Management & Control of Turfgrass Diseases

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Pathogens are an integral part of all biological systems. Organisms are born, they mature, and eventually die. The influx of energy into a biological system determines how many total organisms can exist at any given time. And the relative numbers of different types of organisms are determined by their relative competitiveness. Some organisms, called parasites, prey upon or "pathogenize" live organisms. Saprophytes feed **upon dead tissues**, thereby conserving energy within the biological system. If this constant recycling of trapped energy does not occur the system will die from either lack of energy or congestion in the remains. It has been said that if it were not for fungi and bacteria, we would be knee-deep in our biological residues within a few years. With this in mind we must look upon turfgrass pathogens as a blessing rather than a curse. It is what we do with those pathogens that determines how severely we curse our turf.

Compare a natural perennial grass community (prairie) to a highly managed turfgrass community (lawn). (Figure 1). The undisturbed diversity of the natural community, together with limited nutrient and moisture inputs, allow the populations of different organisms to remain in balance. Birth rate equals death rate over a given period of time. The death of some organisms provide the raw materials for the birth and growth of other organisms. In the turfgrass community, however, there are sudden and dramatic inputs of nitrogen, water and pesticides. In addition the grass is in a stressful environment caused mainly by regular clipping. Any one of these provides an exaggerated advantage or disadvantage for some organisms. The results are sudden swings in population density of those organisms. Many times, the organism with an advantage is a fungus that outgrows all other organisms and feed excessively upon perennial grasses. To acerbate this imbalance, certain organisms are so sensitive to sudden changes in their environment that they die out completely. The ecological "niche" left vacant by their absence

Prairie Community	Turfgrass Community
vertebrates	
invertebrates	limited invertebrates
dicots	
monocots	one or two monocots
insects	limited insects
fungi	limited fungi
bacteria	bacteria
viruses	viruses

Figure 1 — RANGE OF BIOLOGICAL COMPONENTS

is quickly filled by other more aggressive organisms. This often adds fuel to the expansion rate of a disease. The end effect, in the absence of fungicide, is a disease epidemic in your lawn. Diversity is important to a natural biological system.

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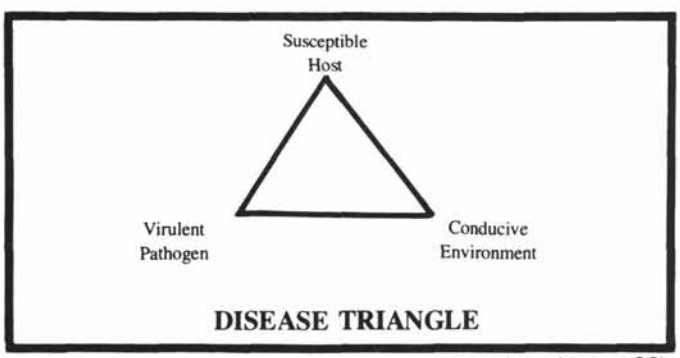
The Virulent Pathogen component cannot be eliminated from the soil short of soil-sterilization. Even then, the soil can be recontaminated. There has been renewed interest in the idea of "biological control" of pathogens by introducing antagonists to the pathogen. Some bacteria, (e.g. *Pesudomonas*) and fungi (e.g. *Trichoderma*) are being tested for their ability to pathogenize or compete with turfgrass pathogens. Perhaps someday you will be able to purchase bottled bacteria to "cure" a disease in your lawn.

Regarding the Susceptible Host component, it is possible in some cases to establish a turfgrass species, or cultivar within a species, that is tolerant to the presence of a pathogen. Additionally, if several species or cultivars within a species are growing in a community, the chances are low of a pathogen being virulent in all of them. The advance of a pathogen within this more diverse community is thereby inhibited. Finally, maximizing turfgrass health minimizes its susceptibility to disease, just as we are more resistant to catching a cold if we maintain our health.

Turfgrass health can be maximized with a high clipping height (2-4 inches), assuring oxygen to the roots with aerification, supplying enough moisture during drought, controlling nutrient release with low-analysis, slow-release fertilizer, and optimizing Cation Exchange Capacity with enougy clay and organic matter at a netrual pH.

The Conducive Environment component can be influenced by the turfgrass manager in avoiding excessive water or nitrogen release from irrigation or fast-release fertilizer, allowing free movement of air over the turf, syringing turf during periods of excessive daytime heat, and increasing sunlight in shaded areas.

Controlling Disease Means Eliminating the Symptoms — Remember, it is nearly impossible to eliminate the pathogen. We have at our disposal, however, an array of fungicides that are highly effective at stopping the advance of pathogens for limited periods of time. If the advance is halted, then the turfgrass has the opportunity to recover from the damage by growing new leaves and tillers. Thus the symptoms of the disease are grown over and eliminated. If a preventive approach is taken, regular applications of fungicide during periods when temperatures are conducive to disease will completely prevent disease symptoms from occurring. It is sitll a fact, today, that if you want "television turf" with perfect uniformity, fungicides and herbicides are necessary. If you can lower your standards and accept some disuniformity and species diversity, then management by the Disease Triangle approach is possible.



DISEASE TRIANGLE

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It increases the probability of some organism checking the proliferation of another organism. It must be remembered, therefore, that in the turfgrass community, there is forced uniformity with the elimination of weeds and insects and partial elimination of fungi by pesticides and inputs of fertilizer, water and mowing. Populations that would normally be in balance are being constantly disturbed. The buffering capacity, i.e., the ability of a system to maintain its species population stability with some components checking or encouraging the proliferation of other components, becomes limited. There is a lack of genetic variability in combination with lots of nutrients, lots of moisture, and succulent host plants. When the temperatures are ideal for the growth of a particular pathogen of turf without the proper fungicide applied ... bingo! You have a turfgrass disease.

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Managing Disease Means Managing the Pathogen —

A classic concept in pathology is the Disease Triangle. There are three components necessary for the occurrence of disease; a Susceptible Host, a Virulent Pathogen, and a Conducive Environment. All three components have to be present in order for a disease to occur. The presence of a virulent pathogen together with a susceptible host does not automatically mean there will be visual damage to the turf. An environment conducive to pathogen proliferation must be present.