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"real" solutions and ongoing maintenance practices to produce optimum results. All sports fields have a light topsoil over a base of heavy clay. Three of the fields had existing hydraulic irrigation systems in place when Robinson came on board. Electronic irrigation systems have been installed on three more fields in the last two years. This is an item included in the town's budget by the aware and committed management team. There's no capability for a large-scope watering on the rest of the fields, so crews must work with the water nature provides.

Annual soil testing forms the basis for the fertilization program. Aeration is scheduled at least monthly during the Bermudagrass active growth period. The multipurpose field underwent deep-tine aeration for the second year to help cope with the compaction caused by heavy use. USGA-grade sand — or as close to it as the budget allows — is used to topdress fields following aeration.

Although Robinson would prefer to overseed with perennial ryegrass, long, cool spring weather can make for a difficult transition back to Bermudagrass, so annual ryegrass is used on all but the multipurpose competition field. "We've had the Bermudagrass greenup occur as early as April — and as late as June. And we've overseeded in December and had the seed do well. Despite the temperatures, spring practices start in March and play of some type continues on the fields through November," he explains. "Once school is out in the summer, we have softball or baseball games six days a week and four to five games on each field everyday. With such 'windows of opportunity,' flexibility is a necessity."

Robinson works with the parks and recreation director and, through him, with the programming staff. The programming staff assigns time slots to user groups (who make their own team assignments) and actually sets the field-use schedules for town-sponsored groups. Field-use decisions are Robinson's call. "Safety is the first priority, then field conditions. We weigh the importance of the game with what play under existing conditions will do to field quality. We've hammered out policies through trial and error, but a system workable for all has emerged.

He makes sure all division personnel are aware of the total program, not just their own responsibilities. "We work for the whole town. Besides letting people know that our phone works and our doors are always open, we want all crew members to be accessible and knowledgeable. If a facility user has a question about when a maintenance procedure will take place, why it's needed or anything else about pertaining to city property, we want the crew member that person approaches to be able to tell them. And if an answer can't be given, the staff member will say, 'I'm sorry, I don't know. But I'll contact (whoever the key person is for that area) right away and find out.' And they get the necessary information to make sure the person can be contacted right away.

"I also make a practice of attending some of the nighttime events to talk to participants and group leaders for feedback. Working with the facilities everyday gives us a good handle on conditions, but users may have a different perspective, especially on specific areas and things we can do to make their enjoyment of the site even better."

Despite the rigorous schedule, Robinson squeezes in time for his growing family. He and his wife, Nancy, have a son, Sam, who will be a year old on March 10. Stepdaughter Jessica is a teenager. Robinson and stepson, Greg, celebrated Greg's 11th birthday last New Year's Eve by attending the Peach Bowl. "When things get especially hectic, they basically see me go and see me come back. But they understand that the job has demands and they're very supportive of me and my efforts," he says.

"There's so much personal satisfaction in this field. With so much changing in the industry and in this position, it's a continual learning process. There are so many people willing to share their knowledge and personal expertise. The results of what can be accomplished have such an impact on the growth and development of each community, and of our future generations. It's great to be a part of it." ❑

Bob Tracinski is the manager of public relations for the John Deere Co. in Raleigh, NC, and public relations chair for the Sports Turf Managers Association.

What's in a Name? Important Changes in Turf Fungicides

By Dr. Gail L. Schumann

Intelligent use of turfgrass fungicides today requires more detailed knowledge of the commercial products than in the past. The most important piece of information in choosing a fungicide is the chemical name of the active ingredient or ingredients — especially if it is one of the growing number of combination products.

Since the chemical structure names are difficult to remember and pronounce, manufacturers apply for an approved common name from the American National Standards Institute. In this case, the common chemical name for Chipco 26019 is iprodione. If the manufacturer uses the common chemical name on the label, one knows the active ingredient. These are the names used in the fungicide chart of the *Professional Turfgrass Management Guide for Massachusetts*. The chemical structure names are more difficult to remember and usually even scientists have to look them up.

There are two reasons to know what active ingredients are in the fungicides you use. First, although many diseases are listed on most fungicide labels, certain products are more effective for certain diseases. If you have used a fungicide for a particular problem, and it has not given satisfactory results, there is not much of a point applying the same product with a different trade name.

