



Properly watered turf is more resistant to insects and diseases.

IPM STRATEGIES

for golf course maintenance

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The ultimate goal of any turfgrass management system is to establish and maintain a high quality turf at a reasonable cost, without being detrimental to the environment. With increasing concerns from regulatory agencies and the public about the environmental impacts of pesticides on surface and ground water, and on people, wildlife and other organisms, an understanding and application of integrated pest management (IPM) principles to turfgrass management programs is essential.

What is IPM?

IPM is a management plan that utilizes a variety of control measures to keep turfgrass pest populations below levels that are economically and aesthetically damaging, without creating a hazard to people and the environment. These control measures include:

1. Inspection and monitoring
2. Proper cultural control methods
3. Biological controls
4. Using adapted species and resistant cultivars
5. Practicing proper sanitation measures to prevent the spread of disease
6. The use of the most appropriate pesticide when necessary

An important point to remember is that an IPM plan does not preclude pesticide use, but seeks to reduce dependency on pesticides. The objective of any IPM program is to reduce pest populations while keeping pesticide applications to a minimum.

IPM control strategies

A variety of control tactics are available to the turfgrass manager. IPM involves understanding how these control tactics interact to influence the overall health of a turfgrass system. The primary objective in any IPM program is maintaining strong, healthy, actively-growing turfgrass that can resist and recuperate successfully from environmental stresses, pest damage, and weed infestations. IPM control strategies include:

Species and cultivar selection

Introducing a species outside its range of adaptation increases its susceptibility to pests and stresses. Turfgrass species and cultivars must be selected to match local environmental and playing conditions. Where possible, select adapted species and cultivars that minimize water and pesticide use.

Mowing practices

Mowing height and frequency are directly related to the turfgrass species and growth rate of the plant. To minimize stress on the plant, no more than 1/3 of the leaf blade should be removed with any one mowing. On greens, cutting heights consistently 1/8 inch or less can place the turf under severe stress during weather extremes. Use of lightweight mowers on greens and fairways tremendously reduces soil compaction effects on turf growth.

Irrigation practices

Properly watered turf is more resistant to insects and diseases. Excessive irrigation is one of the most common problems observed in the field. It is important to survey the irrigation system to ensure that all irrigation heads are working and set



Spot spraying, one form of weed removal, puts the chemical only where it's needed.



Some weeds are best removed by direct pulling.

IPM means using a variety of control measures

properly to obtain uniform coverage.

Irrigation frequency should be dictated by meeting the evapotranspiration (ET) requirements of the plant. Irrigating deeply and less frequently produces a turf with a deeper root system and improved overall turf health. Care must be used when irrigating shallow-rooted turfs. Monitor root depth, soil moisture, ET conditions, and use visual inspection to determine turf irrigation needs.

Fertility and pH management

Fertility is a necessary component of turf management. No one fertilizer program or fertilizer can suit all situations. The type of program must be decided on by the golf course superintendent based on the specific conditions of the golf course.

Fertilization should be scheduled to meet the nutritional and growth requirements of the plant. The frequency of fertilizer application will vary depending on the turfgrass species and the type of fertilizer. Slow release fertilizers such as IBDU, sulphur coated urea, or natural organic materials, should be used on golf courses when possible. Use low rates of inorganic fertilizers with any one application.

A soil test is the best diagnostic tool available for assessing soil pH and phosphorus and potassium needs of the turf plant, as well as other nutrients. Soil test results serve as a guide for proper application of nutrients, avoids the waste of excessive fertilizer applications, and insures that nutrients are applied in the proper proportions. Once the turf has become established, soil tests should be conducted every 1-3 years.

Thatch control

The potential for thatch problems varies with turfgrass species, intensity of culture and traffic. Thatch becomes a problem on fairways and greens when it accumulates to a depth that increases potential for puffiness, mower scalping, disease development, and localized dry spot formation.

Avoiding excessive fertilization is an important consideration for preventing excessive thatch formation. For greens, light vertical mowing at intervals dependent on the growth rate of the plant can be effective in controlling thatch formation. Topdressing is also an effective tool to enhance the rate of biological degradation.

On fairways, excessive thatch can be avoided by preventative cultural practices, such as use of appropriate turfgrass cultivars, maintaining appropriate soil pH, utilizing soil cultivation techniques to enhance soil oxygen levels, proper irrigation, moderate nitrogen fertilization, and use of pesticides only as needed. Corrective measures for thatch control, including verticutting and core aeration must be used if accumulation exceeds 0.5 inch. Verticutting and core aeration are best accomplished during periods of active turfgrass growth.

