1998 TURFGRASS PHYSIOLOGY UPDATE

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Introduction

In 1998, the Baird team conducted more than 30 experiments in the areas of turfgrass physiology and plant growth regulator (PGR) and weed management. Unfortunately, space is limited in the Proceedings to summarize each and every one of these experiments. Below are highlights of the Hancock Turfgrass Research Center (HTRC) activities and our major research projects. For additional information about these or other research projects, please visit our web site at **www.msu.edu/user/turf**.

Hancock Turfgrass Research Center

The HTRC underwent many changes in 1998. Renovation of the Robert W. Hancock Building began in the summer. Upon completion in April 1999, the building will contain two new conference rooms, a plant and soil processing room, a graduate student resource room, lunchroom, and office space that will better meet the needs of the turfgrass team.

The irrigation system at the HTRC will be completely overhauled in 1999 thanks to the support of Toro, Spartan Distributors, Rainbird, Valley Turf, FloTronix PSI, Century Rain Aid, Nelson Irrigation, and Spears Manufacturing. We would also like to acknowledge Carol Colein & Associates for designing the new system and Marc Dutton Irrigation and volunteers from the MTF who assisted with the installation.

Other improvements made to the HTRC in 1998 included installation of new cart paths, an equipment wash pad, a cover for the dome, and ornamental grass and perennial display gardens. The turfgrass team is grateful to the Michigan Turfgrass Foundation (MTF) for their continued support of the HTRC.

The HTRC will host several special events in 1999 including the North-Central Region meeting of turfgrass researchers and the Turf Producers International summer convention and field days in July.

Shade Physiology and Management

Thanks to the support of the MTF, we have made a long-term commitment to determine better ways to grow turfgrass under reduced light. In 1998, two artificial shade structures were erected on a creeping bentgrass putting green at the HTRC. A preliminary experiment was conducted to determine the influence of nitrogen fertilization and trinexapac-ethyl (Primo) applications on the performance of creeping bentgrass putting greens managed under shaded conditions. Preliminary data suggested that Primo applications can help to maintain turfgrass quality in reduced light situations.

Plans for future shade research involve the newly constructed natural shade green at the HTRC. In April 1998, the southeast corner of the HTRC was graded and excavated to make room for a 25,000 ft^2 natural shade area. Shortly thereafter, twenty maple trees (8-inch caliper) were transplanted onto the site to serve as the boundaries for six research greens. Drainage was installed and twelve inches of sand/peat were brought in to build the root zone. Marc Dutton Irrigation installed the irrigation system in September. Each of the six greens was divided into four plots and planted with G-2, L-93, and Penncross creeping bentgrass, and creeping bluegrass (*Poa annua*). The research area will be used to study the effects of photoperiod (e.g., morning vs. afternoon shade) and other cultural practices on putting green performance under shade.

Drought and Salinity Tolerance of Transgenic Creeping Bentgrass

Creeping bentgrass has been genetically engineered in Dr. Mariam Sticklen's laboratory by incorporation of the mannitol-1-phosphate-dehydrogenase [mtlD] gene. The mtlD gene has been documented to provide stress tolerance under drought and high salinity conditions in several plant species. The goals of this project are to determine the amount of stress tolerance imparted to creeping bentgrass clones by the mtlD gene and to incorporate these clones into our turfgrass breeding program in order to develop creeping bentgrass cultivars with improved drought and salinity tolerance as well as improved turf quality characteristics.

Site-Specific Management

Toro continues to sponsor research aimed at developing sensing technology that will tell us what is right or wrong about our turf. Currently, we are using a special instrument to measure spectral radiance from the turf canopy. We are looking for unique spectral signatures that will tell us about the water, nutrient, or disease status of the plant. Sensors are just one part of site-specific management that, in combination with global positioning satellites (GPS), geographic information systems (GIS), and variable rate technology (VRT), will enable turf managers to better manage the variability that exists on their site.

