IPM strategies for warm-season turfgrasses

BY MARIA TOMASO-PETERSON

Bermudagrass (hybrid or common) is the primary warm season turfgrass used for athletic fields in both tropical and subtropical climates. This article focuses on integrated pest management (IPM) strategies for disease control in bermudagrass, but the same concepts can be applied to most warm season turfgrasses. IPM strategies for disease control include appropriate cultural management practices for healthy turfgrass, environmental stewardship, and minimal fungicide usage.

"A healthy plant is a happy plant," is an idea repeatedly expressed by Drs. Jeffrey Krans and Euel Coats, professors of agronomy and weed science, respectively, in turfgrass management at Mississippi State University. That concept is true for all aspects of turfgrass management, including disease control. Fertility, watering, mowing, thatch control, and aeration are key practices for healthy turfgrass. These cultural management practices interact to create a healthy plant, the first line of defense in disease management.

Environmental stewardship includes being acutely sensitive to subtle changes in turfgrass development. Any type of stress caused by environmental fluctuations, mechanical and/or pest damage, or physiological shifts in turfgrass development may result in predisposition to infection by fungal pathogens. Scouting for diseases is a second line of defense in disease management. To be successful, turf managers must be familiar with the dynamic processes of turfgrass diseases. This article reviews the most common fungal diseases that impact bermudagrass managed as athletic turf.

The most predominant and unpredictable bermudagrass disease is commonly referred to as the Helminthosporium complex. Pathogenic fungi can be actively infecting bermudagrass throughout its continual growth cycle, but symptoms are inconspicuous until the plant becomes stressed and/or environmental conditions become conducive for vigorous infection and reproduction of the fungi.

Two fungal genera are commonly implicated in this disease complex. Bipolaris and Curvularia spp. involved in this disease complex may attack all plant parts, and symptoms may be observed as leaf spots, leaf blights, melting-out and/or crown and root necrosis.

Leaf spot symptoms may be observed on leaves and stems of bermudagrass as small, elliptical to circular spots (lesions), dark purplish-brown in color with a dark blackish-brown border (above). Frequently, a yellow (chlorotic) border may be observed. Lesions may enlarge, resulting in total death of the leaf. Older leaves will become symptomatic first, with a progression of lesion development to younger leaves.

Lesions are the result of asexual spores (conidia) landing on the leaf surface, germinating and penetrating leaf tissue, entering and parasitizing the bermuda-

grass plant. This dynamic process is referred to as infection. Conidia are produced by the fungal pathogen on infected tissues and disseminated by wind, rain, and mechanical transport (top).

Conidia may spread distances from an infective site and repeat the infection process in a healthy area of the athletic field. The pathogen is most active when environmental conditions are cool and wet. A moisture film, or "free water," on the leaf surface is necessary for infection. The microenvironment within the turf canopy must be cool (75 deg. F is optimum), and wet before leaf spots will develop. This disease is favored by prolonged periods of leaf wetness that result from cloudy, foggy, rainy days, or late afternoon irrigation. With the advent of warmer temperatures and sustained moisture in the turf canopy, these pathogens can migrate down the plant and infect crowns and roots. Dark brownish-black necrosis of crowns and roots can be observed on infected plants. The leaves will become yellow (older leaves first), then quickly turn brown and produce brownish-purple, irregular patches in the bermudagrass turf (below).

Melting-out symptoms initially develop on the leaf sheath progressing to the leaf as water-soaked lesions, dark reddish-purple to black in color. A chlorotic border fading into healthy green tissue often surrounds lesions. Colonization by the fungus becomes so extensive, the leaf is girdled and falls off. The leaf-dropping phase of the disease gives rise to the name "melting-out". Melting-out commonly occurs when air temperature is above 85 degrees F and relative humidity is greater than 85 percent.

