Tackling the challenges of overseeding and transitioning

By Dr. Shawn D. Askew

Who is the most unruly taskmaster in the athletic complex? Is it the athletic director, the coach, the fans, or the players? The correct answer is time. Time never yields and is always demanding. It never gives you enough and takes from you constantly. It demands pinpoint accuracy from you and does not care that you dodge things like weather, sporting events, and sickness.

Much is asked of the sports field manager and, unfortunately, much of what you do has little to do with taking care of grass. So when you are doing things to keep the field green, it is of utmost importance that your actions count; that you make a difference. Of all the things done to keep a playing surface in great shape, few are more important than overseeding; especially for fields including warm-season grasses like bermudagrass. On warm-season fields, your success as a field manager is measured in large part by your success in establishing and managing overseeded grass.

We often talk about "the transition" as if there were only one transition associated with overseeded game fields: the spring transition. In fact, there are two transitions, one in the spring and one in the fall. When you are trying to establish an overseeded grass in the fall, you are transitioning from a bermudagrass monoculture to an overseeded stand. In the spring, you want to eliminate the overseeded grass to preserve the health of the bermudagrass underneath. Unfortunately most game fields experience use during at least one of these transitions.

Into dense bermuda

In years past, establishing ryegrass or other appropriate grasses in the fall was not very difficult. It seems now that our quest to select bermudagrasses with extreme wear tolerance and increased density is

[Figure 2] Patriot bermudagrass canopy showing mass of stolons and thin layer of leaves on top.

Continued on page 11

causing difficulties with establishing overseeded grasses in the fall.

Patriot bermudagrass has been widely successful in the northern states due to its density, wear tolerance, and cold tolerance. One of the largest problems facing those who adopt Patriot for their game fields is difficulty in establishing perennial ryegrass in the fall. The canopy architecture of Patriot has not been scientifically compared to previously existing cultivars but close observation reveals several differences. Patriot's density seems to come predominately from stolon mass and not leaf mass (see Fig. 1). Patriot had more than twice the biomass of Midiron due to a higher percentage of stolons. Starch content per unit stolon weight was actually higher for Midiron because Patriot's stolons were smaller (data not shown). Patriot tends to have a densely packed canopy of small stolons with a layer of leaves on the surface (Fig. 2). In contrast, most other bermudagrasses have leaves throughout the canopy and much lower stolon mass.

The increased stolon mass and canopy architecture of Patriot likely give the grass its superior wear tolerance but is also responsible for increased scalping problems when mowing is delayed and for decreased perennial ryegrass establishment in fall. Research is currently underway to characterize methods that will aid in the establishment of overseeded grasses into Patriot and other dense bermudagrasses. Although the data are not in, the following are techniques that we plan to test at Virginia Tech to help solve the establishment problem:

Verticut and open the canopy. Field managers in the Deep South are accustomed to cutting or slicing the field in several directions to aid in perennial ryegrass establishment. In the North, winterkill is more of a concern and the practice is less common. At Virginia Tech, we have verticut Patriot up to four directions before overseeding and have not had problems. More research is needed to thoroughly test the procedure.

Use a plant growth regulator or suppression chemical. Products like Primo Maxx (trinexapac ethyl) can be applied to bermudagrass until emergence of the overseeded grass. Other growth regulators like Cutless (flurprimidol), Trimmet (paclobutrazol), and Embark (mefluidide) may be injurious to perennial ryegrass seedling emergence. Turflon Ester (triclopyr) can also be used for more aggressive bermudagrass suppression but may be too aggressive against bermudagrass and injurious to seedling establishment. Consult the label to determine restrictions on seeding after treating with any suppression chemical.

Use a spiker to force seed through the canopy. Any piece of equipment that can safely move the perennial ryegrass seed down to the soil is beneficial to overseeded establishment. We have even used blowers for this purpose. Several Patriot fields have had problems where overseeded perennial ryegrass germinates in the middle of the Patriot canopy. Although perennial ryegrass roots can find the soil even if the seed are lodged between bermudagrass stolons, any wear on the field quickly severs these roots, killing the perennial ryegrass. Topdressing the field with sand or other materials could also help in survival of these "midcanopy" seedlings.

