UF/IFAS Turf Field Day and 16th Annual South Florida Turf EXPO

March Event Showcases Turf Research

Research and education programs beneficial to South Florida are part of a statewide program, with turfgrass scientists specialized in entomology, soil and water science, nematology, turfgrass breeding, plant pathology, weed science, and plant physiology. In combination with industry-generated funds, the effort depends on the support of tax revenues, which are allocated by the Florida legislature based on the importance of the turfgrass industry and its positive impact on Florida's economy and environment.

The brief summaries are intended to convey the diversity of what we are doing. This information is not presented to make recommendations for management decisions, including the use of particular products.

The South Florida Turf EXPO is co-sponsored by the South Florida Golf Course Superintendents Association. The EXPO has provided funds used to build and maintain the Otto Schmeisser Research Green.

Van Waddill, Professor and Center Director

I thank my colleagues for their enthusiastic response, and submission of these research summaries. The brief summaries are intended to convey the diversity of what we are doing. This information is not presented to make recommendations for management decisions, including the use of particular products. The information is made available to stimulate discussion and careful observation among turfgrass managers, product manufacturers and representatives, and others interested, regarding turfgrass research.

Philip Busey and Diane L. Johnston, Editors

Nematodes

Alternatives to Nemacur for Nematode Management on Golf Course Turf

William T. Crow

In 2002 12 products were evaluated on FloraDwarf bermudagrass for ability to decrease nematode populations or nematode damage, or increase tolerance to lance (*Hoplolaimus galeatus*) and stubby-root (*Trichodorus proximus*) nematodes. Each product was applied at the maximum rate monthly for six months. The treatments were evaluated for visual performance, nematode populations, and root lengths. Each treatment was compared with untreated and fenamiphos- (Nemacur-) treated plots. Turf and nematode evaluations were made monthly, two weeks after each treatment. Root lengths were measured once, 14 weeks after the initial treatment.

While some treatments had nematode population densities higher or lower than the untreated at one sampling date, there were no overall trends in nematode population reduction with any of the products. Visually, only CMP (an experimental mustard plant based product) and avermectin (a biologically-derived insecticide/nematicide) improved the turf consistently. These two products applied each month were generally as effective as two applications of Nemacur applied three months apart in enhancing turf performance. CMP in particular had consistently high visual performance compared to untreated, and outperformed Nemacur at most data-collection dates. No treatments had significantly greater root lengths than the untreated controls.

In 2003 we will be testing these same products, and perhaps a few additional ones. We will be moving to a site that is infested with sting nematodes as that nematode may be a better indicator species than lance and stubby-root nematodes. We will also be conducting the test on a different bermudagrass cultivar to see if root differences can be better quantified.

This study is funded by a grant from the Florida GCSA, GCSAA and the Bayer Corp.

Relationships between Nematode Damage and Nitrogen Use on Turf

John Eric Luc and William T. Crow

Can nematode management have a positive environmental impact? What if managing nematodes could reduce nitrogen use and nitrate leaching into groundwater? Plant-parasitic nematodes damage turf roots, making the turf less efficient at extracting water and nutrients from soil. To keep nematode-damaged turf looking acceptable often requires additional water and nitrogen . Where does the nitrogen go that is not taken up by the turf? These questions are being explored in the following experiments funded by the FGCSA and GCSAA.

Greenhouse studies are comparing nitrate leaching and nitrogen uptake by turf from sting-nematode-infested and non-infested lysimeters. Field experiments are being conducted on a fairway in north central Florida to quantify nitrogen requirements of nematicide-treated and untreated turf. The experiment will have untreated plots and plots treated with Curfew Soil Fumigant (1,3-dichloropropene). Each of those plots will be divided into four levels of fertility. Tissue nitrogen will be measured every two weeks, followed by a fertility treatment as appropriate. Differences in percent nitrogen, grams of dry matter collected, total nitrogen uptake, and root density will be compared between nematicide-treated and untreated plots.

Nematode management on turf could be linked to reduced nitrogen use and reduced risk of groundwater contamination, which could help stimulate development of new nematode-management strategies and aid the registration of new nematicides for turf.

Can Using Poor Quality Water Actually Help Your Nematode Situation?

Adam C. Hixson and William T. Crow

In many coastal areas in the southeastern United States water restrictions are causing a headache for golf course superintendents, sports turf managers, and homeowners. Seashore paspalum (*Paspalum vaginatum*) has great potential for use in these areas. Because of its tolerance to drought and salinity, use of this grass in coastal areas may aid in conservation of fresh water resources.