Disease management

Symptoms associated with the Helminthosporium complex will occur when environmental conditions are conducive, and the bermudagrass is experiencing stress. Stress factors may include extended periods of low light that slows down plant metabolism, excessive nitrogen fertility, improper P and K levels, hormonal-type fungicide and herbicide applications, and drought stress. In addition, excessive thatch layers and leaf clippings provide nutritional food for fungal pathogens to grow saprophytically and produce conidia. These stress factors, and "environmentally friendly" microenvironments for persistent fungal pathogens, may be reduced through good cultural management practices. Plant resistance is a key factor in any IPM program. Unfortunately, bermudagrass varieties used for athletic fields lack resistance to Bipolaris or Curvularia spp.

A third line of defense in disease management is minimal fungicide input. Fungicides are most effective when used in a preventive manner with efficacy against the fungal pathogen inciting the disease. Leaf spot, leaf blight and melting-out, all foliar diseases, require a spray volume of 1.0 gal/1000 sq. ft. compared to a spray volume for crown and root necrosis of at least 2.5 gal/1000 sq. ft. The higher spray volume for crown and root necrosis permits penetration of the fungicides to infected plant parts. It is recommended that fungicides used for controlling root diseases be watered into the root zone to a depth of 0.5 to 1.0 inch immediately following application.

Selecting a fungicide with a contact or penetrant mode of action should be considered to maximize effectiveness and minimize applications. Contact fungicides are active on plant surfaces, but may wash off, and usually have a short period of effectiveness. This may necessitate additional applications. However, contact fungicides typically have a broad biochemical mode of action, resulting in minimal development of fungicide resistance.

Penetrant fungicides have chemical activity within the plant. Penetrants may be localized (remain in the area of initial entry) or acropetal (translocated upwards in the plant from the point of entry); only one truly systemic (translocated both upwards and downwards in the plant) penetrant is commercially available.

Penetrants are most effective for bermudagrass root diseases because they can be watered into the root zone, absorbed by the roots and translocated up the plant for complete protection from fungal attack. Penetrant fungicides are absorbed into the plant and provide a longer period of effectiveness, which translates into minimal applications. Penetrant fungicides generally have a specific biochemical mode of action, resulting in selective fungal resistance. Fungal resistance to fungicides can be managed by explicitly following label recommendations and alternating modes of action and fungicide chemistry.

Environmental stewardship is also an integral part of IPM strategies for disease control. The turfgrass manager should maintain accurate records of disease outbreaks, when and where they occurred, and cultural management practices, and fungicides that were effective in controlling diseases. You should also know the disease profile, symptomatology, and environmental conditions favoring disease development is a key factor in successful IPM strategy for disease control.

Distance diagnostics (digital images of turfgrass symptoms), together with plant samples submitted to a plant diagnostic laboratory, can assist in development of an accurate diagnosis quickly. **ST**

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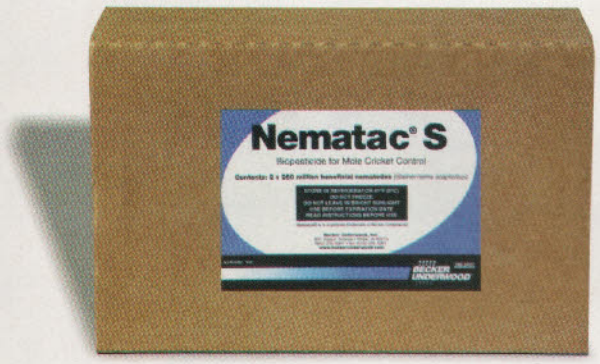

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Taken by "Surprise"

BY PATRICIA AND DAVID FLETCHER

When the City of Surprise, AZ, announced plans to build one of the most ambitious pro training sites to date, it came as, well, a surprise. After all, this farming community located 25 miles on the outskirts of Phoenix has a modest population of about 50,000. Astonishment soon turned to shock, however, when the city managed to woo not one but two major league teams, the Texas Rangers and the Kansas City Royals, to hold spring training there. But late last February, all that was felt was pure joy as the crowd witnessed the opening pitch in the West's shiny new stadium.

