UCR Turfgrass Research Program Update • July 2011

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WEED MANAGEMENT

1. Selective *Poa annua* control in bentgrass greens.
   a. Studies continue in 2011 with major emphasis on development of methiozolin (MRC-01) herbicide from Moghu Research Center, South Korea. Methiozolin is currently registered in South Korea and Japan. Moghu recently granted Syngenta non-exclusive rights to further evaluate methiozolin. This will potentially increase the global market of methiozolin. U.S. Registration is anticipated in 2014.
   b. UCR is one of three primary universities (with Auburn and Virginia Tech) assisting in the development of methiozolin in the U.S. In fall 2011, Nick Hoisington, Assistant Superintendent at Bel-Air CC, will begin a M.S. candidacy at UCR studying methiozolin. His assistantship will be funded by Moghu Research Center.
   c. Studies at DarkHorse GC and California Golf Club of San Francisco determined that spring or fall applications of methiozolin are effective for *Poa* control and confirmed total active ingredient required for control.
   d. In spring, we conducted studies at Barona Creek GC, Bonita GC, The Bridges at Rancho Santa Fe, and Shady Canyon GC in southern California. Results confirmed that spring timing is successful for Poa control and the total active ingredient required for control. Combining applications or herbicide or PGR with application of FeSO4 did not appear to improve *Poa* control. A similar study is ongoing at Cypress Point Club in Monterey.
   e. A study was initiated at Peter Hay GC to determine rates and timing of application of methiozolin for preventative control of *Poa* on new bentgrass greens, and if application following aeration is successful in preventing *Poa* outbreaks.
   f. Presently, methiozolin is being demonstrated on greens at Links at Bodega Harbour, Marin CC, Olympic Club, San Francisco GC, California Golf Club of San Francisco, Bayonet & Blackhorse, Tehama GC, The Preserve GC, Monterey Peninsula CC, and Monarch Dunes GC (velvet bentgrass).
   g. Based on our research to date, a total of 2.5-3.0 lbs ai/A of methiozolin provides effective postemergence *Poa* control in greens with extended residual activity. Individual applications should not exceed 1.0 lb ai/A (1.4 oz/1000 ft2) and should be repeated on 2- to 4-week intervals. Avoid treatment when daytime air temperatures reach 85F or higher on a consistent basis. Although Trimmit helps to reduce *Poa* populations, there is no synergistic or additive effect of tank-mixing Trimmit with methiozolin.
2. Tolerance of Kikuyugrass to herbicides.
   a. Amicarbazone, methiozolin, aminocyclopyrachlor (Imprelis), and flazasulfuron (Katana) were tested on a fairway at Riviera CC. All herbicides exhibited safety at rates tested except for Imprelis.
   b. Imprelis is being evaluated at California Golf Club of SF for selective control of Kikuyugrass in fine fescue/colonial bentgrass turf.
3. Tolerance of buffalograss to herbicides.
   a. Several new herbicides are being tested for safety on UC Verde buffalograss.
4. Weed control during conversion from tall fescue to buffalograss for water conservation.
   a. Thus far, the best treatment has been RoundUp Quik Pro to eradicate tall fescue, followed by applications of Imprelis to control broadleaf weeds.
5. Evaluation of Specticle (Indaziflam) herbicide.
   a. Research continues to evaluate Specticle for weed control in bermudagrass turf.

SALINITY MANAGEMENT

1. Drought and irrigation salinity effects on perennial ryegrass.
   a. Use of reclaimed or other saline water sources for turf and landscape irrigation is inevitable in arid regions of the southwestern U.S. However, the use of saline water for turfgrass irrigation requires that salinity in the root zone be maintained at a level that does not adversely impact turf quality. In this study, we combined the line source method of generating a continuous distribution of saline or potable irrigation water, with the application of different quantities of water, thereby providing detailed information on the interaction of water application and salinity on response of perennial ryegrass 'SR 4550' turf maintained as golf course rough. Once established, the turf was irrigated with saline water through alternating irrigation lines creating a continuous distribution between 0.6-4.6 dS/m. In the perpendicular direction, plots were irrigated with different quantities of water (0.9, 1.1, 1.3, and 1.5 times the