Use paint to keep things green. In addition to winterkill, a second problem with aggressive disruption of the bermudagrass canopy is decreased turf aesthetics. Even folks who don't like using paint might consider the use during this transitional period. After the perennial ryegrass is established, the need for paint will diminish. By the way, paint is an excellent alternative to overseeding on dense bermudagrass fields and should be considered depending on how aggressive the field is used and the expected turf quality during the dormant season.

Use covers to keep things green. Dr. Mike Goatley at Virginia Tech has conducted several experiments demonstrating the ability to keep bermudagrass green during winter using turf covers. Depending on your playing season, turf covers could be an excellent method to keep fields looking good during the winter. By keeping turf paint on hand as a "backup," you may be able to go at it alone with just bermudagrass.

Killing the overseeded grass

About the time your overseeded perennial ryegrass reaches a perfect stand and the field is striping nicely, it is time to kill it to release bermudagrass that is breaking dormancy. Bermudagrass needs 85 to 100 days of competition-free growth to sustain maximum density and health. It is important that the overseeded grass be eliminated as soon as possible in the spring. In the Deep South, simple cultural practices such as lower mowing, increased fertility, and decreased watering will do nicely to aid bermudagrass in overcoming and killing the existing cool-season grass. These practices help in the North, but herbicides must be used due to lack of harsh climate and shorter bermudagrass growing season. There are several new herbicides in the sulfonylurea class of chemistry that

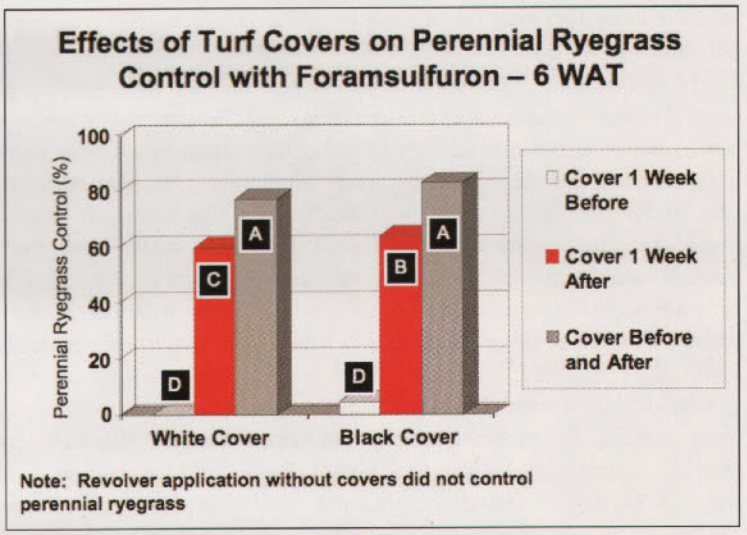
[Figure 1] Dry biomass of aboveground foliage from Patriot and Midiron bermudagrass as affected by the number of competition-free days the bermudagrass was allowed to grow in Blacksburg, VA.

are available to chemically transition overseeded game fields (see Fig. 3).

Plots were treated weekly at Virginia Tech with Revolver (foramsulfuron), Monument (trifloxysulfuron), and Flazasulfuron 25DF, an experimental herbicide from ISK biosciences, to determine effects of environment on herbicide efficacy for perennial ryegrass control. Of these, Revolver has the market share due to excellent bermudagrass safety, reduced restrictions on seeded bermudagrass, and excellent perennial ryegrass control. Monument is an excellent choice and provides superior perennial ryegrass and annual bluegrass control. Manor can be hit and miss for perennial ryegrass control and is less effective for annual bluegrass but still performs excellently for a large sector of the market, especially in the South.

Tranxit GTA (rimsulfuron) is also an excellent herbicide for perennial ryegrass control at rates of 2 oz/A or better. Kerb (pronamide) is an older herbicide that gives a smooth transition in the South but often fails to completely control perennial ryegrass and annual bluegrass in the North.

