-infected plants, the turf may appear yellow to brown by early to mid April.

The disease quickly progresses from the leaf sheaths and leaves to the crowns and rhizomes. Conidial dispersal begins as soon as leaves begin to grow and with the first mowing. Peak conidial release generally coincides with the periods of maximum number of leaf spotting lesions, since each lesion is where the new batch of conidia are produced. Mowing has been shown to be of primary importance in the dispersal of conidia, either by movement on equipment and operators or by dispersal of the clippings over areas of uninfected turf. Strong air movements will dislodge conidia from lesions and blow them to adjacent areas. Rain and irrigation will also spread conidia from an infected area to adjacent healthy turfgrass by splashing of water droplets.

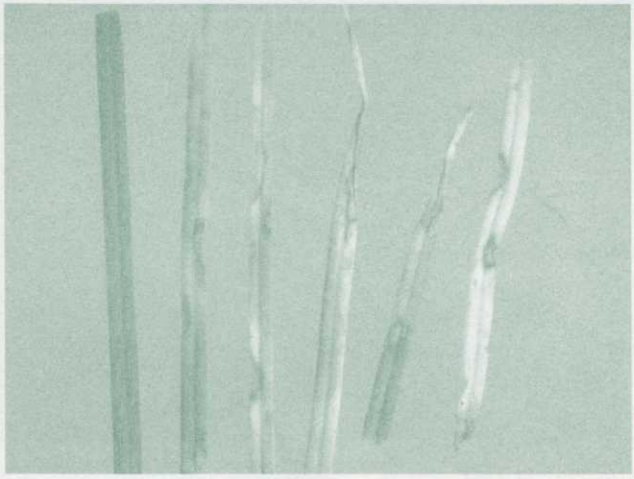


Photo provided by Dr. Eric B. Nelson, Cornell University

Leaf blade chlorosis and lesions on perennial ryegrass

A number of cultural factors may further intensify symptoms. Maintaining infected turf at a short cutting height enhances both the leaf spot and melting-out symptoms of the disease since the shortened leaf blade will show symptoms faster than taller-cut turf. Over-fertilization causing rapid leaf cell elongation will increase both the leaf-spotting and melting-out phases of the disease by making the elongated cells more vulnerable to the infection process. Applications of sterol-inhibiting fungicides, like Bayleton, and growth stimulating hormonal type herbicides, like 2,4-D, will often exacerbate symptoms.

Table 2

Kentucky bluegrass varieties with resistance to *Dreschlera poae.*

Excellent to very good resistance	**Good to moderate resistance**
Able 1	Adelphi
Bonnieblue	America
Blacksburg	Aspen
Bristol	Banff
Challenger	Baron
Chateau	Estate
Columbia	Fylking
Eclipse	Glade
Emmundi	Merit
Midnight	Mystic
Nassau	Touchdown
Princeton	

Control:

- Maintain balanced fertility. Avoid over-stimulation of early growth in the spring when maximum spore production and dispersal increase the chances of plant infection. Use dormant fertilization practices and slow release fertilizers or supplemental iron applications in lieu of nitrogen fertilizers.
- Avoiding irrigation late in the day. Morning irrigation allows the turfgrass canopy to dry during the day, thus reducing the time the leaves remain wet which, in turn, will reduce the the successful infection of plant tissues by germinated conidia.
- Modify the surrounding landscape to increase the air movement, lower the humidity, and reduce the amount of shade.
- Maintain optimum mowing heights for the cultivar of choice. Kentucky bluegrass and fine fescue turf used on home lawns should be maintained at a 2-3 inch mowing height.
- Avoid the overuse of sterol-inhibiting fungicides and hormonal herbicides when symptoms are apparent.

Photo provided by Dr. Eric B. Nelson, Cornell University

Melting-out symptoms on perennial ryegrass

- Maintain thatch layer at one-half inch or less. If mechanical thatch removal is warranted, it should not be done during maximum infection periods.
- Many Kentucky bluegrass cultivars have been bred for resistance to this disease. (See Table 2 on page 3.) These cultivars should be used whenever possible.
- As a last resort, apply contact fungicides such as chlorothalonil, mancozeb, or iprodione to reduce symptoms and sporulation of the fungus.