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previous week's reference crop evapotranspiration or ETo) representing a range from deficit irrigation to leaching. Each plot was further divided into nine strips (3 ft x 30 ft) parallel to the sprinkler lines for data collection. Soil water tension, soil moisture, salinity, and temperature were monitored continuously at 4 and 8 inches below the soil surface. Leachate was sampled at 8 inches below the surface using suction lysimeters. Turfgrass uniformity, percent turfgrass groundcover, canopy temperature, and dry clipping yield will be evaluated biweekly. Additional soil samples were collected prior to salinity treatments, and throughout the study to assess the change in population size and activity of plant growth promoting rhizobacteria (PGPR) in response to imposed drought and salinity stress. This research will help to develop new guidelines and recommendations regarding irrigation of turf with waters of elevated salinity, and contribute to significant reductions in water use on golf courses and other turf areas where salinity management is a concern.

WATER MANAGEMENT

1. Carbon sequestration and water use efficiency of turfgrasses.

   a. Climate change resulting in increased temperatures, longer drought periods, and depleting water resources greatly impacts turfgrass and landscape use. Recently, we measured the carbon fixation potential and water use efficiency (WUE) of cool- and warm-season turfgrasses under non-limiting conditions. Understanding that carbon sequestration is dependent on water and nutrient inputs, our research strives to determine which turfgrasses sequester the most carbon with the fewest inputs. Plots (6 ft x 10 ft) with three replications of each species or cultivar were established in 2008. Beginning in May 2011, all turfgrasses were subjected to deficit irrigation (water stress) based on a percentage of the previous week's reference evapotranspiration (ETo). Hand watering was used to maintain uniform and accurate irrigation distribution. Net ecosystem exchange (NEE) and ecosystem respiration measurements (µmole CO2/mol air) were taken monthly for each cultivar using a closed static chamber seated over each plot with a Li-COR 7500 open-path infrared gas exchange analyzer placed inside. Gross ecosystem productivity (GEP), or the amount of carbon dioxide exchanged between the plant and the atmosphere was calculated using NEE and respiration measurements (µmole CO2-C/m2/sec). The same measurements were taken for two cool-season, and two warm-season species during the course of wetting (irrigation) and dry-down events. Preliminary results indicated that the cool-season and warm-season species required between 75-95% and 55-75% ETo, respectively to maintain acceptable turf under deficit irrigation, depending upon weather conditions. In general, the mean GEP (an indication of overall plant health) of the cool-season turfgrasses was equivalent to or slightly higher than the warm-season species when they were irrigated with 20% more water.

2. Drought tolerance of fescues, ryegrass, and their hybrids.

   a. By recurrent selection for drought and heat tolerance among hybrids of perennial ryegrass (*Lolium perenne* L.; *Lp*) with meadow fescue (*Festuca pratensis* Huds.; *Fp*), we have developed
   a population of *Lp* with a marked increase in drought and heat tolerance. This increase was associated with the presence of an introgression of *Fp* chromatin on chromosome 3. A field study was conducted in 2010 to evaluate the degree of drought and heat tolerance in response to deficit irrigation (55-75 %ETo) among: four populations of our turf-type hybrid with introgression of *Fp* on chromosome 3 (FL3S); the backcross parent (*Lp* 'SR4220'); a drought tolerant *Lp* 'Zoom'; a representative *Fp* 'Pasja'; and three turf-type tall fescue (*Festuca arundinacea* Schreb.; *Fa*) cultivars 'Tulsa Time', 'Speedway', and 'Grande II'. During most rating dates, turf quality was significantly higher in the populations of FL3S, *Lp* 'SR4220', and *Lp* 'Zoom' compared to the *Fa* cultivars and *Fp*. This trend was opposite for clipping dry weights harvested from the plots at all rating dates. There were no significant differences when comparing roots sampled from three depths. Overall, our FL3S populations appeared to offer higher turf quality and faster recovery than the *Fa* cultivars under drought conditions. However, all FL3S populations did not show significantly higher turf quality compared to their parent line, *Lp* 'SR4220'. The field study will be repeated in 2011.

