SPORTS TURF MANAGEMENT PROGRAM UPDATE

J.N. Rogers, III, J.C. Sorochan, J.J. Henderson, and L.M. Lundberg
Department of Crop and Soil Sciences
Michigan State University

In 2000, new turfgrass research investigating high trafficked areas was initiated. Initial results from ongoing research have been promising. Copies of extended versions of these reports are also available via the World Wide Web at www.css.msu.edu

Major areas of research for 2000 include:

1. ENHANCING TURFGRASS GROWTH UNDER REDUCED IRRADIANCE.

2. DETERMINING THE EFFECTS OF STAND-UP AND PRIMO ON DIFFERENT SPECIES IN A MODULAR TURF SYSTEM INDOORS.

3. STUDYING THE EFFECTS OF DIFFERENT SEEDING RATIOS OF KENTUCKY BLUEGRASS AND TALL FESCUE FOR COVERED STADIA.

4. SEEDING DIFFERENT TURFGRASSES UNDER REDUCED LIGHTS FOR COVERED STADIA.

5. ATHLETIC FIELD ROOT ZONES – WHAT ARE THE BEST MIXES TO USE?

6. AMENDMENTS FOR A LOW BUDGET ATHLETIC FIELD.

7. FERTILITY AND SIMULATED TRAFFIC EFFECTS ON KENTUCKY BLUEGRASS/SUPINA BLUEGRASS MIXTURES.

Each of these areas will be reviewed in this paper and/or subsequent papers within these proceedings.

ENHANCING TURFGRASS GROWTH UNDER REDUCED IRRADIANCE

J.C. Sorochan, J.N. Rogers, III, and J.A. Flore
Departments of Crop and Soil Sciences and Horticulture
Michigan State University

Introduction:

Turves subjected to shade have reduced rates of photosynthesis. This lack of photosynthesis results in lower carbohydrate production, which is a major component for turfgrass growth and development. Fructans, which are synthesized from sucrose as a result of carbohydrate production, have been identified as the most common and most important sugars in grasses. Turfgrass managers in any discipline (landscape, golf course, or athletic fields) often have to deal with shady turf conditions; therefore, investigations to counter this dilemma are warranted. Manipulating the daytime and nighttime temperatures or supplementing low carbohydrate reserves by external sugar applications are two potential methods to compensate for the effects of low light conditions.

Perennial grasses in temperate regions are naturally exposed to prolonged periods of low temperatures (chilling temperatures). Fructan is the main polysaccharide reserve in vegetative tissues in most cool season grasses (Pontis and Del Campillo, 1985; Pollock, 1986; Nelson and Spollen, 1987; Chatterton *et al.*, 1989). Generally, low ambient temperatures lead to an alteration in the balance between carbon assimilation and utilization. This results in a pronounced increase in fructan and sucrose contents in the leaves of barley (Wagner and Wiemken, 1989), *Lolium temulentum* (Pollock, 1984), *Lolium perenne* (Arbillot *et al.*, 1991), *Triticum aestivum* (Tognetti et al., 1989; 1990) and *Poa pratensis* (Solhaug, 1991). The role of fructans in cold acclimation remains an open question since their accumulation most likely results from sucrose accumulation (Pollock, 1984; Wagner and Wiemken, 1989) rather than from low temperatures.

Little is known about fructan metabolism in grass roots. Fructan content in roots also varies throughout the season with the highest concentrations occurring in the fall and the minimum in the spring (Steen and Larsson, 1986). However, under controlled conditions, low temperatures increased both sugar and fructan concentrations in roots of *Poa pratensis* (Solhaug, 1991), *Agropyron* and *Agrostis alba* (Chatterton *et al.*, 1987).

Advancements in technology enable a turf manager to manipulate the environment to improve the growing conditions for turf. Controlling soil and air temperatures is one technology that is available for turf managers to manipulate the environment. Our objective is to see the long-term effects of manipulating the difference of daytime and nighttime temperatures (25/20 °C, 25/15 °C, and 25/10 °C (day/night) under a controlled environment to assess fructan concentrations in *Poa pratensis* and *Poa supina* shoots and roots.

If turfgrass is growing under sub-optimal light conditions, an increase in growth can potentially be affected by exogenous sources of sugar. By spraying tomato plants grown under a variety of conditions, with 10% sucrose solution, it was shown that sugar will affect a greater increase in dry weight if the tomato is growing in conditions where carbohydrate synthesis is limited (Wen and Carter, 1948; Juhren and Went, 1949; and Berrie, 1959). However, attempts to have sucrose taken up by turfgrasses have been unsuccessful (Branham, 1999). This is likely a result of the molecule size of the sucrose being too large for plant cell absorption. Experiments testing the use of fructose for turfgrass uptake have been very successful (Penner, 2000). Fructose applications at 1.25% by solution have been shown to greatly increase the efficacy for herbicide control when used in conjunction with an adjuvant (Penner, 2000). Our objective is to determine the uptake of different concentrations of fructose (1.25%, 2.5%, 5%, 7.5%, and 10%) in solution with two adjuvants (Breakthrough and Apsa 80) at two different concentrations (0.1% and 0.25%) to compensate for low levels of carbohydrates as affected by low light. