Turfgrass Research, Education and Extension Endowment

2009 progress reports for funded projects

The Phase I - Turfgrass Field Lab Relocation at Texas A&M University - College Station

Scientists: R. White and D. Chalmers - Department of Soil and Crop Sciences, College Station

Funding: $15,000

Objectives: With 12-acre Turfgrass Field Lab likely to be used for other university functions, the Soil and Crop Sciences Department has embarked upon establishing turfgrass research capacity on a 35-acre site off of F&B road approximately 1 mile to the north. With resources being limited the move is taking place in phases. “Phase I” has involved developing the first 5-acres. This involved:

- Water and Electric hook-ups - funding from Turfgrass Research Education and Extension Endowment (2009)
- Laser Grading: David Browning - a member of Turfgrass Producers of Texas (2009)
- Bryan Parsons with Southwire arranged a donation of 10 and 12 gauge electrical service wire and more than 10 miles of irrigation wire. (2009)
- Installation of main and lateral irrigation pipes, valves and wire. (2009-2010)
- Contribution of irrigation equipment by Professional Turf Products (2010): 162, 1-inch electric valve-in-head rotors, 162, 1-inch standard swing joints, 192, ¾-inch Rotors, 48 1-inch plastic pressure regulating valves irrigation heads, swing joints and 2 Network VP Satellite Series irrigation controllers.
- Installation of Irrigation heads by Texas Landscape Contractors - courtesy of funding support raised by the Houston “OUTREACH” Irrigation Task Force and coordinated by the Houston Gulf Coast Irrigation Association (June 2010)

Impact: This 5-acre site will allow us the opportunity to emphasize turfgrass irrigation management research at College Station. Our capacity at the Phase I Turfgrass Field Lab relocation will include:

- 17 separate 50 by 100 feet irrigated experimental plots
- 6 separate 50 by 50 foot irrigated experimental plots
- 48 separate 20 by 20 foot irrigated experimental plots

Summary: With Phase I completed our hope is that it will draw attention to our other needs for infrastructure to complete the 30+ acre site. Our goal is to help potential donors partner with us on developing a top notch Turfgrass Field Laboratory component as part of the overall Urban Ecology Center that is planned for the greater site. We are committed, like many individuals and other organizations, to promote the growth of the turfgrass industry, supporting the wise use of water in managing turfgrass as a resource, solving turf related issues with good science and providing education and outreach.

Develop Resistance to Biotype 3 - Southern Chinch Bugs that have overcome the Resistance in 'Captiva', 'FX-10' and 'Floratam' St. Augustinegrass Cultivars

Scientist: J. A. Reinert - Texas AgriLife Research - Texas AgriLife Research and Extension Urban Solutions Center - Dallas

Funding: $6,000

Objectives: The objectives of this study were to evaluate germplasm from the St. Augustinegrass (Stenotaphrum secundatum) breeding program at Texas AgriLife Research-Dallas and other breeding programs for resistance to the new virulent strain (Biotype 2) of the southern chinch bug (SCB) (Blissus insularis) and to delineate the spread of Biotype 2 throughout Texas.

Impact: Two cultivars 'Floratam' and 'FX-10' have both exhibited high levels of resistance (antibiosis or high mortality) to populations of SCB in Florida and Texas and 'Captiva', a new cultivar released in 2008 by the University of Florida has exhibited a high level of resistance to SCB in Florida. The new virulent Biotype 2 of SCB that I discovered in Texas in 2005 has spread throughout most of Texas based upon sample population that I have collected and assayed from across the state. Populations of Southern Chinch Bug (SCB) (*Blissus insularis*) have been identified in Texas that are no longer susceptible to the host resistance expressed by 'Floratam', 'FX-10' or 'Captiva' (the new cultivar just released by the University of Florida that is resistant to the SCB in Florida that are no longer impacted by the resistance in Floratam). I have identified populations of SCB in Wharton, Dallas, Houston and Huntsville that are not strongly effected by the Resistance in either Floratam or FX-10. Additionally, these same populations sustained very low mortality (only 5 to 28%) when confined on Captiva for a 7-day feeding period. Based upon the information available on these populations, it has become convincing that a new biotype of virulent SCB are spreading across Texas. I am proposing that this new strain of SCB be designated as Biotype 3, in contrast to Biotype 2 which overcame the resistance in Floratam.