Rootzone management

Improving soil characteristics can have a positive impact on turfgrass health and can decrease the need for chemical inputs. Proper soil drainage is critical for root growth and overall turf health.

Water movement through the soil is disrupted when layering occurs within the soil profile or when compacted soil conditions exist. There is no single solution to all soil problems. Methods to help solve the problem include core cultivation, high pressure water injection aeration, and deep tine aeration. It is important to determine the cause of the problem and then select the best corrective measure.

Good surface drainage through surface contouring alleviates ponding of water created from runoff, although it does not correct underlying soil problems. Properly installed subsurface drainage is an effective way of keeping a golf course in play and avoiding turf damage.

Traffic control measures

With the rising number of golfers on golf courses and the increase in the use of golf carts, traffic must be carefully monitored on the golf course to decrease potential wear and soil compaction problems. Rotate traffic patterns by planned movement of cup and tee markers. Distribute cart and foot traffic over wide areas and use cart paths where traffic is highly concentrated.

Tree management

Trees play a strategic role in golf course design and style and are a valuable asset in the golf course landscape. Tree placement should be carefully considered and turfgrass cultural practices

IPM strategies —

need to be closely monitored in shaded areas. Increase light penetration through the tree canopy by selectively thinning the crown and pruning lower tree limbs. Enhance air movement in pocketed areas by judicious removal of shrubs and trees in the avenue of prevailing winds. Along fairways and greens, root prune trees that are competing excessively with the turfgrass for water and nutrients.

Pest forecasting techniques and equipment

Many tools are now available to the golf course superintendent to aid in forecasting potential problems on the golf course. Weather stations aid in monitoring potential weather conditions that are conducive to disease development. Diagnostic kits are available to the golf course superintendent to provide rapid, on-site test for disease detection and monitoring pathogen levels. New computer forecasting models aid the superintendent in disease, insect and weed control applications.

Alternative pest control measures

Biological controls regulate pests by introducing natural enemies to the turf environment to combat turf pathogens. Some biological products are now available for turf, and research shows that the potential of such products is bright.

Spray only when necessary

There may be times when the use of a pesticide is the most effective way to control a turf problem. Select a pesticide that provides the most effective control of the weed, disease, or insect, while presenting the least possible hazard to people, wildlife and the environment.

Control measures used should be evaluated periodically to determine if the desired results are being achieved, and the control plan should be adjusted if necessary. Diagnosing, evalu-



Consistent cultural programs keeps turf healthier and reduces need for chemical applications.

ating and controlling a turf pest problem follows a logical sequence. Each situation is unique, however, and adjustments should be made to the overall program as circumstances change on the golf course.

Communication and education

Communicate with and educate course officials and golfers about the IPM strategies that are taking place on your golf course and explain why they are being undertaken. Letting golfers know you practice IPM helps them understand and accept your management decisions.

Success with an IPM program depends on being alert to potential problems, following proper cultural practices, carrying through with a well-conceived maintenance plan, and selecting the best corrective measures to ensure the best quality golf course conditions with the least impact on the environment.

The golf course monitoring program

The first step in establishing an IPM program should be developing and maintaining a regular monitoring program to collect information about pest activity occurring on the golf course. Regular monitoring provides a record of active insect, weed, and disease populations, and any resulting damage, and also provides follow-up information on the success of particular control measures. Monitoring can be done by a golf course employee who has formalized training in field diagnosis of weeds, diseases, and insects. This person, often referred to as a scout, examines the golf course on a regular basis and although they may have other duties to perform on the course, the primary responsibility should be the IPM monitoring program.

Monitoring frequency varies for each portion of the golf course, depending on available time and operating budget. The greens and tees usually require the greatest attention and initially should be monitored daily or every other day. Fairways and roughs may be monitored less frequently if labor and time

are a concern. The time spent monitoring will be reduced significantly once indicator areas, or "hot spots," for particular pests are identified. Early morning monitoring is preferred, as disease symptoms and signs are most conspicuous prior to mowing, and this time interferes least with play.

Keep accurate records as each site is monitored. Scouting records can be used to make pest control decisions. Look for trends that suggest pest numbers are increasing to levels that warrant control measures being taken. Early detection can often minimize damage and severity.

Several years of monitoring records will establish pest threshold levels specific to your golf course, further improving pest control decision-making. A monitoring program may not always reduce the number of chemical applications, but it will assure that pesticides are being used in the most judicious manner.

— Dr. Kimberly Erusha