Surprise may be small, but it obviously thinks big. Not only has the city managed to build this 15-field sports complex, but also plans are to spur growth by surrounding it with a 200-acre downtown center. Slated for completion this summer, the municipal hub will be graced with 58 acres of parks, a 5-acre lake, an aquatic center, library, and city administrative offices. Furthermore, city officials envision this downtown, with its centerpiece sports complex, as being as significant as Phoenix is now by the year 2040.

Surprise officials also think smart. Cream-of-the-crop sports-field architects and engineers HOK Design Build and Charlotte Engineering Sports Group were hired to design and build the complex. After gleaning the premiere features from stadiums throughout the states, they came up with a 10,500-seat, stadium/amphitheater that's upscale yet fan-friendly, the way spring training games ought to be.

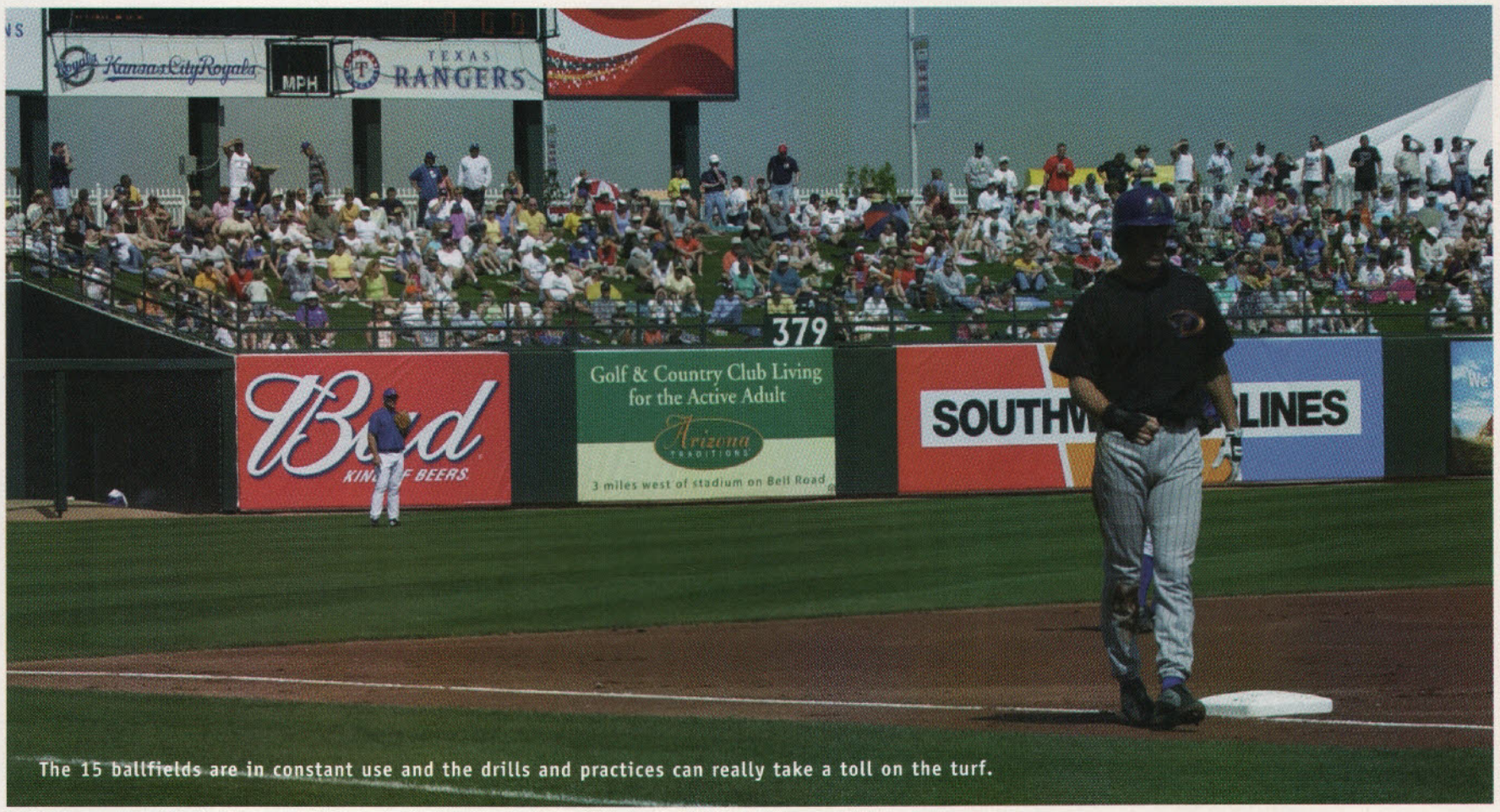
For example, baseball fans traditionally enter stadiums behind home plate, but in Surprise fans enter through center field for a closer feeling with the teams. To accomplish this, a 14-foot below-grade bowl and stadium were built. Players enter the stadium through both the right and left field tunnels, instead of just down a right field line, also making them feel more accessible to fans.

