IPM Leading To Holistic Plant Health Care

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I. IPM DEFINED

Integrated Pest Management has been defined as the selection, integration and implementation of pest control based on predicted economic, ecological and sociological consequences (Bottrell 1979). Though this is an accurate definition, I feel that the foundation of IPM is avoidance of pest treatments by sound cultural and biological practices. The term Best Management Practices (BMPs) has been used as a label for this.

Healthy, growing turf is the best defense to pest problems. My approach to plant health care recognizes that the health of the plant depends on its environment and the interactions of a multitude of other organisms. The challenge is to understand these interactions and develop strategies to stimulate the environment to favor the desired plant. Tools used in the strategies formulated need to be economically and ecologically sound. Often multiple tactics are used coordinating cultural, mechanical, biological and chemical functions. As science reveals more of the biological mysteries that exist in and around the plant, better decisions can be made taking us further to a holistic health care program.

II. REASONS FOR IPM

The importance of practicing IPM is simple: The principles associated with IPM offer all the tools available with plant health care. In the past, turfgrass management has been viewed as a fairly antiseptic, sterile practice. Chemical pesticides were largely the tool of choice. Now, scientists are exploring deeper into the ecology of turfgrass. An understanding of this powerful world will be a driving force in plant health care as more is learned in managing these systems. This ecological approach to plant health care systems is key in turfgrass management.

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III. IMPLEMENTING INTEGRATED PEST MANAGEMENT AND BEST MANAGEMENT PRACTICES

Everyone on a golf course has an active roll in IPM. Golfers need to be educated at a level of understanding in the basic agronomic needs of the course. With this comes tolerance of management practices and respect. Beyond this more passive role, golfers directly contribute with proper ball mark and divot repair and utilizing "spikeless" golf shoe attire. In one season of banning traditional metal spiked shoes, we have seen true, smoother putting surfaces with less wear and desiccation around the cups. We have been able to slightly raise mowing heights because of the improved putting surface.

We reach our golfers through newsletters, bulletin boards, and conversation. Continuing education is a must for myself and the crew, assuring a sound knowledge of identification, biology and control options of pests and turfgrass ecology.

SCOUTING WITH MONITORING

Intense regular monitoring is one of the most important aspects of IPM as well as the most time-consuming, demanding practice in IPM. It is critical to detect and identify pests and potential problems as early as possible. This task is done at least twice a day—once in the morning during course set-up and once after lunch. At peak times, an additional check is done before leaving the course.

With this technique, the more trained eyes, the better. Part of our continuing education program for the crew is informative posters displayed in the shop with videos and other references on pest identification and management. Scouting goes hand in hand with monitoring and written note taking. In time, trends develop where "hot spots" emerge. These hot spots are consistent, usually from microclimates that exist on every golf course. Plotting these areas on a map works well for future reference.

(continued on page 16)

(continued from page 14)

Methods we use to be more efficient in monitoring are:

- Scouting
- Insect traps
- Degree day models
- Key indicator plants, phenology
- Disease forecasting models
- Historic information, mapping vulnerable site specific areas—record keeping
- Chronic testing
- Consulting with other superintendents and professionals in the field—networking
- Computers

INSECT PEST TRAPPING

We have used pheromone traps and black light traps. Pheromone traps are used to trap certain insects. Black light traps are more general, collecting many types of insects. Traps help us to better understand the population cycles and density of insects as well as scheduling scouting intensity. Most traps capture the adult stages of pests, which may appear before the caterpillars or grubs that are damaging to the turf. The black light trap has helped us track the local Japanese beetle population explosion. The steady increase in beetles confirmed the steady increase and damage of the grubs. We use the cutworm pheromone trap to capture the adult moth.

This information is used to judge when we should collect clippings and compost them off site. Typically, we like to return clippings and compost them in place on the turf. However, when high numbers of cutworm moths are trapped, we collect clippings which, in turn, yield the majority of eggs laid. This practice has reduced our insecticide applications. Greens are the only concern with cutworm damage. During course setup, the greens are assessed for holes caused by cutworms. Often the number of burrows are few enough to simply spot treat by a hand sprayer.

DEGREE DAY MODELS

Insect development relies on many factors. One of the largest factors is heat. Scientists have come up with a way to better predict insect emergence and activity by tracking accumulated heat, expressed as degree days. The Metos calculates degree days by summing 120 air temperature measurements for the day and dividing that sum by 120 to get an average temperature for the day. This integrated average is much more accurate than simply adding the day's maximum and minimum temperature and dividing by two. This was the method we used in the past. Once the average is obtained, the degree total for the day is this average minus the base temperature. We use a degree base of 50°F. So, for a day with an average temperature of 59°F at base 50°F, the degree days for that day would be 9. Each day, this calculation is repeated and the result added to the previous day's figures to get the running total of accumulated degree day values. If the average temperature for the day is less than the base, the degree days for that day are zero, not a negative number.