Samples of populations of SCB were collected from the Dallas area, Waco, Austin, San Antonio, Wharton, Bay City, League City, Houston, Huntsville, College Station, Bryan and Longview TX, and assayed for their susceptibility to Floratam, FX-10, and Captiva' and compared to susceptible 'Raleigh' and 'Texas Common'. At each of these locations most of the populations expressed a high tolerance to the antibiosis resistance formerly expressed by

the cultivars, Floratam, FX-10 and Captiva. A Summary of the results from all tests on populations from across Texas is provided in Table 1.

Table 1. Summary of mean % mortality and range for sampled populations of southern chinch bug populations across Texas.

Cultivar	Mortality (%) and Range			
	7-d	Range	14-d	Range
Floratam	40%	4-80%	66%	42-96%
FX-10	44%	2-88%	72%	48-96%
Captiva	19%	4-54%	27%	8-68%
TX Common	11%	2-34%	19%	4-48%
Raleigh	11%	0-34%	15%	6-38%

An average of only 40-44% mortality was expressed on Floratam and FX-10 at 7 days with the levels rising to 66-72% by 14 days. Mortality levels were similar for Raleigh and Texas Common at both 7 and 14 days exposure and only slightly higher when bugs were confined on Captiva. A mortality of ~ 10% is considered normal due to natural mortality. It is Important to note that some populations of southern chinch bugs from Wharton, Austin and Dallas only produced 6, 8 and 4% mortality on Floratam within 7 days exposure while mortalities of bugs from Wharton, Bryan, Austin, San Antonio and Longview were less than 16% on Captiva.

In two different greenhouse experiments, populations of Biotype 2 SCB were caged as mating pairs on Floratam, FX-10, Captiva, Raleigh and Texas Common through one generation to evaluate the reproductive potential and survivorship of a population of each cultivar. After one generation, the five mating pairs that were introduced produced 1 to 10.3 bugs per Floratam plant. In contrast, Captiva produced 29 to 97 bugs per plant and Texas Common and Raleigh each produced 64 to 179 bugs per plant. This data shows that Floratam even though it has lost much of its ability to kill confined SCB; it still provides considerable resistance since the insects do not reproduce and survive well on it. By contrast significant populations developed on Captiva, Raleigh and Texas Common, an indication that they are good hosts for the pest.

Summary: A total of 122 new elite hybrids, from the breeding program at Dallas, were evaluated for potential resistance to the Biotype 2 southern chinch bugs. None of the hybrids provided an acceptable level of antibiosis, expressed as mortality in 7 days.

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Evaluation of Turfgrass Species and Varieties for Drought Tolerance in a Renovated Linear Gradient Irrigation System

Scientists: B. Wherley and A. Chandra - Texas AgriLife Research Urban Solutions Center-Dallas and J. Heitholt - Texas A&M- Commerce & Texas AgriLife Research and Extension Urban Solutions Center - Dallas

Funding: $14,872

Objectives: Given the recent EPA WaterSense (http://www.epa.gov/WaterSense/) guidelines and municipal restrictions on landscape irrigation, identification of drought tolerant turfgrasses and cultural management strategies for coping with water stress are now more important than ever. The objectives of the linear gradient irrigation system (LGIS) project are to 1) quantify the degree of water stress that different turfgrass species and varieties can withstand while maintaining desirable turf quality, 2) determine the minimal amounts of water (relative to reference ET) needed to achieve desirable turf quality, and 3) to identify drought-tolerant varieties that minimize water use and environmental impact while identifying cultural management strategies that lead to greater water use efficiency.

Impact: The LGIS study will contribute to improved water conservation in managed turfgrass systems. The results of the study will be used to offer scientifically based recommendations to municipalities, landscape developers, construction companies, homeowners, turfgrass managers.