SPECIES IMPROVEMENT

1. Breeding, genetics, and management of Kikuyugrass.

   a. Kikuyugrass (*Pennisetum clandestinum* Hochst. ex Chiov.) is considered either an invasive weed or the desired species on many golf courses and other turf areas along coastal and inland California. As part of a comprehensive project aimed at Kikuyugrass improvement and management, a field study was initiated in 2011 in Riverside, CA to identify cultural and chemical practices that are most important for producing quality turf and optimal playing conditions on golf course fairways. The cultivar 'Whittet' was established from sod on a Hanford fine sandy loam. A two-level, five-factor factorial design was used to evaluate mowing frequency (three vs. six times/wk), verticutting (one vs. three times/yr), trinexapac-ethyl (0 vs. 0.25 oz/1,000 ft2 biweekly), nitrogen (2 vs. 4 lbs/1,000 ft2/yr), and fungicide treatment (0 vs. monthly applications according to disease activity). Turf quality was assessed visually and by normalized difference vegetation index (NDVI). Turf firmness and ball roll were measured with a Clegg Soil Impact Tester (2.5 kg hammer Gmax) and Stimpmeter, respectively. Shoot density and organic matter were evaluated twice per year. Results of this study will allow Kikuyugrass managers to choose and implement the most effective and economical practices for optimal turf health and playability.

Fertilizer and Pesticide Use Restrictions: Coming to California?

By Michael Blankinship

Introduction

It's no secret that fertilizers, especially those high in phosphorus and nitrogen, aid all plant growth—from turf grass to weeds. Several states have passed legislation in the past six years to reduce the amount of fertilizer (especially phosphorus) entering waterways that can cause an explosion of aquatic plant growth.

Fertilizers high in phosphorus are popular amongst homeowners that may use the "a little is good, but more is better" philosophy. Unfortunately, it is easy for the public to point fingers at golf course superintendents when it comes to explaining why an algal bloom or aquatic weed infestation has occurred. For example, a homeowner may be oblivious to heavy rain or watering schedules that may cause their fertilizer to runoff into lakes and waterways.

Such fertilizer restrictions have not yet been imposed in California. Here are a few examples of the actions other states have taken to limit fertilizer use:

Minnesota as a Catalyst

Unintentionally fertilizing aquatic weeds and algae via non-point source (NPS) runoff can create aquatic weed overgrowth. This mass of plants when decomposing can leave little oxygen for fish and other aquatic animals. To combat these "dead zones" in lakes, Minnesota became the first state to restrict the sale of phosphorus fertilizers for use on turf in 2005.

Under Minnesota's law, a typical lawn fertilizer must have 0% phosphorus. Newly planted lawns within their first year and turf tested to be phosphorus-deficient are the only exceptions to this restriction. Golf courses are permitted to use phosphorus fertilizers only when directed by an individual licensed or certified by a commissioner-approved organization.

Several other states bordering the Great Lakes soon followed suit. New York, Wisconsin, Illinois, and Michigan have all passed similar laws restricting the sale of high-phosphorus fertilizers for only damaged or very young lawns.

Beyond the Great Lakes

Phosphorus and occasionally nitrogen are under fire elsewhere in the United States. Recently in Sanibel Island, FL, for example, high nitrogen in Tarpon Bay has implicated the local golf course. Florida has limited the sale of fertilizers containing phosphorus to low- or no-phosphorus mixtures. Additionally, cities and counties in Florida have passed strict laws regarding phosphorus and nitrogen use.

More recently, Virginia and Washington have strengthened laws on phosphorus use. Both states had previously banned laundry and dishwasher detergents containing phosphorus. In early 2011, Virginia and Washington passed legislation to take effect in 2013 that restricts the sale of phosphorus for turf for only "new" or "damaged" lawns.

Will California Follow?

