

# Integrated Pest Management for turfgrasses

By **Dr. Leon T. Lucas**, Professor, Department of Plant Pathology, North Carolina State University, Raleigh, NC



Integrated pest management (IPM) is a system for reducing populations of different pests by using combinations of compatible management and pest control practices. Extensive IPM programs have been developed for some agricultural crops in recent years, but have not been developed for turfgrasses. Many IPM principles can be used in growing turfgrasses, and some are being used without recognizing them as part of an IPM program.

IPM for turfgrasses means to manage turfgrasses and all pests that are present simultaneously using all available environmentally acceptable and economical methods. The effect of pest management practices on other pests, nontarget organisms, and the environment must also be considered. Various regulatory, research and educational agencies are involved in IPM programs and are encouraging the development of programs for urban areas. Such programs may reduce the dependence of turfgrass managers on pesticides and encourage the use of alternative methods of pest control to minimize the exposure of humans, nontarget organisms and the environment to pesticides. An IPM program for turfgrasses uses normal management practices for growing turfgrasses, biological control methods and pesticides to keep pest populations below economic or aesthetically damaging levels.

Some turf management practices that are normally used affect pest populations and the damage caused by pests. These include construction methods, soil mixtures, selection of varieties, time of seeding, fertilization, irrigation, mowing, aeration, verticutting, top dressing, modification of environments, and the use of various pesticides. These practices are used to encourage better growing and quality of turfgrasses which, in many cases, involves the control of pests. A good healthy turf is one of the best methods for pest management that is available. Examples of

some management practices that turf managers can use to reduce pest problems are discussed below.

The construction of golf courses can affect the growth of turfgrasses and the management of pest problems. Construction of contours so that good surface drainage results to remove excess water and to avoid high-dry mounds will help reduce weed and disease problems. Incorporation of fertilizer and lime according to soil test results at this time will help grow a healthy turf that can better overcome and compete with pests during establishment and years later. Removal of nearby trees and correction of drainage problems at the time of construction will help prevent weed and disease problems that might be encouraged by these conditions. By constructing a turf correctly, many problems with pests may be eliminated or reduced for years by providing conditions favorable for a good healthy turf.

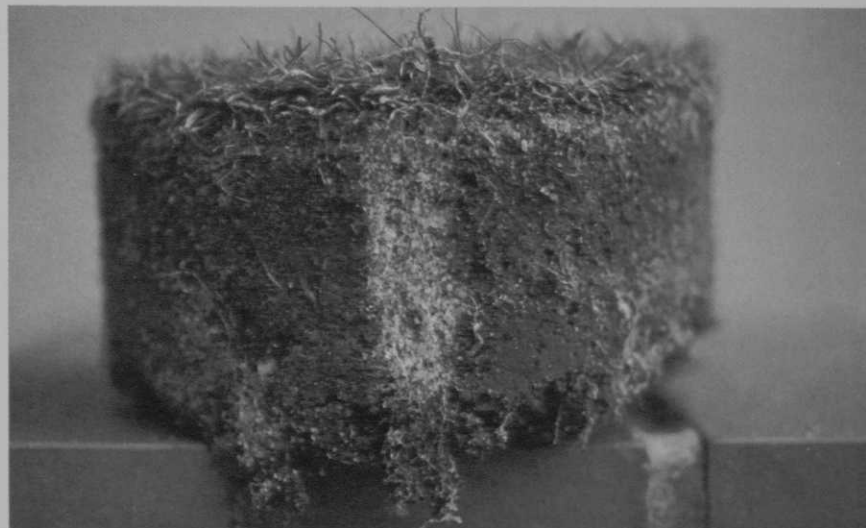
Soil mixtures that are specified for golf greens provide good drainage, retain the proper amount of moisture and help to avoid compaction and too much drying of the soil. Good soil drainage and aeration encourage

root growth and help to prevent many diseases by removing excess water from around the plants. Less soil compaction helps to develop a healthy turf that can prevent or overcome some weed problems that often develop in compacted soils.

