

The Dry Look

Leaf wetness linked directly to several turf diseases

By Curtis E. Swift

Most of the fungal and bacterial turfgrass diseases that superintendents and grounds managers battle are known to be more serious under prolonged periods of leaf wetness.

Bacteria require a moist film on the leaf surface to increase their population and gain entrance to the leaf's interior through wounds and stomata (breathing pores). Fungal spores (most but not all) require this wet leaf surface to germinate and form the structures necessary to locate and enter stomata or otherwise forcibly penetrate the plant tissue. Some fungal-like organisms produce a motile spore that swims in this film of water entering plant tissue through stomata.

Once the pathogen enters the plant, infection and disease can result.

In addition to a wet leaf surface, if an addi-

tional energy source is available to the pathogen, the chance for disease increases. The most common energy source available to these pathogens consists of the sugars, starches and amino acids that ooze from glands called hydathodes onto the leaf surface during the evening and night hours. This exudate (guttation fluid) makes up only 25 percent of the dew that forms with the other 75 percent being condensation from the atmosphere. When turfgrass

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Dollar spot was controlled for many years by a hose dragged over golf greens or a bamboo pole used to knock the dew off the grass. Some turfgrass managers use this same technique today. Fiberglass has replaced bamboo as the pole of choice and, when done early in the morning, diseases can be prevented or at least reduced in severity. This procedure knocks guttation fluid off the leaf blade, thereby reducing the energy available to the disease pathogen.

Knocking the dew off the grass also hastens the drying of the grass, reducing the amount of time the pathogen has available for infection to take place.

Bacterial diseases increase in severity in direct relationship to the length of time the leaves are wet. Infection by bacterial pathogens is more severe under shade conditions than in nonshaded areas because of an increase in humidity within the turf canopy and the increase in the length of time the leaves remain wet.

Rusts (*Puccinia* spp.) and leaf spot fungi (*Bipolaris* and *Drechsler* spp.) are more severe in heavily shaded grasses than in areas



Patch diseases become more severe as duration of leaf wetness increases.

with full sun exposure. This is again because of the duration of leaf wetness.

Moisture on the foliage determines the production and survival of most fungal spores. As early as 1930, the incidence of brown patch, caused by *Rhizoctonia solani*, was shown to coincide with irrigation in the afternoon. The severity of this disease is known to increase when the length of leaf wetness extends beyond nine hours.

The longer the leaf surface is wet, the greater the risk of infection and the greater the number of infections per leaf. Minimal infection by this disease pathogen occurs when the duration of leaf wetness is below six hours; severe infections occur beyond eight to 10 hours.

Irrigation in the afternoon is directly associated with an increase in infection, especially when warm day temperatures are followed by cool night temperatures. When the turf does not dry out before nightfall, normal dew formation during the night hours extends the time the grass is wet. This increase in infection also may be because of an increase in guttation fluids that feed the pathogens.

Watering in late afternoon causes an increase in water pressure within the plant tissue resulting in more guttation fluid being exuded onto the leaf surface. More guttation fluid means a higher concentration of sugars, starches and amino acids available to the pathogen.

Gray leaf spot of perennial ryegrass and tall fescue caused by *Pyricularia grisea* is known to become more severe as the duration of wetness increases. Even patch diseases have been reported to increase in severity with prolonged periods of leaf wetness. The take-all patch organism (*Gaeumannomyces graminis*) is particularly sensitive to moisture fluctuations. Necrotic ring spot (*Leptosphaeria korrae*) also increases in severity with excessive moisture and frequent irrigations.

Curvularia (one of the Helminthosporiums) and the leaf blighting and crown rot phases of *Drechslera*-caused diseases are encouraged by extended periods of leaf wetness. Dollar spot requires an extended period of leaf wetness for its cobwebby structure to develop while *Ascochyta* leaf blight is controlled in part by diluting the concentration of sugars, starches and amino acids in the guttation fluid by irrigating turf in the early morning hours (prior to sunrise) when dew is present.

The powdery mildew fungi are exceptions

to the leaf wetness requirement, as they prefer high humidity without the film of moisture on the leaf surface for germination of spores and infection to occur.

While some turf diseases can become severe when the leaf surface is wet for as little as six hours, most of our turf diseases require 12 or more hours of moist foliage for a major disease outbreak to occur. The shorter the time the grass is wet, the less the disease problem.

If the turf is watered in the early evening hours or in the morning after the sun has risen but before the night dew has dried, the grass is wet for an extended period. This often results in infection.

Early to late evening is the worse time to irrigate as it wets the turfgrass plant and debris (thatch and mat), extending the normal leaf wetness period thus allowing foliar disease organisms to germinate and infect. Watering early in the evening also cools the grass, increasing guttation, which provides fungal organisms additional nutrients for growth. Watering early in the morning (prior to sunrise) dilutes the nutritional benefits of the dew, thereby reducing turf disease problems. It has also been suggested that wetting agents used to reduce leaf wetness may be of some benefit in the war against turf diseases.

Increasing airflow and improving site drainage, especially in humid or wet climates, may help shorten periods of leaf wetness, thereby reducing disease problems. Maintaining the turf at a reasonable height increases the opportunity for the grass to dry properly. Proper fertilization helps avoid succulent, disease susceptible tissue.

While all these factors are critical to disease management and usually well-understood, we often overlook the importance of managing the length of time the turf is wet. In addition, we frequently overlook the need to reduce the concentration of guttation fluid on the leaf surface. Turfgrass managers need to be very flexible when scheduling their irrigation to take advantage of reduced leaf wetness and the dilution of the energy sources found in guttation fluid.

Curtis Swift is an area extension agent at Colorado State University. His responsibilities include assisting owners of sod farms, superintendents and lawn care professionals with turf disease identification and management. He can be reached at Curtis.Swift@ColoState.edu.

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QUICK TIP

As you budget for 2005, make sure to plan for the management of stress on your greens, tees and fairways. In these days of high competition for play, it is not enough to survive, your turf needs to thrive. Emerald Isle Solutions from Milliken can play a major role in stress management. Check out www.milliken-turf.com for details.