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.