Several complaints of poor perennial ryegrass control have been received from patrons who used sulfonylurea herbicides in winter. Since it seemed these control failures were related to temperatures, we conducted studies last year to evaluate temperature influence on three sulfonylurea herbicides (Revolver, Monument, and Flazasulfuron 25DF. These herbicides were applied at labeled rates each week for 17 weeks. Environmental conditions including soil and air temperature, solar radiation, photosynthetically active radiation, leaf wetness period, and soil moisture were recorded at hourly intervals with weather stations at each site (Fig. 4).

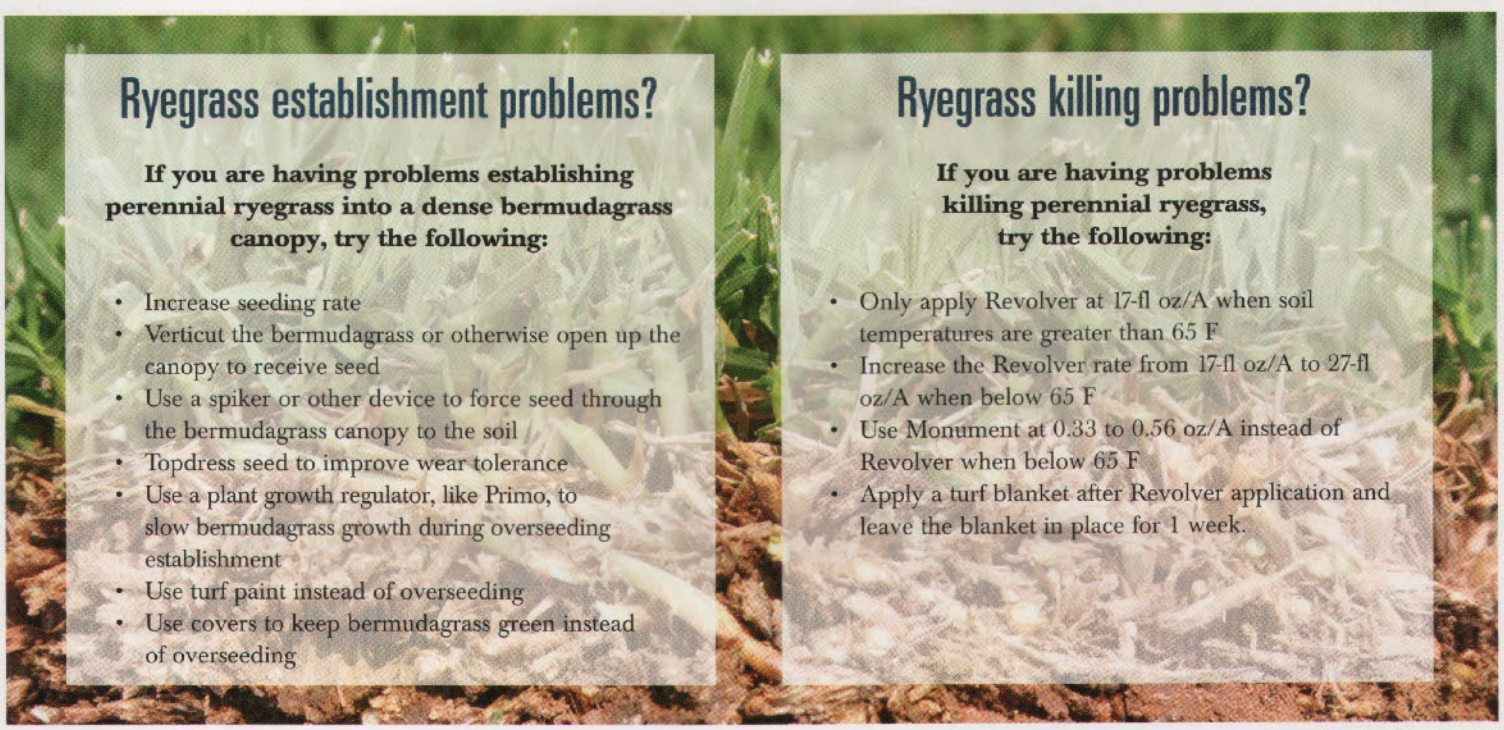


[Figure 3] Plots were treated weekly to determine effects of environment on herbicide efficacy for perennial ryegrass control.