Summary: The LGIS study encompasses over 2 acres of the turfgrass research facility at the Texas AgriLife Research Urban Solutions Center in Dallas, TX. The four-replicate randomized complete block layout supports 22 varieties of grass representing six species. Plots are managed at two nitrogen fertility levels and two mowing heights. The plots are aligned side-by-side, perpendicular to the central row of irrigation, which allows for side-by-side comparisons of various aesthetic and physiological parameters between species along the irrigation gradient. The irrigation system, LGIS, creates a linear gradient of water availability through supplemental water application so that the inner section of each plot is well watered (120% of reference ET) and the outer section of each plot receives no supplemental water (Figure 1.).

Figure 1. (Right) A single replication of treatment plots within the LGIS study. The center row of irrigation heads is visible along the upper right corner of image. Relative drought tolerance of species can be assessed by comparing how rapidly quality declines as one moves to the left down the irrigation gradient.

Over the course of the initial two seasons, some interesting trends have begun to emerge from the LGIS study. First, the two annual rates of nitrogen used in the study have not to this point contributed to any significant differences in any of the parameters under evaluation. Also, there appear to be some noteworthy differences in the level of drought tolerance exhibited between species. Using the distance from the center row of irrigation to the wilt line (interface between acceptable and unacceptable turf quality) as a means of determining relative drought tolerance, buffalograss has consistently exhibited the greatest drought tolerance, as little change in quality can be noted across the entire irrigation gradient. Tall fescue, the lone cool-season species has shown the least drought tolerance, and consequently, has sustained a notable amount of weed pressure due to loss of density in drier zones of plots. Intermediate to these are bermudagrass, zoysiagrass, and St. Augustinegrass, which all have exhibited relatively similar levels drought tolerance. To this point, variety differences within species have not been as consistent.

Mowing height is also influencing drought tolerance in the LGIS study. Our data indicate that for most species, managing the turf at the higher height of cut results in improved quality in areas of the plots receiving less water; however sports-type zoysiagrass (Z. matrella) varieties tend to exhibit an opposite response, with lower mowing heights producing improved quality as soil moisture declines. Because some varieties in the LGIS study are sports-type turf, we suspected these entries might produce better turf quality at shorter cutting than at the higher heights of cut. However, with few exceptions, mowing height has had little influence on overall quality of the grasses, when averaging across irrigation treatments and fertility. This has been the case for both sports-type and lawn-type varieties

Canopy temperatures are also of interest to us in the LGIS study as we attempt to understand how turfgrass variety, irrigation, and cultural management influence or help to moderate urban heat loading. With the exception of the two buffalograss varieties, which maintained a constant canopy temperature from wet to dry zones, all grasses produced significantly greater heat loads with diminishing irrigation levels. Mowing also had a noticeable influence on canopy temperatures. Whereas the majority of varieties maintained cooler canopy temperatures at the higher mowing height, sports-type bermudagrass and zoysiagrasses maintained significantly cooler canopy temperatures at the lower mowing heights, when averaged across fertility and irrigation levels.

Because the data to this point are representative only of the first half of the LGIS study, we are cautious about making any long-term conclusions or recommendations at this time. Data from this study will continue to be compiled through 2011, after which time we hope to be able to make effective recommendations that will contribute to the advancement of water conservation within the turfgrass industry.

Developing Detached Plant Assay for Screening Major Turfgrass Diseases.

Scientists: A. Chandra and S.P. Metz - Texas AgriLife Research and Extension Urban Solutions Center-Dallas, TX

Funding: $6,000

Objectives: (1) Obtain genetically diverse isolates of various pathogens causing major turfgrass diseases and properly maintain this collection to be used in future germplasm screening efforts. (2) Development of efficient techniques for screening the progeny population for major turfgrass diseases as well as to identify resistant parental material to be used in the breeding program and (3) correlate detached plant assays with field screening of germplasm.