Time of seeding is an important disease control practice, particularly for cool season grasses. By seeding cool season grasses in early fall when temperatures are cooler, diseases are less of a problem on young seedlings than in hot weather. Diseases such as brown patch and Pythium blight may kill many of the seedlings during warmer months. Seeding too late in the fall may result in more damage from cold weather. Warm season grasses should be seeded during early summer so that plants can become well established before cold weather in the fall.

The selection of the best adapted and most disease resistant turfgrass varieties for an area is an important practice for a turf IPM program. The best varieties will result in a better turf that can compete with weeds and overcome many disease and insect attacks.

*Continues on page 44*



**Aeration holes** shown above, provide better water drainage and allow oxygen to the roots when filled with sand.

Fertilization practices can affect pest problems that might develop or are present in turf. Cool season grasses, particularly in the transition zone, should be fertilized with nitrogen in the fall, winter and spring and not as much during the summer. The cool season grasses grow best during the cool time of the year and should be encouraged to grow at that time. Fertilization with nitrogen during the summer encourages top growth and not root growth which produces plants that are more susceptible to drought stress and some diseases. Diseases such as brown patch and Pythium blight are more severe following heavy summer nitrogen fertilization. The diseases can cause the turf to become thin which allows weeds to grow in affected areas and become a problem. Adequate amounts of phosphorous and lime are needed in soils that are deficient in these elements to develop healthy seedlings that can compete with weeds and overcome diseases. Soils with high pHs and high amounts of soluble salts can also cause problems. Proper fertilization will help turfgrasses recover from insect damage. Fertilization of warm season grasses during early summer encourages growth of the turf that can compete with or overcome weeds in the area. These grasses should not be fertilized with high rates of nitrogen during late summer which would make them more susceptible to damage from cold weather in the fall and winter. Extra potassium is needed in soils that are low in potassium in late summer on both warm season and cool season grasses to help improve winter hardiness and prevent weed problems.

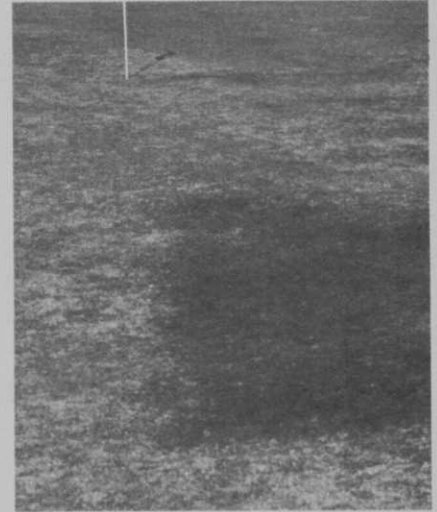
Irrigation is an important practice in an IPM program. Extra water is often necessary during the dry, hot months of summer but should be applied only when needed. Water should be applied infrequently, but enough should be applied to wet the soil 6 inches deep. Frequent irrigations with small amounts of water will cause plants to develop shallow root systems that will be more susceptible to drought stress, and some disease and weed problems. Frequent irrigation may keep the leaves of plants wet for long periods of time and encourage the development of certain diseases. Irrigation of cool season grasses on golf greens in early morning can help reduce diseases by allowing the leaves to dry quickly and removing exudates

from the surface of leaves. The use of irrigation systems to syringe bentgrass golf greens during hot weather may help these grasses grow better and overcome pest problems. Also, proper use of irrigation during the establishment of young seedlings will help seedlings compete with weeds. Irrigation may affect pesticides that are used. Some insecticides may need washing into the soil to be effective on some soil insects, whereas irrigation following the application of some insecticides, fungicides, and herbicides should be avoided to prevent washing the pesticides off the leaves.

Mowing practices can affect pest problems. Mowing grass when it is wet may spread pathogens from diseased plants to healthy plants. Also, mowing plants too high or too low may encourage the development of diseases or favor competition from weeds.

Aerification is used to help overcome soil compaction and provide better soil drainage and aeration. Better drainage removes water from around the crowns and leaves of plants and results in an environment less favorable for most diseases. Removal of soil compaction allows for better turf growth and less weed problems in most cases. Aerification might be a disadvantage with some insects such as the black cutworm which will hide in the aerification holes during the day. However, this is not a severe problem and the benefits of aerification are much greater than the problem with cutworms. Disturbing the soil surface following the application of some preemergence herbicides may reduce the effectiveness of these types of chemicals.