Brown blight and foot rot of perennial ryegrass

Symptoms: Historically, this disease has been considered of minor importance. However, increases in the incidence of this disease have accompanied the rapid increases in the use of perennial ryegrass on golf courses and on home lawns in the last 15 years. Because this has only become a significant disease lately, little research has been done on this disease in turfgrasses to date.

Symptoms typically appear in the spring and in the autumn months. Leaves of perennial ryegrass may be infected in the seedling stage as they develop from infected seed. On mature plants, leaves may become infected as they

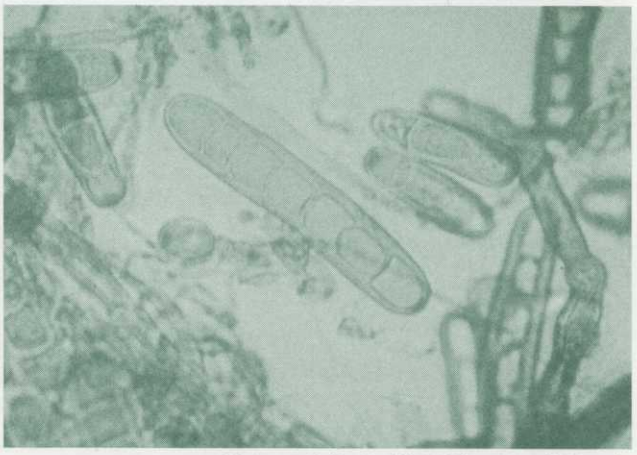


Photo provided by Dr. Eric B. Nelson, Cornell University

Dreshlera siccans conidia

emerge from sheaths in the early spring. Leaf spots, with grayish-white centers and a brown border, will develop on leaf blades, often causing a leaf blade chlorosis adjacent to the lesion. (See photo on page 3, right.) Under excessively wet conditions, entire tillers may be killed.

Multiple infections of leaves may occur resulting in massive numbers of small chocolate-brown spots which may become so numerous that the entire blade becomes chlorotic and is killed. As the disease progresses, melting-out-like symptoms become evident. (See photo on left.) In the autumn, lesions may develop as longitudinal brown streaks on the leaf blades up to 0.25 inches in length.

Table 3

Perennial Ryegrass varieties resistant to *Dreschlera siccans* and *Pyrenophora dictyoides*

Excellent to very good	**Good to moderate**
Blazer	AllStar
Dasher II	Citation II
Derby	Commander
Manhattan II	Fiesta II
Omega II	Pennant
Ranger	Premier
Repell	Runaway
Riviera	Saturn
SR 4100	SR 4000
Yorktown II	

Occasionally, under a severe infection, crown rot symptoms may be evident. Crowns may develop a purplish-brownish appearance and plants may rapidly wilt and die under heat stress.

The pathogen: The causal agent of brown blight of perennial ryegrass is *Dreschlera siccans*. Unlike *D. poae,* conidia of this species are not the typical dark brown color of the many other *Dreschlera* species, but range from colorless to an olive color when immature, developing a golden-brown color when mature. (See photo on page 4, right.) Like *D. poae*, these conidia are the primary means of plant infection early in the spring, when each of the 5-7 cells of the conidium can germinate and infect susceptible tissues if the surfaces of the leaves remain wet for at least 48 hours.

