

The role of irrigation in the control of turf diseases

Irrigating turf using KISSS sub-surface textile irrigation instead of sprinklers will help to reduce the incidence of most of the common turf diseases.

Two conditions must be satisfied before a disease can establish in turf:

1. Disease organisms must contact a susceptible host
2. Environmental conditions must favour infection either by lowering plant resistance to disease or by stimulating and supporting the pathogen.

There are more than 13 common diseases of turf, most are fungal. They include Dollar spot, Brown patch, Powdery mildew, *Fusarium*, *Pythium*, rusts and smuts.

Fungal diseases are spread from plant to plant in the air by wind and by contact and in water by droplet splash and surface flow. Water borne diseases may also be transmitted in contaminated irrigation water.

Disease organisms are almost always present in the environment but only become infectious when conditions are right. One reason for this is that the fungal spore must germinate on the leaf or stem surface before the fungus can penetrate the host. The time from germination to infection is a vulnerable stage for a fungus because it has limited energy reserves and because the hyphae have very thin walls and can easily desiccate. This is why free water on foliage and high humidity favour the development of turf diseases.

Grasses that are strong and healthy are more resistant to disease than turf weakened by shading, drought, high temperature, water logging or poor nutrition. These stresses can significantly reduce plant's capacity to suppress a pathogen that has invaded its tissue. When roots are damaged, sugars and other organic substances will leak into the surrounding soil. Not only does the damage remove a physical barrier to infection, these compounds also activate some pathogens. Those that have a motile stage such as *Pythium* will even follow the chemical scent to find the damaged roots.

With the exception of chemical use, irrigation is undoubtedly the most important controllable factor influencing disease development in turf.

Sprinkler irrigation

Sprinkler irrigation encourages infection of the above ground portion of the plant by wetting the foliage and by increasing humidity. The risk of disease is higher when turf is irrigated frequently particularly at a time of day or in weather conditions where the turf is slow to dry.

Sprinkler irrigation can also increase the risk of disease by water logging the soil. When soils are too wet, roots receive less oxygen because the water has displaced air from pores in the soil. If this condition persists for long enough, roots stop growing, become damaged and may die, increasing the opportunity for disease infection.

Water logging generally occurs in soils that drain slowly because of their fine texture or that drain incompletely because the porosity of the underlying soil

is dramatically different. In these soils, the volume of irrigation must be carefully controlled. This is very difficult when sprinklers are used because the poor uniformity of application means they must be run for long enough to wet the driest area.

Sprinklers also apply water to an area without regard to the natural variation in soil moisture, drainage rate or requirement for water. Wet areas receive as much and sometimes more water as dry areas.

Sprinkler irrigation assists disease spread by droplet splash from plant to plant and by causing contaminated water to flow over the soil surface.

KISSS Irrigation

Many of the problems of using sprinkler irrigation on turf are avoided when the KISSS system is used.

The KISSS system delivers water directly to the root zone and does not wet the foliage. The drier conditions are less conducive to germination of disease propagules and also to subsequent infection of plant shoots.

Special features of the system that distinguish it from more traditional subsurface drip also reduce the risk of tunnelling. Tunnelling is the effect where water from a buried emitter mines its way to the surface. Once formed,

water will appear as a puddle above the emitter within minutes of an irrigation commencing. The absence of free water on the soil surface above a KISSS line prevents disease organisms spreading by mass flow and droplet splash.

The KISSS system cannot waterlog the root zone because the soil above the system is wet by capillary action. This is where a thin film of water spreads by surface tension over soil particles. Capillary wetting will only completely fill and exclude air from the smallest pores in the soil. Consequently, even when fully wet, the root zone will never be more saturated than field capacity which means oxygen is rarely limiting.

The risk of water logging is further reduced because the KISSS system is an intelligent irrigation system. This means the distribution of water is influenced by soil moisture through a mechanism called moisture regulated water distribution (MRWD). The feature ensures that irrigation water flows preferentially to the driest regions of soil. This evens out differences in soil moisture within the irrigation field and helps to prevent over watering of wet areas of soil.

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