Update on university turf-related research projects, Part III

Editor's note: *Following are more reports from leading turfgrass researchers in the US on their current studies. Part I appeared in December 2009; Part II in February 2010.*

University of Georgia Tifton Campus

Turfgrass breeding efforts at the University of Georgia, Tifton Campus are focused on the development of stress tolerant cultivars. Recent evaluations using rain-out and shade structures, non-irrigated plots, and reduced fertilizer input have been prioritized. Pesticide applications, including insecticides and fungicides, have been eliminated from routine maintenance programs to aid in the identification of natural resistances or tolerances. Specific germplasm screens have been initiated to develop plant-parasitic nematode resistance due to the loss of the most widely used nematicide and the increased regulations on alternative soil fumigants.

Turfgrass breeding in Tifton has produced broadly adapted cultivars during the last decade that have been licensed to numerous growers in many different countries and planting across the globe. In 2009, TifGrand hybrid bermudagrass was released on the basis of it shade tolerance, mole cricket non-preference, deep green color, fine leaf texture, and plasticity of response to a range of mowing heights. TifGrand has been distributed to a network of sod producers across the US and will become widely available for sale to the public during 2010.

Currently the program encompasses breeding material from the seedling stage to advanced experimental hybrids that have persisted through rigorous testing for more than a decade. More than 40 laboratory, greenhouse, and field evaluations are underway to maintain the pipeline that has provided leading turfgrass cultivars for more than a half century. An example is a promising bermudagrass hybrid that has demonstrated the ability to maintain turf quality 12-14 days longer than currently available cultivars when water is withheld.

Collaboration with other institutions has been important during the past few years and has included work with North Carolina State University, the University of Tennessee, the University of Arkansas, and the University of Florida. A new relationship has been formed with Texas Tech University in efforts to establish a breeding location outside of the southeastern US to test advanced turf bermudagrass and centipedegrass genotypes for increased salinity, high pH, and cold tolerance, stresses not found in Tifton, GA.-Brian Schwartz

University of Georgia Griffin Campus

The turfgrass breeding program at the Griffin Campus is focused on the development of fine turf cultivars with broad adaptation and tolerance to multiple environmental stresses. Our primary focus at the Griffin Campus is the development of seashore paspalum cultivars, but we also have significant breeding efforts on tall fescue and zoysiagrass. Our multi-disciplinary team of turf scientists at the University of Georgia work closely with the breeding programs and include a stress physiologist, plant pathologists, weed scientists, an agronomist, and an entomologist.

The seashore paspalum breeding program is the largest in the world and is focused on the development of improved cultivars suitable for fine turf applications including the golf courses and athletic fields. Thus far, our cultivars, SeaIsle 1, SeaIsle 2000, and SeaIsle Supreme have been well accepted both domestically and internationally. We currently have the largest and most diverse collection of seashore paspalum ecotypes in the world and are now using this growing germplasm collection to generate new genetic variation through recombination. This approach allows us to generate thousands of new and unique individual lines each year that are subsequently screened for salt-tolerance, tolerance to low mowing, diseases, herbicides, and drought.

Superior lines are extensively evaluated for turf quality and performance over a wide range mowing heights and turf conditions for multiple years in replicated turf evaluation trials at multiple locations across the southern U.S.

The tall fescue breeding program is developing cultivars for home lawns and low-maintenance commercial applications with high levels of tolerance to soil and environmental stresses common to the southeastern US. Lines are systematically screened for tolerance to low soil pH, compaction, heat, diseases and drought. The results of these efforts are attractive tall fescue cultivars with good persistence even under the most stressful conditions.