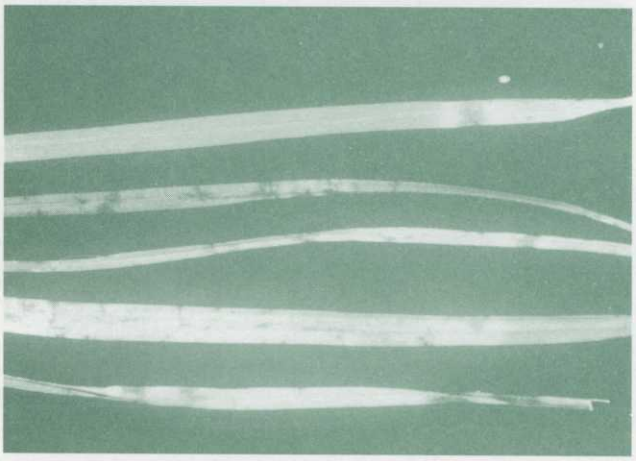


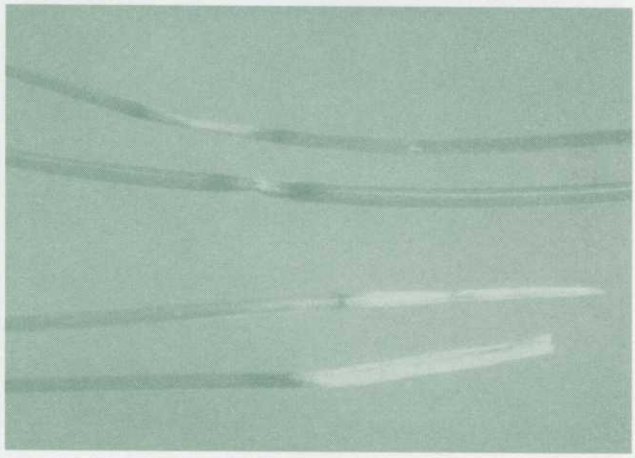
Photo provided by Dr. Eric B. Nelson, Cornell University

Net blotch on perennial ryegrass

Like *D. poae, D. siccans* is proficient at surviving and sporulating in thatch as well as on infected plant tissue. Conidia may be dispersed by wind, rain, irrigation, traffic and grass clippings, just as other *Dreschlera* species do. Furthermore, under optimal wet, humid conditions, conidia can germinate rapidly on a susceptible grass blade. Germinated conidia give rise to a chestnut-brown mycelium easily observed with a microscopic examination of infected plant tissues.

Disease development and control: Although the disease may be transmitted by infected seed, resulting in seed rots and seedling blights, the major means of dissemination in mature turf is by means of splashing water and wind. High relative humidity greatly facilitates the spread of the pathogen in the turfgrass canopy. In some cases, nitrogen application may enhance the severity of symptoms on perennial ryegrass. However, there are conflicting reports on the role of nitrogen fertilization on disease development.

The same control measures for *D. poae* on Kentucky bluegrass are effective for *D. siccans* on perennial ryegrass. Additionally, a number of perennial ryegrass cultivars are resistant to the disease. (See Table 3 on page 4.)



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Net blotch on fescue leaves

Net blotch of fine fescue, tall fescue and perennial ryegrass

Symptoms: Net blotch is one of the more common diseases of fine fescue, tall fescue, and perennial ryegrass in the United States. On fine fescues, leaf lesions initially appear during cool, wet weather as small reddish-brown spots that quickly girdle the leaf blade. This results in a yellowing of the leaf blade and a tip die-back. Small brown patches may appear in fine fescue turfs, and occasionally, a melting-out can occur when crowns and roots also become infected. On tall fescues and perennial rye grasses, lesions initially appear as small brown spots with yellow margins. (See photos above.)

As these spots coalesce, they take on the appearance of a fine network of brown streaks

Table 4

Fine fescue varieties resistant to *Pyrenophora dictyoides*

Chewings fescues	**Hard fescues**
Agram	Aurora
Checker	Biljart
Enjoy	Reliant
Jamestown	Scaldis
Longfellow	Spartan
	SR 3000
	Waldina
Creeping red	**Sheep fescue**
None	Bighorn

running both parallel and perpendicular to the leaf axis. This network of streaks eventually coalesces to form brown leaf spots. Blades show a progressive death from the tips.

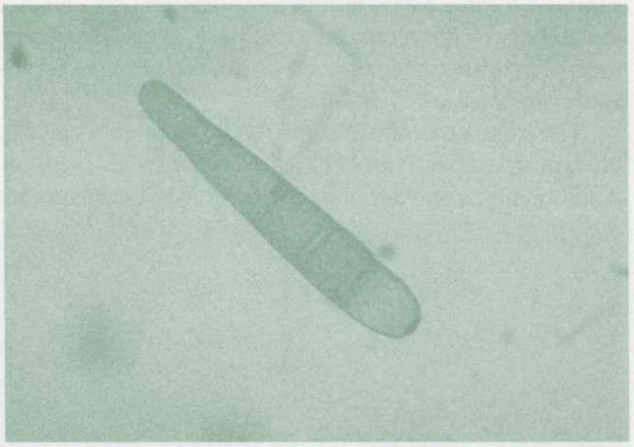

Photo provided by Dr. Eric B. Nelson, Cornell University

Pyrenophora dictyoides conidia

Heavily infected turf may show crown rot symptoms with groups of plants dying in patches, similar to melting-out symptoms prevalent with the other leaf-spotting diseases.