The second reason to know the active ingredient in a fungicide product is for intelligent planning to prevent or delay fungicide resistance. Fungicide resistance means that the fungus population has become immune to the fungicide, so control is reduced or nonexistent. Even though you are using different trade-name products, you may not be using different ingredients. Also, several of the newer products are combinations of fungicides that have been available for some time.

Fungicide Resistance

To manage fungicide resistance, it is necessary to know the fungicide chemical groups. For broad-spectrum systematic fungicides, there are three chemical groups: the benzimidazoles, the dicarboximides and the sterol inhibitors (often called DMI or SBI fungicides).

If a fungus becomes resistant to one fungicide in a group, it will automatically be resistant to the other members of the group even if you have never used those products. To prevent or delay fungicide resistance, it is necessary to rotate or mix active ingredients from different fungicide groups. Contact or protectant fungicides are important alternative products because they are not subject to resistance problems.

All turfgrass managers should have an up-to-date listing of turf fungicides with both their trade and chemical names. These lists are no substitute for reading pesticide labels, but they can be very useful in planning your purchases after you read the fungicide advertising, which, of course, stresses the trade names of the product. These lists are especially helpful in identifying the active ingredients in the growing number of combination products. If you have trouble finding or understanding the name of the active ingredient in any product, be sure to ask for more information from the chemical-sales representatives or a cooperative extension specialist.

New Trade Names

In recent years, some important changes have occurred in the availability and trade names of turfgrass fungicides. For example, vinclozolin is an active ingredient that belongs to the dicarboximide chemical group. This fungicide is now sold under at least three different trade names: Curalan, Touche and Vorlan. Chlorothalonil was previously available under the trade name Daconil 2787. It is an important product in fungicide-resistance rotations and mixtures because it has not been demonstrated to be subject to resistance problems. It is now available under several other trade names, including Echo, Manicure and Thalonil.

Anilizine (Dyrene), benomyl (Tersan 1991) and mercury products will no longer be available for turfgrass use after current supplies are gone. However, two new fungicides are available under federal labels. Flutolanil (ProStar) is a systematic fungicide. It is labeled for diseases caused by fungi in the Basidiomycete group, including brown patch, fairy ring, gray snow mold, red thread and yellow patch (cool-weather brown patch). Cyproconazole (Sentinel) is a fungicide with a label for many important turfgrass diseases. It belongs to the sterol inhibitor (DMI) chemical group and should be considered the same as other members of that group when planning strategies to delay fungicide resistance. Some new trade-name fungicides actually contain active ingredients. New combinations of those ingredients have been available for some time.

Remember that the best way to reduce the chance of fungicide resistance and get the best results from a fungicide application is to use fungicides only when necessary and as part of a well-planned program of cultural practices. Good cultural practices will reduce the amount of damage and improve turf recovery when disease does occur. ❑

Dr. Gail L. Schumann is a plant pathologist with the University of Massachusetts, Amherst.

Getting a Jump on Spring

Plants treated with triazole compounds exhibited reduced transpiration, increased yields under moisture stress, delayed senescence, and increased chlorophyll as well as carbohydrate content.

Three to five light irrigations a day provide good conditions for grass seed germination. Photo courtesy: Hunter Irrigation.

By Daniel Ingham

The first days of spring mean many things to many people. To sports turf managers, it means a race against time to get grass to grow in time for the playing season. It's the pre-game show that few ever see or even hear about.

As the weather warms, athletic-field managers have little time to waste as they try to establish healthy turf that will maintain a high-quality playing surface through countless baseball, soccer and rugby matches. A combination of seeding, core cultivation and topdressing is the key to successful seeding and overseeding. In addition, techniques such as the use of plant growth regulators (PGRs) can tip the odds in your favor.

Turf in the winter is not immune to compaction problems. The turfgrass plant, especially its crown, is vulnerable to damage when feet or vehicles trample frozen or partially frozen ground. During the early spring, turf and soil tend to be wetter. The wetter soil is more vulnerable to compaction.

Early-morning frost, which is typical in the spring, presents special problems. The frost consists of sharp needle-like crystals. These crystals can damage turf when people walk across the frosty ground. Whenever possible, keep people off frost-covered turf. If you can't prevent traffic, lightly spray the turf to wash off the frost.