The recently initiated zoysiagrass breeding program is using a similar strategy to that used for the tall fescue breeding program in attempts to develop new cultivars for home lawns, golf, and commercial applications with improved drought tolerance and performance in the Southeast. Our program has excellent resources including laboratories, greenhouses, more that 20 acres of irrigated managed turf area, warm-season and cool season research greens, low pH field plots, and automated rain-out shelters for drought tolerance evaluations.-Paul Raymer

Iowa State University

Seedbank research. Multiple trials are underway to determine the ability of both Kentucky bluegrass and perennial ryegrass to form a transient seed bank. This research stems from previous research at ISU to combat intense traffic scenarios and the commonplace recommendation from professionals to practice continuous seeding to establish a seedbank. We are interested to know if high inputs of seed will equate into bankable seed to perpetuate turf cover during a traffic season. Multiple and single seedings of higher than normal seeding rates are being evaluated. Also of interest is the loss in seed viability over time. Seed of both species have been buried in nylon bags to test both short and long-term viability.

Poa annua. Annual bluegrass has long been a problem for intensely managed golf courses and now it has become problematic in many closely mowed high performance athlet-

ic fields. Mesotrione (Tenacity) is a new product that was first introduced for golf courses and sod production but is now labeled for athletic fields in 2010. Mesotrione is foliar and root absorbed and has pre and post emergence activity on crabgrass, some broadleaf weeds, and annual bluegrass. One of its unique attributes for sports turf managers is that it can be applied at time of seeding. Our trials show that it requires the maximum yearly rate of 16 fl oz/A of Tenacity made in 3-6 multiple applications for effective post-emergence control of annual bluegrass. Three applications in October made 10 days apart and each at 5.3 fl oz/A has completely eliminated annual bluegrass. Applications at other times during the year may require 4-6 applications over a 2-week period to reach the recommended annual rate of 16 floz/A. Mesotrione will be a very effective tool in managing annual bluegrass as well as other weeds that compete when establishing turf from seed. Mesotrione turns the affected weeds white and they will be very noticeable on the athletic field.

Fertility and establishment. Recent demonstration trials have shown that it is possible to generate more above ground biomass during establishment from seed with increased nitrogen. Our demonstration showed that 8-10 lb N/1000 ft2 applied to Kentucky bluegrass over 2.5 months in the fall resulted in the highest percentage of turf cover when compared to lower rates applied in the same manner. In the current study, we have established grasses (KB, PR) at one seeding rate per species and four fertility rates to establish 100% cover as quickly as possible before subjecting the plots to simulated traffic the following season relative to seeding time. This study will encompass all possible establishment periods for cool season sports field managers. The first portion of this trial was seeded in April and traffic will start in June; the second portion will be seeded in June and trafficked in August; the third will be seeded in September and traffic will start immediately. Our main goal is to determine how the accelerated aboveground biomass will affect traffic tolerance and which season best fits this establishment strategy.

Earthworms and thatch. Earthworms are known to be major decomposers of organic matter on the surface of the earth. Thatch is constantly degraded by earthworms, leaving no protective layer between the soil and the grass blades to mitigate traffic wear. We are attempting to control/irritate earthworms with Sevin (carbaryl) to minimize surface disruption to the thatch layer. Once different thatch levels are established, simulated traffic will be applied to determine if earthworm control can help increase wear tolerance in a turfgrass system. Recent developments (Dr. Daniel Potter, University of Kentucky) have demonstrated that a by-product of tea tree processing results in a product that is very irritating to earthworms. We will evaluate its potential for managing earthworms and biomass on athletic fields.

Calcium products. The roles of gypsum and calcium in turfgrass are often heralded but not well understood on a research level. We are working with Calcium Products, Inc. to evaluate multiple products and their impact on turf appearance, rigidity, soil physical properties, biomass yield, and infiltration rates in a series of experiments.

Bermudagrass in the north. The use of bermudagrass continues to creep north. Bush Sports Turf established a 2000 ft2 section of Patriot bermudagrass on our ISU practice football field in Ames at the STMA Midwest Regional field day in June 2009. It completely survived the winter in both covered and non-covered plots. It is the first time that bermudagrass has survived an Iowa winter and we will continue to monitor its success in this northern climate.