The pathogen: Net blotch of all three grasses is caused by the pathogen, *Pyrenophora dictyoides*, formerly called *Dreschlera dictyoides.* Conidia of *P. dictyoides* are distinctly different from those of *D. poae* and *D. siccans,* both in color and shape. (See photo above.) Conidia may contain from 1-7 cells, each capable of germinating and infecting susceptible tissues independently of one another.

Disease development and control: *P. dictyoides* may initially infect plants from seed-borne inoculum, although the pathogen can be infrequently detected in routine germination tests and rarely does its presence reduce the ability

Photo provided by Dr. Eric B. Nelson, Cornell University

Leaf spot on bentgrass

of the seed to germinate. It appears that seed-borne inoculum of *P. dictyoides* serves to establish the pathogen in a particular site.

However, the environmental conditions prevalent at the time determine the ultimate expression and severity of this disease. The fungus can survive in both living and dying leaves on which conidia are formed all season long. As with other *Dreschlera* species, *P. dictyoides* can survive well in infected crowns and in thatch. Conidia produced in these sites are disseminated through the same mechanisms as the other leaf spotting pathogens. Leaf spot symptoms are

Photo provided by Dr. Eric B. Nelson, Cornell University

Red leaf spot on creeping bentgrass

suppressed during warm, dry weather when crown infections predominate. None of the perennial ryegrass or tall fescue cultivars have shown resistance to net blotch. There are, however, a limited number of resistant fine fescue varieties. (See Table 4 on page 5.) Other control measures for net blotch are the same as for *D. poae* on Kentucky bluegrass.

Red leaf spot of creeping bentgrass

Symptoms: Circular or oblong lesions, either brown or reddish-brown develop on *Agrostis* (bentgrass) leaves during wet, humid weather. But unlike the other *Dreschlera* and *Pyrenophora* species, symptoms are more evident in warm weather as opposed to cool weather. Large numbers of leaf lesions may give an overall reddish cast to the turf. Once leaves become girdled, they quickly wither and die, showing symptoms similar to drought stress or other root-rotting diseases. (See photos above.)

The pathogen: Several different fungal pathogens cause red leaf spot symptoms on bentgrasses. The primary pathogen is *Pyrenophora erythrospila.* However, *Dreschlera catenaria* also causes similar symptoms, more typically appearing as sunken reddish-brown patches of turf on golf course putting greens. The two fungi can be easily distinguished by the shapes of their conidia. The conidia of *P. erythrospila* are light grayish-brown and may contain 4-8 cells (See photo on page 11.), whereas conidia of *D. catenaria* are yellowish-brown and up to twice the length of *P. erythrospila* conidia.

Disease development and control: Red leaf spot is a warm, wet weather disease that usually does not appear until well into the summer months. Similar symptoms incited by *D. catenaria* are evident at somewhat cooler temperatures. Although both pathogens are seed-borne, the

Continued on page 11

those grass-infecting fungi that clearly didn't belong in the *Helminthosporium* genus, but had to be placed somewhere. Thus, *Helminthosporium vagans, H. siccans, H. dictyoides,* and *H. erythrospilum* became *Dreschlera poae, D. siccans, D. dictyoides,* and *D. erythrospila*, respectively.

Distinctions were made

The genus *Pyrenophora* was also well known at that time. It contained fungi that were placed there based on the morphology of their sexual reproductive structures. When the genus *Dreschlera* was created, it was known that there were associations between it and the genus *Pyrenophora,* but there were enough dissimilarities to keep it as a distinct genus. Furthermore, not all of the *Dreschlera s*pecies so classified produced sexual structures and, because of taxonomic custom, could thus not be properly classified as *Pyrenophora.* It wasn't until much later that the *Dreschlera* species such as *D. dactyoides, D. erythrospilum,* and *D. tritici-repentis,* among others, were reclassified as species of genus *Pyrenophora,* once the sexual reproductive structures were found or induced and compared with those of other species of *Pyrenophora.*

Classification arguments continue

To this day, taxonomists still argue about the classification of these as well as other fungi that are important pathogens of turfgrasses. In fact, the genus *Dreschlera* and the genus *Pyrenophora,* have not been accepted universally as the proper genus for the former grass-infecting, leaf-spotting *Helminthosporium* species. Nonetheless, the majority of plant pathologists accept this genus as an appropriate one for these fungi.