Currently, California has not banned detergents containing phosphorus, which in other states has served as a regulatory stepping stone to fertilizer use restrictions. The fact that several states outside of the Great Lakes area have passed laws to restrict fertilizer use makes one wonder if California could be next. Stay tuned. Joining the following email lists will help you stay up to date:

http://www.cdfa.ca.gov/is/fflders/fertilizer.html

http://www.waterboards.ca.gov/resources/email_subscriptions/pressreleases_subscribe.shtml

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About the Author: Michael Blankinship is a 10-year GCSAA member, a DPR licensed pest control advisor and a registered professional civil engineer in California. His Davis-based consulting firm solves problems related to permitting, compliance, water quality and natural resource management throughout the Western U.S.

Learn more at www.h2osci.com. Reach Mike at: (530) 757-0941 or mike@h2osci.com.

Pesticide Use Restrictions in California Counties

Three California Counties, Marin, San Francisco and Santa Clara, have created local pesticide use ordinances to reduce or eliminate pesticide use on county lands.

Where Marin and Santa Clara have created lists of approved pesticides for use, the City and County of San Francisco has simply banned Toxicity Category I and II pesticides, along with any that may cause cancer or reproductive or developmental harm. In all three counties, applicators can file for exemptions to these restrictions.

The ordinances also require posting signs to notify the public of pesticide applications. These are to include information such as the signal word, name and active ingredient in the pesticides, the date of the application, the target pest, and contact information for the entity applying the pesticide. The signs, must be posted at the site 3-4 days prior and 4 days after an application.

If you supervise a golf course on county land (or if your course leases the land from the county), these regulations may apply to you. Marin County will help entities create their own plan when they require intricate and continuous pest management solutions—like golf courses.

Timeline: When Did States Restrict Phosphorus Fertilizer Use?

2005	2006	2007	2008	2009	2010	2011
Minnesota	New Jersey	Maine Florida		Wisconsin	Illinois Michigan New York	Virginia Washington

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Connecting the Dots: Is There a Link Between Parkinson's Disease and Pesticides?

By Michael Blankinship

Recent news has suggested that there is a link between pesticides and Parkinson's Disease (PD). Specifically, the herbicide paraquat and the piscicide (fish killer) rotenone have been implicated. PD is a degenerative disorder characterized by the death of neurons in the brain. This disease is common among the elderly with symptoms of shaking, rigidity, slowness of movement, difficulty walking, and cognitive and behavioral problems. Although PD is the most common neurodegenerative disorder after Alzheimer's disease, the cause of PD remains unknown. As research into the origin of this disease increases, scientists have investigated the potential that pesticide exposure may play a role.

Much of what is known about the mode of action of Parkinson's disease is based on an accidental exposure of the chemical MPTP 1983 by a group of young drug addicts who developed PD overnight after self-administration of this narcotic drug.

It turns out that paraquat and rotenone illicit similar effects in humans as does MPTP. These two pesticides resemble MPTP in either structure or mechanism of action and both induce the death of brain cells that ultimately cause behavioral changes similar to those associated with PD. Yet, scientists are unconvinced that these pesticides alone are to blame. For example, analysis to date that suggests a link between PD and pesticide exposure is based on studies that contain significant sampling bias.

Establishing a potential connection between rotenone, paraquat and PD is on-going. What about paraquat's cousin, diquat? Diquat provides the rapid "burn" to vegetation that paraquat does, but instead carries a Caution label and is labeled for aquatic use. Remember, regardless of your choice of pesticide, always, carefully read and follow the label directions.