Temperature effects on efficacy

Soil temperature was the most influential environmental influence on perennial ryegrass control with the three herbicides tested. Cold temperatures negatively impacted Revolver more than Monument or Flazasulfuron 25DF. Perennial ryegrass control 9 weeks after treatment by Monument was not correlated to temperature and tended to be inconsistent at both high and low temperatures. Revolver tended to control perennial ryegrass consistently when average soil temperature for 5 days before and after treatment were 65 F or higher. Despite some inconsistencies, Monument controlled at least 70% of perennial ryegrass 65% of the time when temperatures were below 65 F and 67% of the time when temperatures were above 65 F.

In contrast, Revolver controlled perennial ryegrass equivalently only 10% of the time at temperatures below 65 F and 88% of the time when temperatures were above 65 F. In short, Monument is more effective than Revolver when average temperature is below 65 F.



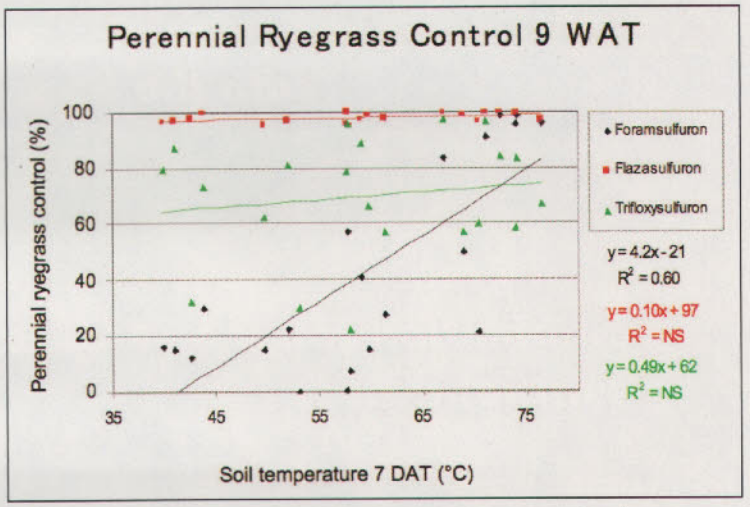
Continued on page 14

Flazasulfuron 25DF is not currently registered for use on game fields but may be soon. This herbicide controlled all of the perennial ryegrass 100% of the time, regardless of temperature.

Several things may cause poor herbicide performance. Let's examine a few other reasons sulfonylurea herbicides like Monument and Revolver may perform poorly:

- Did not use an adjuvant
- Rainfall soon after treatment
- Turf was mown soon after treatment
- Target weed is stressed due to heat, drought, disease, etc
- Mixing and calibration errors
- Poor water quality (hard water, or pH 2 units above or below 7)
- Large weeds and/or bermudagrass is not competitive

John B. Willis, Research Associate and Graduate Student, Virginia Tech, established and maintained most of the research trials discussed in this article. His efforts have made and continue to make substantial impact in the turfgrass community. Dr. Mike Goatley, Associate Professor of Turfgrass Science, Virginia Tech, provided valuable insight for the writing of this article. David McKissack, Kevin Hensler, Brent Compton, Matt Goddard, Matt Page, Andrew Monk, and Julie Keating provided technical assistance for research trials. The contributions of these individuals are much appreciated. ■



[Figure 4] Perennial ryegrass control with three sulfonylurea herbicides as influenced by soil temperature in Blacksburg.

Shawn D. Askew is Associate Professor of Turfgrass Weed Science, Dept. of Plant Pathology, Physiology, & Weed Science, Virginia Tech, Blacksburg, VA. He can be reached at saskew@vt.edu.