Verticutting is used to help control thatch in turf. By controlling thatch, some pest problems can be reduced and better control can be obtained when pesticides are needed. Where too much thatch is present, some pesticides may become attached to thatch and not be available to control the pests. Verticutting could be detrimental and cause more pest problems in some cases. For example, verticutting cool season grasses heavily during the summer months would reduce the stand of the grass so that weeds could invade and become a problem. Also, disturbing the soil face may interfere with the action of some herbicides. Verticutting should be used to prevent the accumulation of thatch and to en-



**The solid** areas were treated with Nema-cur for sting nematode. Weeds are encroaching in the weakened, non-treated areas.

courage the growth of turfgrasses. Localized dry spots may develop in areas with excess thatch that become dry and are difficult to wet again. Diseases and weeds may be more of a problem in or around the dry areas.

Top dressing with soil is a management practice that is commonly used to smooth turf surfaces and to aid in thatch decomposition. Top dressing mixes soil into the thatch layer which encourages biological activity in the thatch and increases the rate of decomposition. Pathogenic fungi that survive in the thatch may also be affected and numbers could be reduced by competition and the production of antibiotic substances from saprophytic microorganisms. Top dressing can also be used to modify the top few inches of existing soil by aerifying and filling the aerification holes with an appropriate type of soil. Heavy soils can be modified for better soil drainage and less compaction by top dressing with sand. This management practice may help reduce disease problems because of a healthier plant and less moisture on the surface of leaves and crowns of the plants. Also, it may help overcome weed problems by developing a stronger turf that can compete better with the weeds.

Excess shade on turf areas often contributes to weed and disease problems. Diseases are often a problem in a partially shaded area because of more humidity and more susceptible plants. Weeds are often a problem in shade because of a poor

*Continues on page 46*



turf that does not compete well with weeds. Another example of problems associated with shade was seen following the severe winters in the transition zone during which the bermudagrass was damaged. Bermudagrass was often killed on the southern side of fairways and greens that were shaded by evergreen trees. Weeds such as crabgrass and goosegrass invaded the poor turf areas during the summer. Several years of good weed control and turf management were needed to reestablish desirable turfgrasses in areas that were killed. Removal of lower limbs or entire trees may be needed to eliminate shade problems. Certain ground covers that grow well in shady areas could be used in low maintenance areas.

Biological control methods specifically for turfgrasses have not been developed for most pest problems, however, biological factors are involved in many pest management practices on turf. Biological control methods on turf for diseases include the use of resistant varieties and competition and antagonism among microorganisms in the soil or on the plant. Biological control methods for insects include the uses of diseases of insects, predators, sterilization of insects and the use of resistant plant varieties. Several insecticides that have a bacterium of the genus *Bacillus* as the "active ingredient" are being used on turf at the present time. Biological control methods for weeds includes the use of competition by turfgrasses and diseases of weeds. Competition involves growing a good healthy turf that does not

**Bermudagrass** located on the south slope (left) appears very healthy, while that on the north slope (right) has suffered some damage.



**Dollar spot** is showing in the dry-soil areas of this turf.

allow weeds to become established or that can compete with weeds that develop in the area. Biological control methods for nematodes include the use of resistant types of grasses and antagonism. Many soil microorganisms are antagonistic to nematodes and certain types of cultural practices may help increase this antagonism.

Research is underway to develop more resistant varieties to diseases, insects and nematodes. Relatively little is being done in the area of biological control with competition and antagonism for microorganisms. Research has shown that the use of large amounts of certain types of pesticides often reduce the level of microbial activity in the soil and

thatch. As a result, thatch often increases more quickly in an area that has been treated with large amounts of certain fungicides. Competition is an effective biological control method for weeds, and a good healthy turf is one of the best weed control programs. More research is needed to identify more biological control factors for pests of turfs.

**Integrated Pest Management  
will continue in the next issue  
of Golf Business South.**