ASSISTANT SUPERINTENDENT PROFILE

Name: Dan Dalske
Employer: Contra Costa Country Club
Position: Assistant Superintendent
Years in the Business: 10
Previous Employment: Martis Camp
Education: Cal Poly San Luis Obispo
Family: Wife, Emily; border collie, Chloe
What was the first car you ever owned? 67 Chevy stepside, original sea foam green
How fast did you drive it? 0-60 in 6 seconds
How did you get into the business? Caddying at Lahontan one loop and realized that I was more interested in the maintenance of the course rather than playing golf
What is #1 on your bucket list? To be in the south of France at midnight on the third Thursday of November when the Beaujolais arrive.
What accomplishment are you most proud of? Graduating from Cal Poly-San Luis Obispo
What's your favorite restaurant? Bix's in SF
Beer or wine? Wine
Favorite course to play: Cypress Point
What's your favorite vacation spot? Paris
Lowest score you ever shot and course: 74 at Sharp Park
Favorite hobby: Working on my house
Name your top life influences: My father
The hardest part of your job: Using the weather to my advantage in managing turf
The most rewarding thing in your job is: Seeing a member's putt drop in the hole from across the green.
If you weren't in the business of growing grass what would you be doing? Maybe grow wine grapes.
What's in your garage? One Rotary and one Toro Greensmaster 1000
What's in your office? My border collie, Chloe
What magazines do you subscribe to? *Links* and *GCM*

TPC Stonebrae Hosts 'Birdies For The Brave' Event

On Monday June 27, 2011, Dave Davies, CGCS hosted the third annual 'Birdies for the Brave Tournament' at TPC Stonebrae in Hayward, California. There were 110 golfers plus 36 military personnel. 'Birdies for the Brave' is a military outreach initiative proudly supported by the PGA Tour and 12 PGA Tour players including Phil Mickelson, Vijay Singh and Corey Pavin. These events will be conducted at 30 sites around the country in 2011. TPC Stonebrae has raised over $61,000 in 3 years. PGA Tour Charities has raised over $6.5 million through December, 2010. The tournament supports the following charities: Wounded Warrior Project, Operation Homefront, Navy Seal Foundation, United Through Reading, Special Operations Warrior Foundation, and Operation Homes for our Troops.

The day began with Presentation of the Colors and the national anthem which was performed beautifully. There were representatives from local Army, Marine and Air Force units. Dave arranged for a flyover by a Coast Guard helicopter while everyone was on the driving range. The various charities were positioned around the course to educate the participants about the great work they do. There was a silent auction for lots of sports memorabilia and other donated items such as rounds of golf and sports tickets. They had a closest to the pin competition that was very entertaining. This followed by another Presentation of the Colors and Honor Procession from the 9th green to the 18th green. The Marine Corps Color Guard and bagpiper led all past/present members of the Armed Forces up the path lined by the rest of the participants who were all waving the

American flags from the golf carts. The vocalist sang America the Beautiful. It was a very moving moment. Everyone then went inside to hear from some of the charity groups. SFC (ret.) Norberto Lara spoke to all about how much these groups helped him in his recovery from injuries received in service to our country. It was special.

The event gets bigger every year and all participants look forward to next year. Dave Davies is very passionate about this cause as it has touched people who were close to him. He prepares for it year round. We were all lucky to be involved.

Court Vacates EPA Stop Sale Order On AMVAC's PCNB

Newport Beach, CA – August 19, 2011 – American Vanguard Corporation (NYSE: AVD) today announced that the Chief Judge for the United States District Court for the District of Columbia has granted the Company's motion for summary judgment and vacated the Stop Sale, Use or Removal Order that had been issued in August 2010 by the United States Environmental Protection Agency relating to the Company's USEPA-registered pentachloronitrobenzene (PCNB) product line. The Company's wholly-owned subsidiary, Amvac Chemical Corporation, manufactures, distributes and sells PCNB as a fungicide for use primarily on turf.

The company's motion sought relief on various grounds, including denial of due process. In reaching its decision,the court found that the agency official who signed the SSURO lacked the authority to issue such an order. Because SSURO was invalid on this ground, the court did not address AMVAC's other challenges. The court remanded the matter to the USEPA for any further proceedings as it may deem appropriate.

Eric Wintemute, Chairman and Chief Executive Officer of the Company said, "We are, of course, pleased with the court's decision. This has been a long and trying process which appears to be coming to a conclusion. We are now focused on working with the USEPA to get our amended end-use labels for PCNB products issued as quickly as possible, so that we can return to the market." Mr. Wintemute concluded, "We are also grateful to our customers for their continued support and patience throughout this ordeal and hope to be in a position to meet their needs in the very near future."