Creeping Bentgrass Cultivars for Putting Greens

Several new creeping bentgrass cultivars are now commercially available without much scientific research to warrant their selection and use on putting greens, especially in Michigan. This prompted us to conduct an experiment to evaluate five of these newer cultivars (A-4, G-2, L-93, Providence, and Putter) compared to Penncross at Crystal Downs CC in Frankfort and at the HTRC. The cultivars were planted in fall 1997 at Crystal Downs and spring 1998 at the HTRC. Preliminary results have shown that G-2 ranked the highest in terms of overall turf quality. A-4, L-93, and Providence also exhibited good turf quality.

Kentucky Bluegrass Cultivars for Golf Course Fairways

Kentucky bluegrass would be desirable on tees and fairways throughout many golf courses in Michigan provided that it could withstand low heights of cut that are typically applied to creeping bentgrass. The objective of the study was to evaluate 14 Kentucky bluegrass and 2 creeping bentgrass cultivars under a half-inch mowing height. The Kentucky bluegrass cultivars evaluated were: Abbey, Arcadia, Ascot, Cobalt, Coventry, Fairfax, Liberator, Limousine, Midnight, P-105, Rambo, SR 2109, Unique, and Wildwood. The creeping bentgrass cultivars evaluated were Penncross and Princeville. The experiments were established in June 1998 at the HTRC and Forest Akers golf course in East Lansing. It is too early in the experiment to evaluate cultivar tolerance to the 0.5-inch mowing height. However, we were able to gather information on the relative establishment rate and divot recovery among the cultivars. Preliminary results indicated that Arcadia, Cobalt, Liberator, Midnight, and Rambo established most quickly among the bluegrass cultivars. However, all of the bluegrass cultivars established much slower than the bentgrass cultivars. Fairfax, Liberator, Midnight, Rambo, and Unique demonstrated the fastest recovery from divoting among the bluegrass cultivars.

Localized Dry Spot

Wetting agents were evaluated to determine the effectiveness of single vs. multiple applications for season-long control of localized dry spot and improved turf wetting. Plots were established on an annual bluegrass-creeping bentgrass fairway grown in dune sand at Crystal Downs CC. Cascade, Primer, Lesco Flo, and two experimental products were included in this study. Quality differences between plots either did not exist or were masked by heavy rainfall that occurred prior to the rating dates. Cores were taken several times during the study to determine the re-wetting speed of the turf at various depths (thatch, 0-3 cm, 3-6 cm). At the thatch depth only Primer provided an improved re-wetting time as compared to the control. However, Cascade, Lesco Flo, and Primer were effective at reducing re-wetting times of the cores at the 0-3 cm and 3-6 cm depths.

Preemergence Crabgrass Control

Preemergence control of crabgrass and other summer annual grasses is a standard component of many turfgrass management programs. There are many preemergence herbicides and herbicide-fertilizer combinations available. Most of these products provide adequate season-long control in Michigan. Warm soil temperatures contributed to an early flush of crabgrass during this spring. Extremely dry conditions followed until mid-summer. Much of the crabgrass that germinated in the spring died before the rains of July. A second crop of crabgrass was evident by mid-August. On the whole, crabgrass pressure in 1998 was light. All of the preemergence products included in our 1998 trial provided acceptable control of crabgrass. We continue to recommend long residual products such as dithiopyr (Dimension) or prodiamine (Barricade) in areas where a history of heavy crabgrass pressure exists.

Postemergence Crabgrass Control

Traditional postemergence controls for crabgrass such as the arsenicals are no longer recommended due to turf safety issues and environmental baggage. Dithiopyr (Dimension) can be applied postemergence to crabgrass and offers excellent turf safety. Dimension will control young crabgrass plants (1-3 leaf) and provide a preemergence barrier to prevent any further infestation. Fenoxaprop (Acclaim Extra) is a single isomer formulation of Acclaim. Acclaim Extra offers improved turf safety over Acclaim and will effectively control 2-3 tillered crabgrass. Quinclorac (Drive) has received registration and will be introduced in 1999. Drive is safe on cool-season species and has excellent activity on crabgrass, even at mature stages. Drive will be an excellent addition to our postemergence crabgrass arsenal.