Barenbrug seeding trial. A series of evaluations began this spring with a variety of different species and mixtures from Barenbrug USA. We will be testing spring, summer, and fall as establishment times for the various mixtures and traffic will commence at time of seeding to determine which species, mixtures, and blends are most appropriate for immediate traffic stress.

Results from high seeding rate establishment. Many trials over the last 5 years at ISU have concentrated on establishment of perennial ryegrass, Kentucky bluegrass, and tall fescue in high traffic situations. Our general approach to this type of study is to sow seed in excess of established seeding rates to evaluate if higher seed input results in a higher percentage cover of the intended species at the end of the simulated traffic period. In our study the traffic simulator was used to cleat-in seed and also apply traffic to emerging seedlings during the traffic season. The following seeding rates are recommended to quickly maximize turf cover. Higher rates are needed during traffic because much of the seed is lost to attrition. When traffic is absent, do not exceed the maximum seeding rates suggested or excessive seedling competition will produce weak turf.

Recommended seeding rate (lb/1000 ft2) during the traffic season or during a non-traffic reestablishment period for Kentucky bluegrass, perennial ryegrass, and tall fescue.

	During traffic season	During non-traffic reestablishment
Kentucky bluegrass	6-12	3-6
Perennial ryegrass	30-90	15-30
Tall fescue	30-60	15-30

Thanks to: Bayer, Syngenta, Calcium Products, Bush Sports Turf, United Seed, and Barenbrug, USA- Dr. Dave Minner and Andrew Hoiberg

Mississippi State University

Dog parks are becoming more popular in communities throughout the US. Most parks start out as a grassed area but many become devoid of grass or the turfgrass stand becomes very thin due to heavy dog traffic. Last spring (May 2009) we installed an experiment to examine different grasses for use in dog parks in the southeastern US. Plots (9 ft x 10ft) of ten different grasses were planted at the Starkville, MS dog park to see how they respond to dog traffic, including the effects of dog urine.

The grasses in the experiment are Tifway bermudagrass, MS Express bermudagrass, common centipedegrass, Raleigh St. Augustinegrass, Sea Isle seashore paspalum, Seadwarf seashore paspalum, tall fescue, Meyer zoysiagrass, Palisades zoysiagrass, Zorro zoysiagrass. At establishment 1 lb of N-P-K was applied from 13-13-13. The grasses were maintained under normal park maintenance and mowed week. Since this was an establishment year, nitrogen was applied at a rate of 1 lb of N per 1000 ft2 per month from 19-0-

19. The grasses established from sod, and dogs were fenced out of the plot area for 2 weeks after the sod was laid. The area was kept well watered for these 2 weeks.

During the first season of observation, all grasses except for the tall fescue performed well. No grass variety was found to attract more dog excrement than any other variety. Dog urine spots occurred in all varieties but none lasted for more than a week. This was a very rainy summer in Starkville and the seashore paspalum cultivars had some problems with disease, but the grass did come back when the disease pressure lessened. The plots were not located in very high traffic areas of the park and it is doubtful any grass would hold up well in these areas, such as along the fence, and near the gate areas.

The fall of 2009 was one of the wettest on record in Starkville and soil at the site remained saturated for much of this period and the winter of 2009-2010 had some of the lowest temperatures we have seen in the last decade. In the spring of 2010 it appeared that some plots of centipede grass and St. Augustine grass had not survived the winter well. All the rhizomatous warm season grasses tested survived the winter with more than 50% cover of the intended grass on May 15, 2010.

Plots of these grasses were also established on our research farm for a more controlled test of the effects of dog urine on grasses. That experiment will be conducted this summer.-Dr. Barry Stewart

Virginia Tech

Seeded bermudagrass blends have generally been discouraged because of concerns with turf uniformity due to the different morphologies and colors of multiple varieties. Superior cold-hardy varieties such as Riviera have proven to be well adapted to Virginia's climate, but the seed is very expensive and the grass is typically one of the slowest bermudagrasses to establish. What would be the outcome of blending Riviera seed with Common bermudagrass, a low-cost, cold intolerant variety, or Wrangler, a cold-tolerant, slightly cheaper cultivar developed for animal grazing systems? The hypothesis was that the improved Riviera variety would ultimately dominate the stand.