Breeding Better BLUE GRASSES

By Dr. David R. Huff, Dr. Ambika Chandra, and Jeff "Vern" Borger

The United States is a land of immigrants and so is our most popular sports turfgrass, Kentucky bluegrass (*Poa pratensis* L.). Kentucky bluegrass is native to Eurasia and was brought to North America by the first European settlers as feed and bedding for their livestock. In this warmer climate, Kentucky bluegrass became naturalized and like the nation's immigrants, Kentucky bluegrass developed and prospered in its use as lawns and sports field surfaces.

American-born sports like baseball and football began using Kentucky bluegrass for its beauty and durability under intensive use. Unlike any of our other immigrant cool-season turfgrasses (e.g., perennial ryegrass, tall fescue or bentgrass), Kentucky bluegrass is sod-forming and provides superior stability and traction due to its production of underground rhizome stems. These rhizomes intertwine and hold the

Kentucky bluegrass provides excellent low maintenance playing surfaces. Photo courtesy of Dr. Andy McNitt.

sod together against shearing forces. They also contain growing points called nodes where new plants can begin to develop. Normally new plants form at the tips of rhizomes as they reach the soil surface. However, a deep vertical mowing can cut rhizomes and stimulate the production of new daughter plants all along each rhizome. Turf manager Robert Hudzik uses this feature at Penn State's Beaver Stadium each spring to increase shoot density without additional overseeding.

The aesthetic beauty of Kentucky bluegrass is beyond compare due to its combination of rich green color, medium fine texture, and high shoot density. Its disadvantages include susceptibility to disease and insect pests and a tendency to become thatchy. Just as the rhizomatous growth habit of Kentucky bluegrass creates a strong sod and stable playing surface, these same rhizomes also contribute to the addition of organic matter, underneath the green leaves, called thatch. If the thatch layer becomes too thick (>1/2 inch) then playability may be hindered as the sports field becomes too soft.

In addition, the field will lose some of its ability to grow and recover from damage due to a shallower than normal root system. However, if there is too little thatch (<1/4 inch), then the field will lose its ability to absorb the impact of participants, increasing the risk of injury and/or reducing traction and the predictability of ball bounce. Properly managing the height of cut and thatch thickness of Kentucky bluegrass creates some of the highest quality sports field in any venue.

In Europe and Australia, perennial ryegrass is favored over Kentucky bluegrass (known in these countries as smooth-meadow grass) for sports fields. Here in America, Kentucky bluegrass has historically been the first choice for sport fields and today is often mixed with either perennial ryegrass or tall fescue.

During the 1980s and 90s, the component percentage of Kentucky bluegrass seed in high maintenance mixtures began to decrease as significant genetic improvements were bred into the turf-type perennial ryegrasses. In other words, genetic advances in traits like higher shoot densities, darker green color, and shorter stature began to give perennial ryegrass a quality that rivaled that of Kentucky bluegrass, and subsequently perennial ryegrass use increased in the sports turf market.

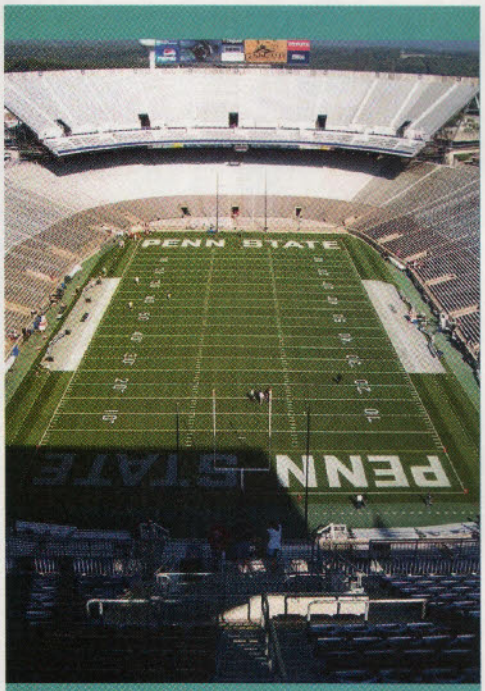
During the same time, similar genetic gains were also being realized in tall fescue. Genetic improvements in Kentucky bluegrass have lagged behind those of either perennial ryegrass or tall fescue for the simple fact that Kentucky bluegrass does not normally reproduce seed through a sexual process. The breeding system of Kentucky bluegrass is known as apomixis, which results in the asexual (without sex) production of seed. This means that every seed produced is genetically identical to the plant that produced it, or in other words, a genetic carbon copy of the seed-bearing parent. As such, attempting to bring together traits from different parents or improving a trait through artificial selection is nearly impossible. Thus, new types of Kentucky bluegrass only occur when the apomixis system malfunctions and produces