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Researchers have developed degree day thresholds for many insects. Knowing the degree day value and referencing it to a particular insect's development, in effect, creates a calendar of insect activity. Following such a calendar helps the turf manager to focus on intense scouting for a particular insect and better target pesticide applications, if needed.

Other biological activity can be predicted using degree day figures. Plants respond to accumulated heat as well. Some plants' determination to flower or set fruit can be predicted with degree days. *Poa annua* has a degree day model for its flowering period. Understanding the plants physiological state can better determine the timing of plant growth regulator applications. Because plants and insects share this heated phenomena, field observations of plant activity can also help in determining insect and weed activity. An example is applying preemergence herbicide for control of crabgrass when the Bridal Wreath Spirea (Spiraea X Vanhouttei) blooms. I found that phenology is not only helpful but fun.

KEY PLANTS

We also use indicator plants as key plants. A bentgrass nursery is maintained on site, maintained and grown in the same manner as the turf used by the golfer except

(continued on page 24)

IPM...

(continued from page 16)

no plant protectants are used. This nursery is home to over 35 varieties of creeping bent. Each variety has its own characteristics. Cultivars within turfgrass species differ in their relative susceptibilities to various diseases. Some are more susceptible to Dollar Spot *Sclerotinia homoeocarpa* than others. Some more susceptible to Brown Patch *Rhizoctonia* than others. Observing these key plants gives us an early look at what we may see in the field due to their high susceptibility as a disease host.

Observing other species of grasses grown on site can also help in early forecasting. Plots of perennial rye grasses that are susceptible to Pythium blights may be observed for disease development. If Pythium is seen on these grasses, and conditions favorable for Pythium development continues, other less susceptible grasses may develop disease symptoms. Observing symptoms on these susceptible plants will give an early indication that disease development is likely elsewhere if favorable conditions persist.

DISEASE FORECASTING MODELS

Our Metos weather station has three prediction models for turf diseases, Pythium Blight *Pythium aphanidermatum*, Brown Patch *Rhizoctonia solani*, and Dollar Spot *Sclerotinia homoeocarpa ssp.* The predictive models are based on complex mathematical calculations to estimate severity and timing of disease events. The calculations include information collected from sensors of air temperature, soil temperature, rain or irrigation, relative humidity and length of leaf wetness. These predictive disease models are used as indicators of favorable environmental conditions for disease. They do not account for inoculum pressure, species or cultivar resistance to disease, fertility or future weather (environmental) conditions that may or may not favor further disease development. Ultimately, it is the turf manager who makes the decision on disease pressure verses needed controls.

TESTING

Effective testing is conducted. Periodic tissue testing coupled with annual soil testing is done to assure proper nutrient balances. Water testing is done once every three years with our new water source. Our old water source was high in sodium; and at that time, annual testing was done. Diagnostic tests are done to identify or confirm what pathogen is responsible for the symptoms. In our annual operating budget, we have a separate account just for testing fees.

(continued on page 26)

IPM...
(continued from page 24)

NETWORKING

Consulting with other professionals is very helpful. Finding what other golf course superintendents or university professionals are seeing in the area often indicates what I may soon be seeing.

COMPUTERS

The use of computers has helped us in many ways. From our computer in the office, we can access our weather station and bring up degree day figures, raw weather information, disease forecasting models, evapotranspiration, soil temperatures and moisture. The computer has also helped us in the very important task of note taking. Two complete sets of drawings are scanned into our computer. Each set is a hole-by-hole drawing to a scale of 1 foot to 100 feet. One set has our irrigation and drainage; the other is used to map "hot spots." The computer is also used to go on-line. Several golf course superintendents' bulletin boards are accessed which helps greatly in networking with others. There are several services available over the wire also, one being the Turfgrass Information Center at Michigan State University. This reference allows me to research topics quickly. ■

Part 2 will continue in the January 1997 issue.

the Bull Sheet
(continued from page 18)

Network (NLDN). They will pinpoint and map all cloud-to-ground lightning strikes detected within a 10-mile radius of your facility for a given time period. Call 800/283-4557.

Congratulations to Tim Anderson, the new superintendent at Prestwick C.C. who has replaced Dick Trevarthan, who is retiring. Dick will be around for a few months as a consultant and help with the changeover. Tim was the assistant at Naperville C.C. We all wish Dick an enjoyable and happy retirement.

Steve Cummins at Lake Barrington Shores is looking for a mechanic. Call 847/382-3252 if interested.