Plant Growth Regulators for Lawn Care

Trinexapac-ethyl (Primo) was introduced in 1993 and has gained wide acceptance in the golf industry. Lawn care use of PGRs has been limited. It has been difficult to quantify the benefit of a PGR application in a home lawn or commercial setting. After several years of research, we believe that a well-timed application of Primo in early May could greatly reduce the amount of clippings produced during the spring growth flush. This could eliminate the need for double cutting, bagging, or raking in the early part of the season. The growth regulation from a single Primo applicaton should last from 4-6 weeks. Avoid applications when the turf is under stress conditions.

Chipco Proxy: A New Growth Regulator for Turf

Rhone-Poulenc will be launching a new PGR for the 1999 season. Ethephon (Chipco Proxy) has a different mode of action than either Scott's TGR or Primo. Ethephon affects the ethylene (a plant hormone) synthesis pathway in the plant. Our research in 1998 focused on Proxy used alone and in sequential combinations with Primo on annual bluegrass maintained at greens height. Clippings were collected, dried, and weighed twice per week. On a seasonal basis only the Primo treatment resulted in significantly fewer clippings than the control. Turfgrass color ratings were taken throughout the evaluation period. The Primo treated plots were initially rated lower than the control plots, however, by 28 DAT the plots were significantly darker green than the untreated controls. Just the opposite was true for the Proxy treated plots where overall turfgrass color was somewhat lighter green than the control plots after 21 DAT. Applications of Proxy increased turf density and visual uniformity, but did not significantly reduce clipping production.

Non-Selective Vegetation Control

Several non-selective herbicides are now available for use in turf and landscape situations. Pelargonic acid (Scythe), diquat (Reward), and glufosinate (Finale) are contact-type herbicides; in other words, they are not translocated in the plant. These herbicides provide rapid foliar burn usually within hours up to a couple of days. Their best use is on annual vegetation, for edging, or when rapid foliar burn is desired. Glyphosate (Roundup Pro) is the only systemic or translocated non-selective herbicide available. The hot topic this year is tank-mixing the various contact non-selective herbicides with glyphosate for faster and more effective vegetation control. Our research suggests the contrary. Think about it. If you tank mix, let's say Scythe with Roundup Pro, how can a lethal dose of glyphosate be absorbed and translocated to underground plant parts when the Scythe acts so quickly to disrupt the integrity of the shoot tissue? So remember, you can't have your perennial vegetation control and speed of activity too.

Best Management Practices for Home Lawns

We continually make recommendations to lawn care operators and homeowners about the management of weeds in their lawns. The most effective way to eliminate weeds is with a well-timed fall-applied herbicide application. However, when weeds infest a lawn it is typically an indication of some other problem (fertility, irrigation, mowing height, etc.). Unless these issues are corrected, the weeds will quickly return. Providing adequate fertility and raising the mowing height will help to maintain a healthy green, weed-free lawn. To help demonstrate the importance of the basic lawn needs we have established plots at the HTRC that include various combinations of mowing heights and nitrogen fertility. Initial weed counts were taken before the plots were treated with either Trimec Classic or Confront in the fall of 1998. We will continue to monitor the weed populations in these plots in 1999.

Difficult to Control Weeds

In the summer of 1997, we screened postemergence herbicides for the control of creeping speedwell (*Veronica filiformis*). The results of that study indicated that tank-mixing common broadleaf herbicides with quinclorac (Drive) greatly increased control of speedwell. Drive offers excellent postemergence control of crabgrass but has relatively low activity on certain broadleaf weeds. However, when tank-mixed with Confront, 2,4-D, or Trimec the effectiveness of both products is improved. In 1998, our difficult to control weed crosshairs were set on ground ivy (*Glechoma hederacea*). The initial results are very encouraging and are presented in these Proceedings.