The aesthetic beauty of Kentucky bluegrass is beyond compare due to its combination of rich deep green color, medium fine texture, and high shoot density.

an off-type, or an aberrant, progeny.

Most aberrant plants are quite unacceptable for turf, however, and so tens of thousands of seedling bluegrasses need to be grown in order that just a few aberrant plants can be detected that might exhibit potential improvements. Once a superior plant has been identified, then the rest of the breeding process is comparatively easy because apomixis is a great way to preserve the genetic makeup of the superior plant and to produce genetically uniform seed. But finding an aberrant plant that exceeds the performance of any of today's top cultivars is no easy challenge. Nonetheless, the need for improved cultivars of Kentucky bluegrass remains strong because as Dr. C. Reed Funk, Rutgers University, would say, "We have a lot of good cultivars of Kentucky bluegrass, but we don't have any great ones."

Because of this need for improved bluegrasses, breeders refocused their energies over the past 15 years and have developed a



The high level of visual and functional quality of Kentucky bluegrass sports fields is difficult to achieve with any other grass.

Kentucky bluegrass x Texas bluegrass hybrids like the cultivar Rev are beginning to add significant improvements to bluegrass adaptability. Photo courtesy of Dr. James Read.

wide range of new Kentucky bluegrass cultivars (go to www.ntep.org for the latest list of cultivars along with their performance ratings from across the country). As a result of these improvements and perhaps a regained appreciation for Kentucky bluegrass's sod forming ability, the percentage component of Kentucky bluegrass in mixtures with perennial ryegrass has slowly been increasing over the past 7-8 years. Sustaining our focus on breeding improved bluegrasses, we should expect genetics improvements to continue in the coming years.

No easy task

When the time comes, choosing the right cultivar of Kentucky bluegrass for a specific use is not necessarily an easy task for the scientist or the turf manager. Basically, there are types of Kentucky bluegrasses that perform best during the spring and fall seasons and other types that perform best in the summer months. There are Midwestern common types, mid-Atlantic common types, and then there are those that nobody has quite figured out what type they are (the Miscellaneous types).

The types typically preferable for sports fields are the aggressive types and the compact types; however, these types also possess particular management requirements and may not be the right choice for everyone. Thus, the selection of which Kentucky bluegrass cultivars to blend together for a sports field depends on your application and turfgrass management resources. Since any single cultivar is only a single individual (genotype), it is best to blend several cultivars together to create some genetic diversity in order to better combat disease and other unpredictable stresses.

One of the beautiful features of Kentucky bluegrass as a whole is that there are a lot of different types of cultivars to choose from to best match your needs. Do your research and choose your cultivars wisely!

Some of the newest breeding efforts with Kentucky bluegrass have involved its hybridization with Texas bluegrass (native to North America) which has deeper roots, deeper rhizomes, and better heat tolerance. Normally, when two different species are crossed, the resulting progeny are reproductively sterile. For example, a mule is sterile because it is a cross between a donkey and a horse and the only way to get a mule is to make the cross. However, the Kentucky/Texas bluegrass hybrids are selected for their apomitic form of seed reproduction and therefore entirely avoid this genetic sterility barrier. The newest Kentucky/Texas bluegrass hybrids still lack the high turf quality of pure Kentucky bluegrass cultivars but they are beginning to make an impressive impact in turf areas reserved for low maintenance and will only improve in quality as the breeding efforts continue.