Impact: Millions of dollars are spent annually on pesticides as preventative and curative control measures for turfgrass disease on golf course, home lawns and other recreational sites. Fungicide use adds to the production costs of turfgrass and can contribute towards health and environmental risks. The development of turfgrass cultivars resistant to major turfgrass pathogens is a sustainable solution and is cornerstone to a successful integrated pest management program. A successful disease screening program that demonstrates a high level of correlation between various parameters used to quantify disease as found under bioassay and field conditions, allows for the selection of resistant germplasm for the advancement of turfgrass cultivars through conventional and molecular breeding efforts.

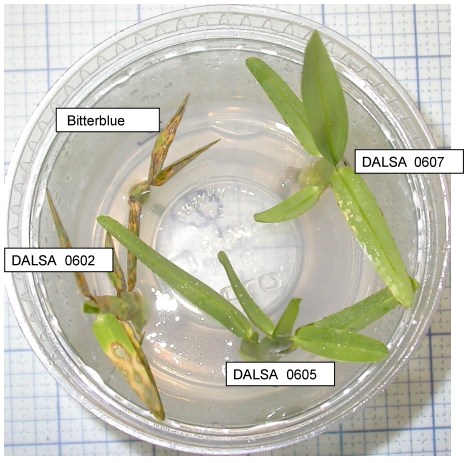

Figure 1. (Right) Detached plant bioassay identifying two St, Augustinegrass germplasm expressing high level of resistance to a mixture of two local isolates of gray leaf spot (pyricularia oryzae). Spearman's rank correlation indicates a high level of correlation between detached plant bioassay and field inoculation.

Summary: Using a detached plant part bioassay to detect a plant's resistance to major turfgrass pathogens is useful only if results have a relatively high correlation with host/ pathogen interaction as found under field conditions. Based on trials done to date, the bioassay using a detached leaf or a detached stolon to determine St. Augustinegrass resistance to gray leaf spot shows the greatest potential.

Development of State-Wide Fundraising to Benefit Texas Turfgrass

Scientist: D. Chalmers, Soil and Crop Sciences Department - Texas AgriLIfe Extension

Funding: $6,000

Objective: While the turfgrass industry and more specifically the game of golf, has many benefactors in the form of state and national organizations/associations, many of the games improvements in grass and soil systems come about through research and education at the Land Grant University turfgrass programs in each state. Texas A&M University System faculty have addressed turfgrass issues impacting the game of golf since the 1950s. Annual fundraising is important to the continuity of research, teaching and Extension outreach for the purpose aiding in the logical and orderly growth of the Texas turfgrass industry.

Impact: Directed research grant support and annual contributions are how turfgrass research is funded. Turfgrass is very much a resource in recreation, sport, ornament and environmental protection. Turfgrass research provides scientific perspective on the agronomic, environmental, economic and societal issues that face the turfgrass industry. Turfgrass research enhances golf course health by combating diseases and other pests while continually advancing the game's role in water conservation and environmental stewardship. At the same time, healthy courses help drive healthy economies. The game is worth upwards of $7.3-billion in Texas alone. Plainly said, the Texas A&M University System turfgrass program needed to develop more funding opportunities for golf turf research to meet the needs of the Texas golf industry and the challenges ahead.

Summary: Methods for involving end users of turf to support turfgrass research were formulated and evaluated for feasibility and long-term continuity. These efforts led to discussions with the Carolinas Golf Course Superintendents Association who had just completed its inaugural year of their on-line auction of donated golf tee times ("Rounds4Research"). After much preliminary discussion with the CGCSA and the the Lone Star Golf Course Superintendents Association (LSGCSA) there was mutual agreement to extend the Rounds4Research program to Texas. Rounds for Research in Texas (Rounds4Research.com) is a project of the LSGCSA administered through the CGCSA. Proceeds will benefit golf turf research in Texas and within the Texas A&M University System. As a result of this overall effort the Texas A&M University has trademarked its own brand to use to raise additional funds. "*The Grass Beneath the Game™*" brand is aligned with Texas A&M University for the purpose of positively influencing the future of "*The Grass Beneath the Game™*" in Texas.