Core Cultivation

Unless you address any underlying compaction problems, overseeding will not provide the desired results. The most direct benefit of aeration is the improved *exchange* of air and moisture between the soil and the atmosphere. The term exchange is important because air and water must both enter and exit the soil profile. Plant roots and microorganisms in the soil consume oxygen and release carbon dioxide during respiration. Plant health and nutrient uptake are reduced when the rootzone lacks sufficient oxygen.

Compacted soil disrupts air exchange. Air, located in the pockets or pore spaces between soil particles, occupies roughly 25 percent of the volume of good soils. Compaction reduces the amount of pore space available for gases and moisture and restricts their exchange.

Water plays a major role in the exchange of air in the soil. It displaces air in the pore space when rain falls or irrigation is applied faster than the soil can drain. In well-drained soils, water coats the surface of soil particles, moving from one particle to another by a process called capillary action. In such conditions, pore space is open for air exchange and moisture is available to plant roots and beneficial microorganisms.

The following are characteristics common to compacted soils:

- Poor water movement, air exchange and rooting;
- Layers in the soil that reduce water, air movement and rooting;
- High salt levels, particularly in high-sodium soils;
- Subsurface soil compaction;
- A high water table formed by a compacted layer.

Aeration improves infiltration of water into the rootzone. This is especially helpful on moderate slopes where runoff is most likely. Consequently, irrigation run times for compacted areas can be lengthened following aeration.

As moisture moves further into the rootzone, turfgrass plants will respond by generating deeper and more extensive roots. The "moisture reservoir" for the turf is multiplied, enabling the plant to establish a deeper root system, thus increasing its drought tolerance. Eventually, the interval between irrigation can be lengthened because of this extended root system.

Deeper root systems also have a larger volume of soil from which to extract nutrients. Fertilizers, as they become soluble, are moved into the rootzone by surface-applied water. Slow-release fertilizers can be applied soon after aeration to improve their storage within the rootzone.

Pesticides that need to enter the soil to be effective can also be applied following aeration. In some cases, application rates can be reduced since you are assisting the placement of the pesticide in targeted areas by aeration.

Indirectly, aeration benefits virtually all critical growth factors and improves the effectiveness of all other maintenance practices.

Aeration brings the turf rootzone into balance and allows the plant to function in a healthy, conditioned environment. This is the ultimate achievement for a manager of turfgrass.

Overseed Prep

Overseeding is considerably more complex than simply spreading seeds. As a practice, it will accomplish little more than feeding the local bird population.

Before any overseeding can take place, a number of preparatory steps are necessary. Without adequately treating the seedbed, the new grasses will not properly establish in the soil.

Turf should be aerated a few weeks before overseeding to allow good seed-to-soil contact. The seeds themselves can then be applied with a variety of mechanical spreaders and seeders.

After distributing the seed, a thin layer of topdressing, such as compost, humus or mulch, should be used to keep seed in contact with the soil and protect it from wind, erosion and birds. The initiation of germination depends on the top 1/2 inch of the seedbed being kept moist. Three to five light waterings each

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Spring Seeding

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day to moisten the surface usually provide the best results. Care should be taken to avoid puddling or washing out the seed, which occurs when too much water is applied at one time. With today's high-tech controllers, this should be easy to avoid.

The length of time necessary for the new grass to germinate depends on a variety of factors, including climate, moisture and seed type.

During this germination phase when watering is frequent, turf diseases such as pythium can develop. A preventive fungicide program is important when dealing with high-density, cool-season seedling populations if conditions are favorable for disease. This has led to innovations such as fungicide-treated seeds, which cost more while providing insurance against disease. In addition, preplant or complete fertilizers are usually applied at the time of seeding to provide the essential nutrients for seed development.

Biostimulants

Biostimulants are non-mineral substances that stimulate metabolic activity when you apply them to plants. They stimulate growth and include hormones (auxin, gibberellins, ethylene and cytokinins), vitamins, organic acids, chelating agents, enzymes, coenzymes and triazole compounds. Two of these that have been researched extensively at Virginia Tech, cytokinins and triazole compounds, are proving to be very effective.

A cytokinin is a hormone plants manufacture that affects plant growth. It can be naturally derived or synthetic. Seaweed naturally contains high levels of cytokinins and other plant growth-regulating material. Therefore, seaweed performs better in stimulating turfgrass growth than the synthetic cytokinin.