Fifty-eight acres of parks, a 5-acre lake, an aquatic center, library, and city administrative offices will surround the new stadium.

Maintenance matters

The engineers created an equally high-tech playing field. They had planned an extensive hard-pipe drainage system, but after consulting area farmers, dry wells hard-punched into the soil became the solution. Adding to the wells, they dug deep and laid drainage tiles on the soil, covered it with pea gravel and topped it with USDA-certified sand as root-zone soil for the advanced hybrid bermudagrass sod. All this adds up to a playing field that makes a quick comeback after heavy stress and rainfall.

"Over a 2-day span early in the spring training games, we had 3-3/8 inches of rain, which is more than



The 15 ballfields are in constant use and the drills and practices can really take a toll on the turf.

"I'm here to keep the coaches and teams happy." -Joe Kennedy

Arizona gets in over half the year," says Joe Kennedy, head groundskeeper. "But we didn't miss any practices because our fields, including the infields, drained tremendously."

The big job remains daily for Kennedy and his 30-man crew, many of whom are new to him and to baseball. The 15 ballfields are in constant use and the drills and practices can really take a toll on the grass. But Kennedy and his supervisors, Joey Brazil and Carl Hanson, already had 8 years of maintenance experience at nearby Peoria Sports Complex, another two-team training facility home to the Seattle Mariners and San Diego Padres.

"Our routine is to prep each field three times a day for about 20 minutes each time," says Kennedy. "Then at the end of the day, we go back to reconstruct any damaged areas, irrigate, and fertilize. Basically, our crews are going from 6 a.m. through 9 p.m."

Aside from the 15 fields, Kennedy oversees: 12 acres of common fields; the 5-acre lake, which is also the reservoir for the irrigation system; three soccer fields that serve as over-fill parking; two practice fields used for warm-ups; and a landscaped aquatic center across the street along with the pools (crewmembers are also certified pool operators). If there were a partridge in a pear tree, his crew would surely be there for any needed care.

"The toughest part of my job is coordination between my new employees and my supervisors," says Kennedy. "I'm here to keep the coaches and teams happy. I'm a bit of a perfectionist so we're all getting along well. These coaches are some of the toughest to please from a head groundskeeper's point of view." ST

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Irrigation system hurdles demands

Of all the aspects of maintaining the 15 sports fields at the Surprise Sports Complex, perhaps the most challenging is irrigation. It's obvious that the sheer size of a site like this is demanding on an irrigation system. Add to that the constant public use of the venues beyond spring training with fall ball, college games, fantasy camps, and more. In fact, there will only be about two weekends per year when the fields are not in use. And finally, there's the added curve ball of high ET rates in the desert landscape.

Charlotte Engineering Sports Group, of Phoenix, saw the challenge as two-pronged: to water as close to ET as possible for conservation purposes-up to 2-1/2 inches of water per week, and in the short windows of time available. About half a million gallons are put down daily, and at build-out, including the 57-acre park, as much as one million gallons will be used.

"We obviously have a short water window and so we break the watering down on each field and often change the schedule on a daily basis," says Joe Kennedy, head groundskeeper at Surprise.

