WATER AND TURF DISEASES

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PLANT diseases have been a problem to man since the dawn of history, and there has been a constant effort to find methods of alleviating or preventing them. Blight and mildew were known in biblical times, and Aristotle described wheat rust in 350 B.C. During these early times the causes of disease were unknown and accordingly many superstitious explanations were offered. At least one of the explanations was that the diseases were caused by demons or angry gods inflicting punishment on the people. In order to frighten away the demons or appease the gods, complex rituals were performed or prayers were offered. This was somewhat like the witch doctor approach some backward nations still use for curing human disease, and it constitutes the first known attempts at plan disease control.

The following directions for plant disease control date back to 1790 and are a good example of some of the earlier experimentations in this field. Take one bushel of fresh cow dung, one-half bushel lime rubbish from old buildings, one-half bushel wood ashes, one-sixteenth bushel pit or river sand. The last three are to be sifted fine before they are mixed. Then work them together with a spade and afterwards with a wooden beater until the stuff is very smooth like fine plaster used on ceilings of rooms. The mixture was made to the proper consistency with soapsuds or wine; and after its application to the plant, it was dusted over with dry powder of wood ashes mixed with the sixth part of the same quantity of burnt bones.

Experiments with mixtures such as these were the forerunners of the successful experimentation that has resulted in modern controls for plant diseases. Extensive research has now given us chemical as well as cultural methods for combating turf diseases, but these principles and controls must be logically and systematically applied to be of value.

Since our discussion is primarily concerned with water's relationship to plant disease, I would like to define the word "disease" in such a way that it encompasses all detrimental effects of moisture to turf. This is using Webster's definition of disease rather loosely, but in many ways we may think of any condition which impairs health as being a disease.

For years the subject of altering the susceptibility of turfgrass to disease by manipulation of the water and fertility management programmes has interested pathologists and management specialists. Today, there are many opinions along these lines but few facts. There is certainly a great void in our knowledge of the relationship of water to plant disease and in most cases we are left to draw our own conclusions.

Water's Influence

Essentially, there are only three ways in which water can influence disease and affect turf. Our troubles come from either too much water, not enough water, or impurities in water. Again, this is treating our subject rather generally, but I believe we can give some specific examples which fall into each category.

First, we will consider overwatering as a major cause of unhealthy turf. This practice is found rather frequently on golf courses in spite of all that has been said and written about the subject.

Golfers sometimes get the idea that the more water that is applied to a green, the better it will hold a shot. This is neither good golf nor good greenkeeping. What actually occurs with many soils is that they become harder with the addition of excess water. The combination of water and traffic on the greens causes the soil to puddle on the surface, and there is a lack of oxygen in the root zone for the grass. Under

these conditions the turf cover is lost, and the soil is further compacted by the lack of a cushion of turf above it; and it becomes increasingly difficult to hold a shot on the green.

Also, a soggy condition of the turf aids disease development. The fungi which cause disease need abundant moisture for their best growth; and when the soil is kept saturated, they develop readily to cause turf injury. Watering is too often a routine rather than an effort to supply the needs of the grass. By watering on schedule rather than according to need we invite trouble from many sources.

Other Sources

Irrigation is not the only source of too much water, however; and rainfall, high humidity, dew and guttational water are closely related to disease incidence.

Rainfall gathers as many as 5 million organisms per square yard on the way to earth, and the figure for snow is even higher. Disease organisms are carried so well by raindrops and run-off water that the activity of disease can actually be closely correlated with annual rainfall in areas of similar climate. The higher the rainfall, the greater the disease activity.

Rain Often Aids Disease

Often the action of raindrops is the means by which certain spores are liberated. Rain in large drops or driven by wind breaks the disease spores from their stalks or from within an enclosed layer and sets them free.

Relative humidity acts in two ways. During periods of high relative humidity most disease organisms reproduce freely and are able to infect healthy plant tissue. On the other hand, low relative humidity can cause partial wilting of the host tissue in dry air and apparently aids the penetration of certain fungi.