Plant-parasitic nematodes are damaging pests of turfgrasses in Florida, with sting (*Belonolaimus longicaudatus*) and lance (*Hoplolaimus galeatus*) nematodes being the most damaging. It is unknown how these or other plant-parasitic nematodes may impact seashore paspalum and how high-salinity irrigation will affect these and other plant parasitic nematode populations. Therefore, a salinity test was performed to examine the effects of high salinity irrigation on *Belonolaimus longicaudatus* and *Hoplolaimus galeatus*.

Treatments consisted of six different rates of salinity used to irrigate the grass on an as-needed basis. The irrigation treatments were formulated by concentrating deionized water to five salinity levels, (5, 10, 25, 40, and 55 ds/M) and deionized water to serve as a control.

This currently ongoing research has tentatively determined that at high salinity concentrations (25 ds/M and above), sting and lance nematode reproduction and feeding significantly decreases. Seashore paspalum has also shown to be susceptible to sting nematodes with a 30% to 40% root reduction when compared to uninoculated pots, but lance nematode data has proven to be inconclusive thus far.

Damage Potential of the Stubby Root Nematode Species *Paratrichodorus minor* and *Trichodorus proximus* on Bermuda and St. Augustine Turfgrasses

Johanna Welch and William T. Crow

Trichodorus proximus and *Paratrichodorus minor* are the most common species of stubby root nematodes found on turfgrasses in Florida. An experiment funded by the Florida Turfgrass Association compared the reproductive rates and root damage caused by these two stubby root nematode species on bermudagrass and St. Augustinegrass.

Twenty pots each of TifEagle bermudagrass and Floratine St. Augustine turfgrass were used for this experiment. Five pots each were inoculated with 400 T. *proximus*, 400 P. *minor*, or 100 *Belonolaimus longicaudatus* (sting nematode), and five pots were uninoculated controls. After inoculation, the plants were left for 100 days in a climate-controlled greenhouse during which all of the plants

During the Field Tours Dr. John Cisar explains the results of Ultradwarf Management studies done on the FGCSA research green. Photo by Joel Jackson

Dr. George Snyder summarizes the environmental information learned from a decade of studying pesticide applications to USGA greens from Nemacur to MSMA. Photo by Joel Jackson.

Art Lewis of Lewis Equipment demonstrates a verticutting unit during the South Florida Turf Expo. Photo by Joel Jackson.

were watered and fertilized in an equal manner. Each test was conducted twice. Results were obtained through nematode assay of the soil and root length analysis.

All three nematode species reproduced on both turf species. Both species of stubby-root nematodes damaged bermudagrass roots, but *T. proximus* caused greater root reductions, equal to those caused by sting nematode (considered the most damaging nematode on turfgrasses). Bermudagrass root lengths were reduced 22% by *P. minor*, 41% by *T. proximus*, and 36% by sting nematode. Both stubby-root nematode species caused equal damage on the first trial on St. Augustinegrass, but *T. proximus* caused greater damage than *P. minor* in the second trial.

Sting nematodes did not damage Floratine St. Augustinegrass roots in either trial. The two stubby-root nematode species in this research are easily distinguished by a trained diagnostician. Based on these results and on field observation, the University of Florida Nematode Assay Lab has changed the damage thresholds used to diagnose nematode problems on turf. Separate thresholds are now used for each stubby-root nematode species.

Mole Crickets

Interactions between Mole Crickets and Insect-Parasitic Nematodes (*Steinernema scapterisci*, Nematac S)

Kathryn A. Barbara and Eileen A. Buss

Mole crickets (*Scapteriscus spp.*) are the most damaging insect pests of managed turfgrass and pastures in the southeastern United States. Although insecticides often provide effective short-term control, long-term suppression of mole cricket numbers is needed. We examined the establishment and spread of the insect-parasitic nematode *Steinernema scapterisci* on golf courses. We placed 20 linear pitfall traps on two mole cricket hot spots within 10 different fairways on two Gainesville golf courses (40 traps total). Within each fairway, one hot spot (1/10th of an acre) was treated with nematodes and the other was left untreated. The rate was 1 billion nematodes per acre.

The average percentage of infected mole crickets before the fall 2001 nematode application was 16.7 percent at Ironwood Golf Course and 20.4 percent at Gainesville Golf and Country Club. This showed that the nematode had persisted on these golf courses after earlier applications in 1988 and 1989.

Pesticides were commonly used on both courses. Post application infection to date is an average of 33.9 percent at Ironwood and 24.4 percent at Gainesville Golf and Country Club. However, over time, the percentage of infected mole crickets collected varies, often because of weather and mole cricket activity. Data also demonstrate that the nematode is moving into untreated areas of the golf courses.