To help make scheduling efficient, Charlotte Engineering specified Hunter's Genesis Central Control System with an ET weather station, handheld radio remotes, and a flow sensor on each ball field. The central determines the most efficient watering schedule based on ET, flow data (water already applied) and the available watering time as determined by the managers.

"The central is so important because it tells me how much water we've put down and how much more the fields needs," says Kennedy. "And I can schedule watering around events. I do whatever my scheduling requires and I can still maintain ET."

Hand-held remotes allow managers in the field control to provide extra water for hot spots without affecting the schedule.

For the sprinklers, Hunter Irrigation I-40-ON rotors were specified for all the turf on the ball fields. Senior designer Bill McBride liked the coverage, range, and high flow rate these rotors provide.

Kennedy agrees. "The I-40 puts more water down in less time, which helps tremendously with scheduling," he says. "Plus, these rotors have great uniformity, especially close to the head."

"The turf looks phenomenal," says McBride. "In fact, it's exceeded everyone's expectations."

Modular turf system evolves in Puerto Rico

BY MARK LESLIE

The Ponce Lions completed last baseball season on a brand-new, real-turf field at the city's Estadio Francisco Montaner, and that same stadium was then changed over into a track-and-field venue for Puerto Rico's annual college championships.

"It was great. It worked perfect," Rama Construction co-owner Hector Costas said of the technology. "I was a hero in Puerto Rico for several months."

The world got its first glimpse of the possibilities of modular turf when Michigan's Pontiac Silverdome hosted a portion of soccer's 1993 World Cup Championships. Because World Cup matches must be played on natural grass, and the Silverdome had artificial turf, Michigan State Professor Trey Rogers and the staff of the Robert W. Hancock Turf Research Station were asked to solve the problem. The result was octagonal trays filled with natural grass that could be moved into the stadium and later removed.

That was the genesis of GreenTech's Integrated Turf Management System (ITM). The Ponce solution started with a discussion between Costas, a civil engineer, and Frankie Lopez, owner of Eco-Tectura and a sister company, Jardinero (Gardener), both in Ponce. City officials wanted to maintain their Estadio Francisco Montaner with natural grass for the Lions, but still be able to host, on synthetic track, the collegiate track-and-field competition and, on occasion, the PanAmerican Games for Central America and the Caribbean.

The quandary was left to Rama Construction to solve. Years before, Lopez had told Costas about GreenTech's modular system. And neither man had forgotten them. A phone call later, GreenTech was shipping about 2,000 of its trays to Puerto Rico. Once on site, half of the modules were filled with the traditional mix for turfgrass, while the others were filled with concrete, topped with the special synthetic surface for track-and-field competition.

"The GreenTech modular system is perfect for multi-use venues such as Estadio Francisco Montaner. The concept was truly 'outside the box,'" said John Patton, vice president of GreenTech, which manufactures 4-square-foot, high-density, polyethylene containers that have primarily been used for athletic fields, golf course tees, and rooftop gardens.

For athletic fields, the GreenTech modules are filled with a layer of gravel and 7 to 11 inches of rootzone mix then turfed with sod, seed, or sprigs. "Foot locator pads" lock the modules together and keep them closely aligned to insure no seams or joints disrupt the playing surface. Channels accommodate forklift or pallet jack arms on all four sides; and numerous small holes enable extensive drainage and gas exchange into the rootzone.

"You have to fight traditional thinking, but the science is behind this method," said Patton. "Dr. Rogers at Michigan State is an adviser for GreenTech as well as Dr. Rich Hurley at Rutgers University and Dr. Dave Chalmers of Texas A&M."

In Ponce, Costas said: "Comments from the Lions ballplayers were great. There are fewer injuries because it is natural grass." He said construction, like that at Estadio Francisco Montaner, should take about 2 weeks. Once a concrete base is poured, installation is simply a matter of putting the trays in place, using a forklift since they weigh from 600 to 1,000 pounds. Transferring the modules from turf to the synthetic track takes 7-8 days, although Costas' crews performed the task in four long workdays.

While the Lions play baseball, the 879 track-and-field trays are stored offsite. Likewise, when track-and-field is in season, the turf trays are stored elsewhere. ST

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