Seaweed has been known to stimulate plant growth for centuries. However, it was not until the early 1970s that the growth enhancement of plants correlated with seaweed was attributed to cytokinins. Since then, cytokinins have been associated with delaying leaf senescence, enhancing bud initiation and regulating plant growth.

Triazole fungicides originally were researched for their ability to control fungi. About a decade later, research discovered applications of triazole compounds that inhibit sterol biosynthesis also cause an increase in plant-water content. This aspect can have an important impact on plant-water management.

It was shown in 1983 that Kentucky bluegrass shoot and root growth were reduced when triazole compounds were applied. At low rates, these compounds cause growth reduction of the foliage but not plant roots. This is because the foliage's growing points are at the base of the sheath. The roots' growing points are at the root tip. The reduction in top growth and increased plant-water retention of triazole-treated plants appears to contribute to an enhanced root development.

By 1986, it was shown that plants treated with triazole compounds exhibited reduced transpiration, increased yields under moisture stress, delayed senescence, and increased chlorophyll as well as carbohydrate content. Also, these compounds helped to protect

plants from chilling temperatures, heat and ozone.

Unpublished studies have shown that applications of seaweed extracts, as well as triazole compounds to turfgrass, have enhanced plant-water retention, salt and drought tolerance, and shifted fatty acids within the plant toward unsaturation. Also, preemergence herbicide injury was reduced when the turfgrass was previously treated with biostimulants.

PGRs and Overseeding.

PGRs can help with overseeding and spring transitions.

Making a PGR application before seeding into existing warm-season turf stands can give the new seedings a competitive advantage. This may help to hasten the establishment of the overseeded grass. Soil moisture, nutrients and light will be more accessible. Also, the PGR will control the existing turf growth for three to four weeks, relieving the compaction stress from mowing.

Bermudagrass is an aggressive turfgrass. By suppressing its growth, you tip the competitive advantage over to the newly planted turf.

Care should be taken to avoid puddling or washing out the seed, which occurs when too much water is applied at one time. With today's high-tech controllers, this should be easy to avoid.

Ryegrasses germinate quickly, so they can rapidly take advantage of the suppressed Bermudagrass. This gives the ryegrass a chance to develop a healthy stand, especially in particularly warm fall seasons when Bermudagrass can remain aggressive late into the season. Fescues, which do not germinate as quickly, also can be helped to establish in this way.

The same principles apply to spring transition. Cool spring conditions can favor the cool-season species well into the late spring. By applying a PGR, you give the advantage to the Bermudagrass or other warm-season varieties.

A lower application rate is needed for fescues and ryegrasses because they are more sensitive to PGRs. Some slight discoloration may occur on ryegrass with some PGRs. Check the product label for the recommended application rate.

Apply the PGR when Bermudagrass begins to show a consistent green color. At this point, the Bermudagrass should be quite competitive. The PGR application to suppress fescues and ryegrasses is about 1/8 of the rate required to suppress Bermudagrass growth, so the PGR application won't significantly affect the emerging Bermudagrass. If you decide to seed the Bermudagrass, wait at least three days after the PGR application (two weeks in California). ❑

Kentucky Bluegrass

By Helen M. Stone

Surprisingly enough, Kentucky bluegrass did not originate in Kentucky. Instead, it was introduced from eastern Russia in the 17th century. Early transport ships used soil from the region for ballast. When they reached America's shores, the soil was shoveled out of the ships' holds, so they could be filled with goods from the New World. In addition, immigrants also brought seed with them. "Kentucky was the first place the seed was grown for commercial production, so that's how the name originated," says Dr. Doug Brede, research director for Jacklin Seed Co. in Post Falls, ID. Production began about 100 years ago.