Thus, use of *S. scapterisci* against pest mole crickets is a sustainable and low-risk IPM tool for turfgrass managers. The nematodes attack large nymphs and adults, reproduce inside their bodies within several days, and then disperse back out into the soil to infect other mole crickets. Our research, and that of Dr. Martin Adjei and Dr. J. Howard Frank, indicates that these nematodes work well over time where insecticides either cannot be used (e.g., pastures) or where insecticides have failed to control pest mole crickets.

Nematode populations persist for years and kill mole crickets in the soil, before they can lay more eggs in the fall and spring. We are continuing tests to evaluate the effect of these nematodes on mole cricket tunneling behavior and to see if soap flushes, which are currently monitoring methods, accurately indicate infection in mole crickets.

Integrated Pest Management of Pest Mole Crickets with Emphasis on the Southeast

J. Howard Frank and J. Pat Parkman

There are at least 70 species of mole crickets (*Orthoptera: Gryllotalpidae*). Some are rare, others are innocuous, and a few are important pests. These soil-dwelling pests damage underground parts of a long list of cultivated plants. Although tillage and flooding are used successfully in some situations to bring these pests to the soil surface and expose them to vertebrate and other predators, chemical pesticides are widely used.

Knowledge of their life history is used to time application of chemical treatments to save money, but is not used as widely as it might be. Classical biological control has been used against immigrant mole crickets in Hawaii, Puerto Rico, and the southern USA.

In Florida, three *Scapteriscus* species from South America cause major damage to pastures and turf and are targets of a classical biological control program. Population levels of two of the pest species have been reduced substantially in Florida by establishment of a tachinid fly (*Ormia depleta*) and a steinernematid nematode (*Steinernema scapterisci*) from South America. The nematode also functions as a biopesticide. Managers of pastures and turf in Florida have thus far derived benefits from these classical biological control agents without understanding their function: use of chemicals is reduced when mole cricket populations are lower due to action of these organisms.

Future enhancement of the action of *O. depleta* and of a sphecid wasp (*Larra bicolor*, which also was introduced from South America) probably will demand deliberate planting of nectar sources for adults of these biological control agents, and the advantage will be to managers who adopt such a strategy.

Chemical pesticide use is strongly promoted by a large chemical industry, whereas biopesticidal use has thus far been little promoted and sales have been few. Even managers who do not change their strategy of pesticide use in response to damage by mole crickets, and have no knowledge of the differing life cycles of the three Scapteriscus species or of the presence and action of the classical biological control agents, will derive benefit as these biological control agents (and a predatory beetle which has not yet been released) increase their distribution.

Soils and Water

Effect of Fertilizer Rates and Sources on Nitrate Leaching and Turfgrass Quality.

Subhrajit K. Saha, Laurie E. Trenholm, and J. Bryan Unruh

Due to increasing concerns over potential pollution of Florida's water resources from fertilization of home lawns, there are statewide research projects designed to verify different aspects of turfgrass Best Management Practices. The objectives of this study are to evaluate differences in quality and fertilizer leaching between turfgrass and landscape plants in response to different fertilizer formulations.

The experiment is being performed in a climate-controlled greenhouse at the G.C.Horn turf field laboratory at the University of Florida in Gainesville. Floratam St.Augustinegrass is being compared with a mix of ornamentals including canna, nandina, ligustrum and allamanda. Plant material is growing in 80-gallon plastic pots in an Arredondo fine sand. There are three fertilizer treatments (16-4-8 quick-release, 15-0-15 quick-release, 8-4-12 slow-release) applied at 1.0 lb. N/1000 sq. ft. every other month. There are four replications.

Leachate is collected at three intervals following treatment and analyzed for nitrate and phosphate content. Quality ratings are taken weekly and multispectral reflectance readings are taken biweekly. Water is applied to meet the evapotranspiration. Turfgrass tubs are mowed biweekly by hand.

In this preliminary work, turf was more responsive than ornamentals to fertilizers and preliminary data indicate best turfgrass response from quick release 16-4-8 and 15-0-15 treatments. During the establishment period, water use was lower in turf than ornamentals.

Fertilization of St. Augustinegrass And Environmental Implications

Dara M. Park, John L. Cisar, George H. Snyder and Karen E. Williams

A multi-faceted field-scale study evaluating the effect of turfgrass nitrogen fertilization and irrigation maintenance practices on turfgrass performance and N leaching from St. Augustinegrass lawns was conducted over six bimonthly cycles. Water samples were collected and analyzed for NO3-N and NH4-N. Other data collected included clipping yields and turfgrass visual quality ratings throughout the year.