Maintenance of Kentucky bluegrass can be much different than the maintenance of pure tall fescue or perennial ryegrass but neither tall fescue nor perennial ryegrass have the rhizomatous feature of Kentucky bluegrass (including the so-called "rhizomatous tall fescues"). As budgets allow, the most important management practices to institute for any sports field are regular mowing, followed by a nutrition program (fertilization), and finally an irrigation system. When all three are combined, a very suitable field can be created. Supplementing these practices with core cultivation to alleviate compaction, vertical mowing to manage thatch, and topdressing and overseeding will only enhance the quality, safety, and durability of multi-use sports fields.

Kentucky bluegrass management is as much an art as a science. For example, Kentucky bluegrass seed is notoriously slow to germinate (10-21 days). Researchers have found that soaking bluegrass seed overnight (allowing it to drain during the day and repeat the next night) in their original woven seed bags, using a water-filled garbage can, followed by air-drying enough to flow through a seed spreader, starts the germination process and greatly enhances its establishment rate. So the next time you need to resurface or build a sports field, put Kentucky bluegrass on your list of choices. Although Kentucky bluegrass is an immigrant, its use on sports fields is as American as apple pie. ■

AUTHORS:

Dr. David R. Huff is associate professor of turfgrass breeding and genetics, at Penn State. Dr. Ambika Chandra is assistant professor of turfgrass breeding and molecular genetics, Texas A&M University, Dallas. Jeff Borger is an instructor of turfgrass and weed management at Penn State.

Improving The Development of Kentucky Bluegrass Sod & Seed with APEX-10

Kentucky bluegrass seed is a primary grass species used for temperate climate sports fields because of its density and unique rhizome growth qualities that provides wear recovery. Kentucky Bluegrass sod is selected when time constraints become a factor during seasonal play The biggest challenge when selecting sod for repair is establishing fully rooted sod as soon as possible to achieve functional footing for play and to insure player safety and turf longevity.

At Virginia Tech the organic and humus qualities of APEX-10 an OMRI approved organic peat humic substance were compared with the humic acid qualities of Leonardite. The Studies objective was to examine the establishment rate of Kentucky bluegrass post sod transplant for root mass, root strength, and tiller density (See Table 1).

At Rutgers University APEX-10 was tested with Kentucky bluegrass seed planted in sandy loam soil with adequate and deficient phosphorus levels and measured for turf height and turf density over a 6-week period (See Table 3)

Virginia Tech

At the Virginia Tech Turfgrass Research Center two studies were conducted (April 26 - July 22 & August 27 - November 23) using APEX-10 and Humic Acid from leonardite on an adequately fertilized sand based root zone with an adequately fertilized sand based root zone used as the control. The chemical properties of APEX-10 and the Leonardite were also examined (See Table 2).

Kentucky bluegrass sod was placed of medium-coarse textured sand with expanded metal sheets having uniform openings to allow root growth into the underlying sand and used for evaluating turf strength. The sod was rolled over the grates and fertilized with 15-30-15 and watered. Treatments were applied the day after sodding, with re-application every two weeks at the recommended rates until a total of six applications were

Table 1. Virginia Tech Kentucky bluegrass sod transplant, APEX-10 compared to Leonardite & Fertilizer

