UNIVERSITY TURFGRASS RESEARCH UPDATE

Over the past 5 years we have periodically published reports from some leading turfgrass researchers in the US on their current studies. Here is our latest update on such research projects.

▲ **Above:** Colorant to improve color of dormant warm-season turfgrasses. **Top Right:** Response & recovery of DBG to severe drought. **Bottom Right:** Turf paint and glyphosate application timing effects on annual bluegrass control and zoysiagrass spring green-up

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Response and Recovery of Kentucky Bluegrass Cultivars to Severe Drought with No Irrigation. In a 2-year study, we subjected 28 cultivars of KBG and two hybrid bluegrasses to 81 days without irrigation in the first year and 61 days without irrigation in the second year; plots also received very little precipitation during these periods. Our goals were to evaluate the performance of these KBG cultivars during the dry downs and their recuperative abilities after being rewatered. All 30 of the bluegrasses went completely dormant in the first year and mostly dormant in the second year from prolonged drought stress. Remarkably, all 30 bluegrasses recovered in both years, although the recovery was slower after the first dry down because of longer exposure to drought. There were no consistent differences in the performance of the 30 bluegrasses. Given increasing pressure to conserve water when irrigating turf, and the possibility of total bans on turf irrigation in some areas, a viable strategy may be to adjust our expectations to allow for some dormancy of KBG during hot, dry summers. (Drs. Tony Goldsby, Dale Bremer, Jack Fry, Steve Keeley).

» Frequency-based irrigation cycles ran three times weekly regardless of precipitation amounts, and SMS applied water only when soils dried to a predetermined threshold.

Irrigation Management and N Fertilization Effects on Water Application Amounts and Nitrate Leaching in Turfgrass. Urbanization in the US has increased the area covered with turf, causing greater concern about water amounts used for irrigation and the potential for leaching from nitrogen (N) fertilization in urban watersheds. In a 2-year study on a silt loam soil, we compared differences in water applied between traditional frequency-based irrigation and irrigation controlled by soil moisture sensors (SMS) in tall fescue turfgrass. Frequency irrigation cycles ran three times weekly regardless of precipitation amounts, and SMS applied water only when soils dried to a predetermined threshold. Within each irrigation treatment, nitrate leaching was also measured in subplot treatments consisting of N applications of urea and polymer-coated urea, each at

122 and 244 kg N ha-1 yr-1, and no N (control). The SMS-based irrigation applied 32 to 70% less water than frequency-based irrigation. No differences in nitrate leaching occurred between irrigation treatments or among N sources and leaching levels did not exceed 0.6 mg L-1, which is well below EPA thresholds. All fertilized turf had acceptable quality throughout the study. Results indicate that on silt loam soils, SMS-based irrigation saves water compared to standard frequency-based irrigation while providing acceptable quality, and nitrate leaching is negligible. (Josh Chabon, M.S. and Drs. Dale Bremer and Jack Fry).

▲ **Late-season bermudagrass** control with glyphosate, fluazifop and mesotrione combinations for spring renovations

Irrigation Management, Cutting Height, and Primo Effects on Mowing Requirements of Tall Fescue. In-ground irrigation systems are often mismanaged, resulting in excessive application of water. In this 2-year study, we evaluated mowing requirements of tall fescue irrigated using frequency-based irrigation and irrigation controlled by soil moisture sensors (SMS). Frequency-based irrigation cycles ran three times weekly regardless of precipitation amounts, and SMS applied water only when soils dried to a predetermined threshold. Within each irrigation treatment, we evaluated mowing at 5.1 cm or 8.9 cm, based upon the 1/3 rule, with or without monthly applications of Primo. In 2012, tall fescue mowed at 5.1 cm and treated with Primo required three fewer mowings than untreated turf mowed at 5.1 cm; at an 8.9 cm cutting height, only one fewer mowing resulted after Primo application. Mowing at 8.9 vs. 5.1 cm, or using Primo vs. not resulted in a 9% reduction in total mowings required in 2013. (Josh Chabon, M.S. and Drs. Dale Bremer and Jack Fry).

Nitrous Oxide Emissions and Carbon Sequestration in Turfgrass: Effects of Irrigation and N Fertilization. Nitrous oxide (N_2O) and carbon dioxide (CO_2) are important greenhouse gases that have been implicated in global climate change, and N_2O is the most important ozone-depleting substance in the atmosphere. Turfgrass covers ~50 million acres in the USA and is typically fertilized with nitrogen and irrigated, which may result in significant N_2O emissions. Turfgrass also has the capacity to sequester or emit CO_2 from/into the atmosphere. We are beginning a 3-year study to measure N_2O emissions and carbon sequestration from turfgrass when fertilized with different nitrogen (N) fertilizer types (urea and poly-coated N) and different irrigation regimes. The use of slow-release N fertilizer and deficit irrigation may mitigate N_2O emissions from turf, although deficit irrigation may also reduce carbon sequestration. Therefore, it is important to measure N_2O fluxes and carbon sequestration in turfgrass managed under various combinations of deficit irrigation and fertilized with urea or slow-release N. Our goal is to develop smarter management practices that may reduce N_2O emissions from turfgrass and enhance carbon sequestration in turf soils, which could help mitigate climate change and atmospheric ozone destruction. (Ross Braun, M.S. student, and Drs. Dale Bremer and Jack Fry).

Rough Bluegrass Physiology and Control. Rough bluegrass (RBG, *Poa trivialis* L.) is a difficult-to-control weed that commonly develops in cool-season turfgrasses due to vegetative propagation of stolons and contamination from seed lots. Rough bluegrass is less tolerant of heat stress than desirable cool-season species such as tall fescue (TF), and often declines during mid-summer due to biotic or abiotic stresses. The objectives of these 2011-2013 controlled environment and field studies were to 1) observe growth and physiological differences between 'Laser' and 'Pulsar' RBG and TF; 2) differentiate between physiological and pathological contributors to RBG decline; 3) determine the effects of TF seeding rate and mowing height on TF/RBG establishment when RBG is a seed contaminant; 4) evaluate herbicide combinations for selective RBG control; and 5) evaluate seasonal timing of glyphosate for nonselective RBG control. Tall fescue was less affected by elevated temperature than RBG. When subjected to 35°C, Laser and Pulsar experienced similar reductions in quality, gross photosynthesis, shoot and root biomass, and root length density compared to when grown at 23°C. Evaluation of RBG foliage and roots did not reveal a fungal pathogen associated with RBG decline. Still, repeated applications of strobilurin fungicides increased RBG quality and cover during summer compared to untreated RBG, possibly due to poorly understood non-target physiological effects of the fungicides. Mowing TF at 7.6 or 11.4 cm reduced RBG incidence up to 57% compared to mowing at 3.8 cm. Tall fescue seeding rate had no effect on RBG incidence. Several herbicides and herbicide combinations provided transient RBG control in the field, but Velocity was the only treatment that provided RBG control (16 to 92%) in Manhattan, KS; Hutchinson, KS; and Mead, NE. Spring-applied glyphosate resulted in the lowest RBG coverage (1 to 31%) among field studies in Manhattan and Mead, followed by late-summer applications (6 to 58%), and mid-summer applications (9 to 86%). (Drs. Cole Thompson, Jack Fry, and Megan Kennelly; Univ. of Nebraska Cooperators: Dr. Zac Reicher, Mr. Matt Sousek).

Using Colorants to Improve Color of Dormant Warm-Season Turfgrasses in the Transition Zone'Chisholm' zoysiagrass (*Zoysia japonica*) is a new cultivar that is well adapted to the transition zone, with low maintenance requirements, and good quality and drought