As expected, excessive N fertilization at approximately double standard recommendations resulted in significantly more N leaching. Conversely, reducing the N rate by half of the recommended rate did not significantly reduce N leaching but did lower turf quality ratings to levels below minimally acceptable values as the experiment progressed for sod grown with lower soil organic matter.

Homeowners should be encouraged to apply the appropriate amount of fertilizer N, since excess N results in adverse environmental impact. Too little N could result in the eventual overuse of fertilizer and pesticides to improve the quality stand of turf and/or result in the replanting of turf sod which also has environmental consequence.

The rate of irrigation played a role in reducing N leaching during several dry season cycles. During rainy weather, reduced scheduled irrigation was not effective in reducing N leaching. Slow-release N sources did not consistently reduce N leaching. This experiment compared readily soluble N from urea versus N from urea encapsulated with a sulfur/polymer barrier as a means to provide controlled N release. Further research on the influence of other N sources to reduce N leaching is suggested to gage the effectiveness of other products to reduce N leaching.

The level of soil organic matter (SOM) in sod had significant impacts on N leaching. Higher SOM resulted in higher N concentrations in percolate before the initiation of N fertilization and in more N leaching after N fertilizer applications were made. However, higher SOM improved turf quality and clipping growth. Based on this research, N fertilization strategies could be optimized to provide quality turf with reduced potential N leaching by accounting for N contributions from SOM during the first year after planting. The influence of SOM over time needs further study to quantify the extent of N release over several years.

Evaluating Methods of Predicting Irrigation Needs of Warm-season Turfgrasses

Joon H. Lee and Laurie E. Trenholm

Water is one of the greatest limiting factors influencing turfgrass growth. Due to increased pressure to preserve water resources, there is interest in development of sensor-based technologies to indicate turfgrass irrigation requirements. This study is designed to determine what technologies might reliably and accurately predict

irrigation scheduling needs of warm-season turfgrass.

Floratam St. Augustinegrass and SeaIsle 1 seashore paspalum were established in 19-inch tubs in the Envirotron Turfgrass Research facility in Gainesville in the spring of 2002. Each grass was subjected to repeated dry-down cycles where irrigation was withheld. Data were collected on: a) shoot quality, leaf rolling, leaf firing, turf color; b) spectral reflectance data within 450 to 930nm; c) soil moisture content; d) leaf relative water content (RWC); e) chlorophyll content index. These evaluations were used to determine if irrigation scheduling could be determined.

Results of this study indicated that turf quality was highly correlated with visible range spectral reflectance (P= 0.001), reflectance indices (P= 0.001), and with soil moisture (P= 0.001) throughout the dry-down cycle. As turf quality declined below acceptable levels, these sensor-based technologies were able to predict the need for irrigation scheduling.

Grasses

Evaluation of Ultradwarf Bermudagrass Cultural Management Practices

John L. Cisar and George H. Snyder

Florida leads the USA in numbers of golf courses and, with over 66 million rounds of golf played annually, there is great interest in improved putting surfaces. New ultradwarf bermudagrasses have been developed for better putting performance and are being planted in new and reconstructed greens. We are conducting research to develop information on ultradwarfs from which to base sound cultural management recommendations for golf course superintendents.

Thanks to the great support of the Florida turfgrass industry, we initiated in late September 1999, an ultradwarf cultural management research trial in south Florida at the Ft. Lauderdale Research and Education Center. The United States Golf Association has provided funds for the past two years to continue the research. This project was designed to identify the optimal cultural practices for best performance of three popular ultradwarfs and thus form the basis for management recommendations of these grasses under Florida conditions.

The grasses were selected based upon their use in Florida: Champion, TifEagle, and Floradwarf. The grasses were planted into an existing USGA green soil mix on a site near the Otto Schmeisser Research Green at the University of Florida's Fort Lauderdale Research and Education Center in south Florida.

Cultural management practices evaluated included fertilizer at two N rates (30 and 60 g N/sq. m.) which translated to 6 and 12 lbs. N/1000 sq. ft. and three N:K ratios (1:1, 2:1, and 1:2). In April of 2001, the fertilizer component was changed to 60, 90, and 120 g N/sq. m and the N:K ratios were reduced to 1:1 and 2:1 in order to evaluate a greater range of N rates. This fertilizer regime was continued through 2002.

Other cultural management treatments were light topdressing frequency (weekly vs biweekly) and shallow verticut frequency (3.4 mm setting weekly vs. biweekly). There were four replication of each treatment. The daily mowing height was set at 3.0 mm -3.4 mm (0.13-0.14 inches) during the period. Because of the number treatments (288 plots), the size of the new green was approximately 930 sq. m. (1/4 acre) in area. Evaluations were based upon visual turfgrass quality ratings, visual disease ratings, thatch ratings, turf leaf blade clippings and shoot counts. Significant treatment effects were observed for all parameters.