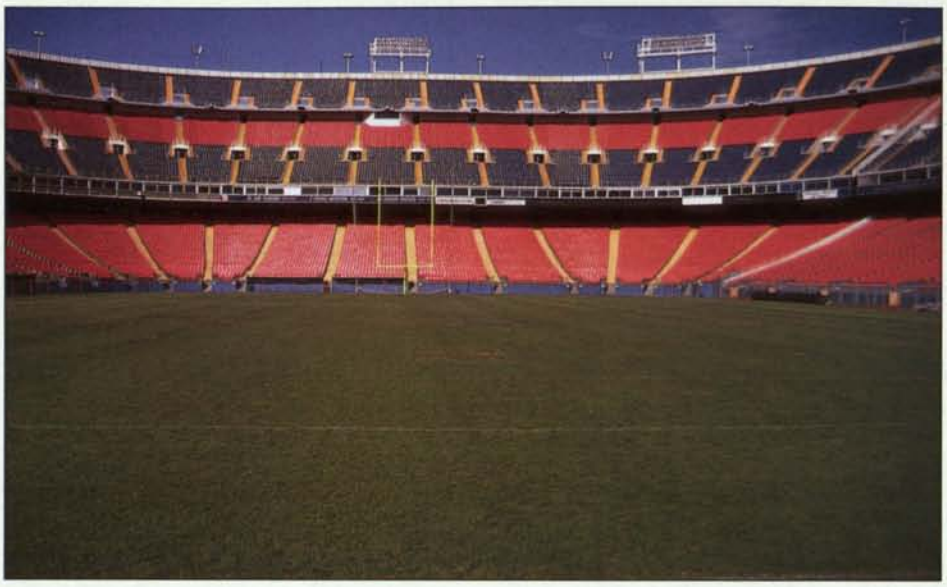
Today, Kentucky bluegrass is considered the most important and is certainly the most widely used northern turfgrass. You can find it throughout the cool-season zone, and even at high elevations in the subtropical zone.

Kentucky bluegrass produces rhizomes. These stems elongate horizontally from the crown of the parent plant, and grow beneath the soil surface (stolons also come from the crown of the plant, but grow along the surface of the soil). This spreading habit allows it to recuperate well after injury and "fill in" bare spots with time and proper culture. However, it is considered only moderate in wear resistance.

The leaf texture is medium to medium fine. Establishment rate from seed is considered slow. Nitrogen requirement can vary according to cultivar, but is considered medium among turfgrasses, ranging from 2 to 6 pounds per 1,000 sq. ft. per year.

Mowing frequency is less than for perennial ryegrass and about the same as turf-type tall fescue. Of course, your mowing schedule will be affected by the fertilizer and water scheduling.

Drought tolerance is considered good. However, this tolerance comes at a price. When temperatures are high and drought conditions occur, the turf will become dormant and lose color. It will recover soon when cool, moist conditions return.



At Mile-High Stadium in Denver, Kentucky bluegrass takes hard traffic and still provides an excellent playing surface. Photo courtesy: Jacklin Seed Co.

Since Kentucky bluegrass is considered a cool-season turf, it should come as no surprise that the majority of root initiation occurs in the spring. There is also some root growth during the cooler weather in the fall. The grass also retains a major portion of its roots for more than a year, so it is classified as a perennial rooting grass. (Some bentgrasses and perennial ryegrass replace most of their root system every year and are considered annual rooting grasses.)

Kentucky bluegrass has been the subject of a great deal of research and breeding. Some of the varieties recommended for sports fields include Asset, Broadway, Buckingham, Haga, Julia, Limousine, Miracle, NuBlue, NuStar, Parade, Unique, Viva and Wildwood. However, since new varieties are released every year and your location, soil and climate will influence performance, you need to cultivate local contacts for recommendations. Your cooperative extension office or seed supplier are both good places to start. If you are fortunate enough to have a college or university with a turf program nearby, most will run trials that can help you find a suitable cultivar. In addition, networking with other turf professionals at local association meetings is a good way to learn more about what works in your area.

Insects and Diseases

Like all plants, healthy turfgrass that is adequately watered and fertilized is the least likely to develop insect and disease problems. In addition, turfgrass breeders have developed Kentucky bluegrass cultivars that are resistant to some of the most common maladies.

However, sometimes in spite of your best efforts, your playing fields may be plagued with pests. Here are some of the more common problems associated with Kentucky bluegrass, along with steps you can take for control.

• *Bluegrass billbugs.* If your turf looks wilted and you know irrigation has been adequate, chances are you have a billbug infestation, especially if it's mid to late summer. Billbug larvae feed on turf roots and stems, and turf can be pulled up easily. "Frass," a material that looks like sawdust, can often be found in turfgrass thatch. Billbugs can be controlled with carbaryl (Sevin, Sevimol), chlorpyrifos (Dursban), isazofos (Triumph) and isofenphos (Oftanol). A recently introduced product, imidacloprid (Merit), also provides control.