Even though the air around us feels dry, the microclimate surrounding the grass may contain ideal moisture conditions for disease germination. This is sometimes accounted for by dew or the guttation from grass leaves. Many diseases also tend to be autocatalytic in that a certain amount of moisture is produced by the decomposition of the spent disease organisms to provide moisture for new ones.

Early Morning

Watering in the early morning is considered best for dispersing dews and allowing the grass leaves to remain dry as much as possible. Threshing the greens with a limber bamboo pole or dragging a clean water hose across the green surface also helps to disperse dew and moisture otherwise collected on grass leaves.

Another common malady of grass caused by excess water is scald. This condition may or may not be accompanied by disease organisms, and its real cause is somewhat questionable. All too often the term "scald" is used as a "catch all" classification to describe any unidentified turf injury. It is doubtful that grass is ever actually scalded by water that has been overheated by the sun's rays; but we do know that when oxygen is excluded from the soil by overwatering, plants take on a scalded appearance. Low oxygen supply leads to impermeability of the cell walls in

roots and they are no longer able to absorb water in proper quantities. This leads to a moisture deficit in the plant and causes the plant to wilt even though it may be in water.

Because most people fail to associate a wet soil with a lack of moisture in the plant, the condition is not recognised as wilt and is called scald.

Weakness

A lack of water may be associated with turf disease in that it weakens the plant, making it all the more susceptible to disease organisms. A good example of this is the Curvularia sp. organisms which usually attack only plants that have first been weakened by adverse environmental conditions.

Fairy ring is a different type of disease which actually denies moisture to the grass. A very dense mass of fungus filaments called the mycelium are produced in a circular pattern in the soil. Because of this dense mycelium, which acts very much like compressed felt in its ability to absorb moisture, the soil cannot be properly wetted by normal watering; and the turf dies or is weakened from lack of moisture.

Mat and thatch also deny moisture to the turfgrass and provide an excellent place for disease to breed. The dead and decaying organic matter in thatch or mat is actually what most fungi pathogenic to turf feed on. Water and air are restricted from the grass roots by an impervious layer of undecomposed organic material, and we have almost ideal conditions for weak grass and strong fungi.

Watch for Warnings

The last and most inexcusable reason for lack of moisture is the failure to apply it when it is needed. The warning signals are always there for those who take time to notice. The grass turns a blue-grey or slate colour and begins to footprint. In many locations during the summer a period of 15 to 20 minutes is the difference between live and dead bentgrass.

By all means we should try to learn and use good watering habits. In this way we will be helping to overcome disease by maintaining vigorous turf.

The third way in which water affects turf is through impurities it carries. Water with an extremely high or low pH can have an effect on bacterial action in the soil, and any detrimental effects should be alleviated by correcting the pH of the soil.

Other impurities in water which may cause trouble are certain salts which are injurious to turf. When water containing a high quantity of injurious salts is used, management of both soil and water is essential. Good drainage is necessary to wash the accumulating salts downward and out of the root zone, and it is therefore necessary to have a permeable soil with a high infiltration rate. Quite often, some relief may be obtained by the use of soil conditioners such as gypsum which replaces the undesirable salt in the coil and allows it to be leached out.

Last of all, the amount of water used as a solvent or carrier for fungicide in a spray solution affects turf. When used in the proper amounts with the proper pressure, it is effective. If large quantities are used, the chemical may become too dilute and have little, if any, effect. If too little water is used, the resulting burn may sometimes be worse than the disease.

The future

Now, let us look to the future. It is possible that someday our whole concept of water may be changed, and we will be better able to use it and understand it. Only in the last three years has powdered water been developed by the National Cash Register Company and put to use industrially. Some day this may be the answer to golf course watering problems whereby exact quantities can be applied with little waste. This may seem ridiculous now, but so did a lot of other things which we now accept as commonplace in our present Space Age.

There is a lot to be learned about water and its relationship to our environment. We know the basic composition of water, but we have not yet measured all its properties. It is so essential we cannot live without water, but we can live better with it if we learn more about it.