Influences of Shade on Dwarf-Type Bermudagrasses

Grady L. Miller, Russell T. Nagata, and Jeffry Edenfield

Golf course superintendents are often faced with major challenges due to tree shade on turfgrasses, particularly on putting greens. An increase in available sunlight or an increase in leaf area enables the turfgrass to increase in leaf area, which enables the plant to increase carbohydrate synthesis and storage processes critical for withstanding the many stresses inherent to putting green turf.

This study addresses the dilemma golf course superintendents have when managing putting greens subjected to light stress from excessive tree shade. We evaluated physiological and growth responses of the new ultradwarf bermudagrass cultivars (Champion, FloraDwarf, TifEagle and Reesegrass) when subjected to various levels of shade. We also evaluated potential advantages of slightly raising the mowing height. It was hypothesized that a slight increase in mowing height would result in an exponential increase in carbohydrate synthesis, potentially facilitating a more stress-resistant turf. Results indicate that TifEagle and Champion bermudagrasses are capable of sustaining quality better than other dwarf bermudagrass cultivars when grown under reduced-light conditions.

FloraDwarf also responded slightly better to shaded conditions than Tifdwarf. None of the tested grasses performed well under dense shade or long periods of shade.

Weeds

Control of Goosegrass using Foramsulfuron (Revolver) as an alternative to MSMA

Philip Busey

Goosegrass is the most serious weed as reported by South Florida golf course superintendents and sports turf managers. MSMA and diclofop-methyl (e.g., Illoxan) are widely used for postemergence control of goosegrass in bermudagrass turf. Diclofop is usually inadequate for control of mature goosegrass plants. Repeat application of a mixture of MSMA + metribuzin (e.g., Sencor) controls mature goosegrass. MSMA contains arsenic. The Florida Department of Environmental Protection says that excessively high arsenic concentrations can frequently occur in South Florida golf course soils and water, associated with the use of organic arsenical herbicides such as MSMA. Alternative methods of controlling goosegrass are sought.

There were two experiments: at Sunrise Golf Course and Broward County's Brian Piccolo Park ballfield, involving mature stands of goosegrass emerging in a hybrid bermudagrass matrix.

At Sunrise, foramsulfuron in Revolver at rates of 0.4 and 0.6 liquid oz/1000 sq ft was compared with MSMA at 0.9 oz/1000 sq ft., with a second application of both products nine days after initial treatment. During 25 days after treatment, Revolver by itself at 0.6 oz/1000 sq ft caused a peak of 52 percent goosegrass injury (mean of six replications), compared with 42 percent injury from MSMA. There was no injury in either case to bermudagrass. In comparison, the MSMA + Sencor (at 0.33 lb/acre) caused a peak of 93 percent goosegrass injury, and a peak of 52 percent injury to bermudagrass. Sencor was not included as a tank mix with Revolver.

At Brian Piccolo Park, Revolver at 0.6 oz/1000 square feet was compared with MSMA at 1.0 oz/1000 square feet. Both products were mixed in all combinations with Sencor at 1, 2, 3, 4, and 5 ounces by weight/acre. Sencor was also used by itself at the same rates, and with untreated controls there were 16 treatment combinations in three or four replications. During 23 days after treatment, the MSMA mixtures required at least 3 oz/acre Sencor to achieve 80 percent goosegrass control, whereas Revolver achieved 80 percent control with no Sencor. Revolver + Sencor at 2 oz/acre achieved 100 percent goosegrass control, whereas MSMA mixtures required 4 oz/acre Sencor to achieve 100 percent control. There was more bermudagrass injury from Revolver mixtures than MSMA mixtures, at the same rate of Sencor. Revolver was as effective as MSMA in postemergence control of mature goosegrass, and observed injury to bermudagrass in these two experiments was acceptable. More research and pilot testing is needed to understand the use of foramsulfuron in the full range of environmental conditions in Florida golf courses.

Following this research, the foramsulfuron was labeled by Bayer Environmental Science as a new postemergence turfgrass herbicide Revolver, in accord with the approval of the US Environmental Protection Agency. It may be applied to bermudagrass and zoysiagrass on golf courses. A Florida pesticide registration is pending, therefore at the time of this writing, the product cannot be legally applied for golf course maintenance in Florida. This is not to be considered an endorsement or a recommendation to use foramsulfuron or Revolver in golf course turf. Any person who applies pesticides must adhere to the label and all other regulations. There is no data on its effects on tropical signalgrass and some other important weed species.