To test our hypothesis, Riviera seed was blended with Wrangler or Arizona Common at 0, 25, 50, 75, or 100 % by weight and seeded at either 0.5 or 1 lb pure live seed per 1000 sq ft in Blacksburg, VA in the summer of 2004. A commercially available blend, Riata (containing 60% Wrangler and 40% Riviera by weight) was also included in the experiment. The plots were maintained at a 0.75 in cutting height (all clippings returned) by mowing twice per week during the active growing season. The plots received a total of 3 lbs of N/1000 sq ft per summer season (1 lb N/1000 sq ft every 4 weeks) each year. No supplemental irrigation was supplied after establishment. Data were collected on % establishment rates, visual turf quality, and spring greening characteristics. At study completion in late summer 2007, all plots were allowed to go to seed in order to measure for visually distinct differences in seedhead heights.

Establishment rates. As expected, the 1 lb/1000 sq ft seeding level tended to provide quicker establishment rates for all treatments in year one as compared to the 0.5 lb/1000 sq ft level, but there were no significant differences in other treatment responses between the seeding levels beyond initial establishment. There were no significant trends in establishment rates for any blend at the 0.5 lb/1000 sq ft seeding level. However, there was a significant linear increase in ground cover as % Riviera increased in R/W blends. As larger percentages of Common were blended with Riviera, plot establishment rates tended to increase, but were only significant at the 1 lb/1000 sq ft seeding level on one date in July 2004. Riviera establishment from seed has consistently been slower than other seeded bermudagrasses in Virginia Tech research trials and led to our hypothesis that blending the fast establishing Common with Riviera could improve establishment and coverage ratings.

Spring greening. As spring greening progressed in all studies, the increase in % Riviera in blends with Wrangler resulted in linear increases in spring greening rate. In addition, significant positive linear and quadratic trends were recorded for spring greening as the % Riviera increased in blends with Common bermudagrass. The spring greening advantage of the more cold tolerant Riviera as compared to Common increases the competitive advantage of Riviera in dominating stand densities of these seed blends over time.

Visual turf quality. Significant linear and quadratic responses in visual turf quality were evidenced at all rating dates as % Riviera increased in R/W blends. Similarly, significant linear trends were evidenced at all rating dates as % Riviera increased in R/C blends, and significant quadratic trends were observed at 2 of the 5 rating dates in 2006 and all rating dates in 2007. The significance of the quadratic trends is that this indicates that treatments containing 50% Riviera by weight are visually similar in quality to treatments that were either 75 or 100% Riviera.

Seedhead height data. All R/C blends had significantly different mean seedhead heights from the 100% Riviera and Common standards, but were statistically similar to each other. All R/W blends had significantly different seedhead heights from the 100% Wrangler plots, and all heights for R/W blends were statistically similar (including the commercially available Riata blend). These quantitative data support the results of the subjective visual quality ratings in indicating that shifts in bermudagrass population over time favor Riviera.

In a transition zone climate, blending an improved turf-type bermudagrass variety that is highly adapted to the transition zone (Riviera) with lower quality, cheaper bermudagrasses (Common and Wrangler) resulted in:

- Riviera began to dominate the blends as early as the second growing season with as little as 25% Riviera in the initial seed blend with Common or Wrangler, resulting in a dense, high quality turf maintained at a 0.75 inch height.
- The Common component of the R/C blends was advantageous in first season establishment rates, but not at the expense of the ultimate goal of Riviera succession.
- Blending Riviera with cheaper seeded bermudagrasses offers the potential for savings of 25 to 75% of seed costs.

Blending superior cold-tolerant varieties of bermudagrass with lower cost, less persistent varieties is a viable grassing alternative for transition zone athletic fields. This strategy puts the likelihood of extreme winter temperatures to work for you in shifting the competitive advantage to the improved varieties.-Mike Goatley, Jr. ■