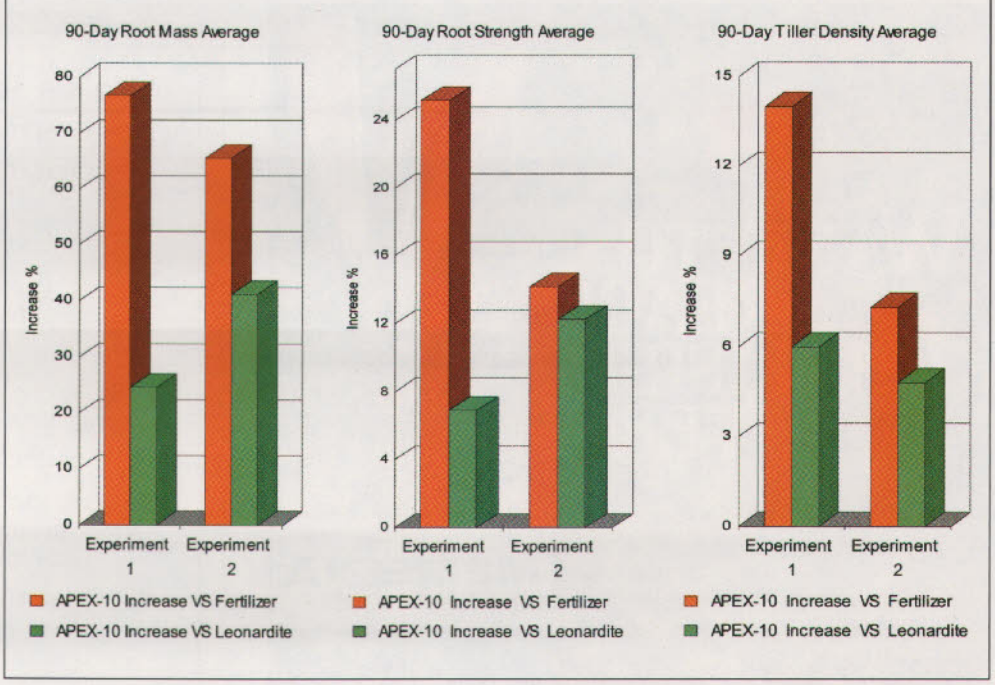


Table 2. Virginia Tech chemical analysis, APEX-10 compared to Leonardite

Chemical Characteristics of APEX-10 and Leonardite

Parameter	Peat Humic Substance	Leonardite Humic Acid
Solids content	11%	100%
Ash (inorganic) content	12.5%	34%
Volatile (organic) content	87.5%	66%
Total C	49.3%	35%
Total N	0.91%	0.78%
C/N ratio	54:1	45:1
Humic acid in solids	100%	80%
pH	4.6	9.5

Additional substances added to soil (APEX-10 Compared to Leonardite)

	APEX-10		Leonardite
		Additional Solids	809%
		Additional Inorganic Matter	172%
Additional Volatile Organic Content	33%		
Additional Soluble Carbon	41%		
Additional Nitrogen	<.02%		
Increase in C/N Ratio	20%		
Additional Soluble Humic Acid	25%		
		Additional Non-Soluble Humate	25%
		Increase in pH	106%

applied during each experimental cycle.

Mowing was performed twice weekly at the height of 3.8 cm at two weeks after transplanting, until two weeks before the end of each experimental cycle, foliar fertilizer 20-20-20 with micronutrients was applied to all plots uniformly and Irrigation was provided on an as needed basis in order to prevent visual wilting.

Rutgers University

At the Rutgers University Research Farm in New Brunswick four replications were configured and treated with and without APEX-10 and with adequate levels of phosphorus and deficient levels of phosphorus. Plots treated with APEX-10 received three applications at the rate of 1.5 ounces per 1000 sq ft to newly seeded Kentucky bluegrass in sandy loam soil and evaluated for 6-weeks.

Results

Turfgrass height and density was generally better in soils with phosphorus applied then those deficient in phosphorus. The combination of APEX-10 further enhanced turfgrass height and density when applied in soil with deficient levels of phosphorus and when applied in soils with adequate levels of phosphorus. ■

Table 3. Rutgers University Kentucky bluegrass seed establishment

6-Week Height Average			6-Week Density Average		
Plot	**Plot**	**Increase**	**Plot**	**Plot**	**Increase**
T1	T2	4.41 %	T1	T2	16.84%
T1	T3	15.25 %	T1	T3	50.64%
T1	T4	18.54 %	T1	T4	61.30%

T1 = Control With Deficient Phosphorus
T2 = No APEX-10 & Phosphorus
T3 = APEX-10 & Deficient Phosphorus
T4 = APEX-10 & Phosphorus