Are there effects on warm-season turf?

The reclassification of the *Helminthosporium* group of fungi may be important from a practical point of view. It turns out that all of the species of *Dreschlera* cause diseases only on cool-season grasses, unlike other genera split out of the original *Helminthosporium* grouping that can also cause diseases on warm-season grasses. This has definite repercussions from the turfgrass manager's point of view.

Warm-season turf managers will better understand this group of diseases so they can avoid using the management criteria commonly linked to the *Dreschlera* genus when devising their own control strategies. Additionally, because newer fungicides are designed to control a limited number of fungal pathogens, understanding which pathogen is causing a problem becomes very important.

Hopefully, the taxonomic placement of species of *Dreschlera* and *Pyrenophora* is stable for the future and turfgrass managers can spend their time doing what they do best: managing turf. However, we should not be surprised to find these fungi have undergone yet another name change by the next issue of *Turf Grass Trends.* ■

role of seed infections in disease development is unknown. Under severe disease conditions, roots and crowns are also infected, similar to disease caused by other related pathogens. Increased nitrogen fertilization will generally enhance the severity of red leaf spot. Most creeping bentgrass varieties are susceptible to red leaf spot. 'Toronto' creeping bentgrass is especially susceptible to *D. catenaria.* Other control measures are the same as for the other *Dreschlera* and *Pyrenophora* diseases.

Glazed looks

Although heavy doses of scientific names often lead to glazed looks in eyes of readers of articles like this, it is important that turfgrass managers have a good working knowledge of the various species that have been and still are causing a considerable amount of damage of turfgrass sites.

Often untreated infections by members of these fungal species leave the turf plants weakened and vulnerable to opportunistic summer diseases, ranging from "red thread" and "dollar spot" to "summer patch" and "brown patch".

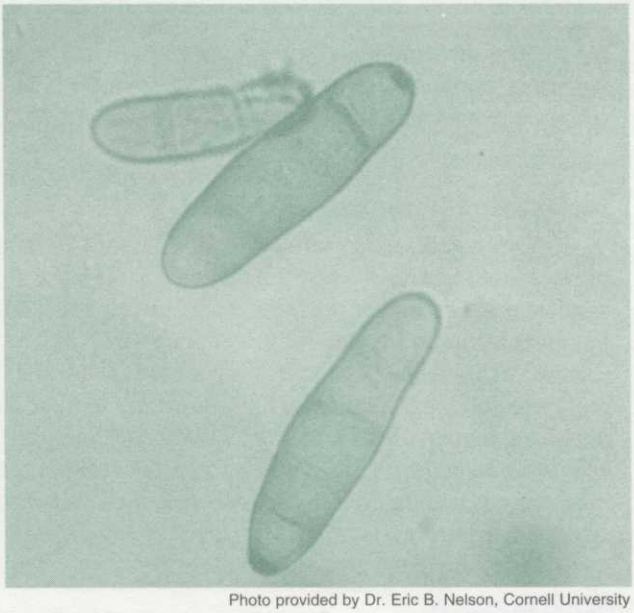

Photo provided by Dr. Eric B. Nelson, Cornell University

Conidia of *Pyrenophora erythrospila*

Understanding the biology and optimum growth periods of these fungi can lead to actions that preclude the appearance of the disease symptoms. The actions, particularly cultural practices, that reduce symptoms of the leaf spotting diseases often have beneficial carryover effects that produce substantially fewer summer diseases on the treated areas.

Success in managing these important diseases leads to a healthy, dense turf that is better able to withstand heat and drought stress, weed infestation and attacks by insects and other diseases. Failure to manage these diseases leaves the turfgrass manager in a hole that is often impossible to get out of. ■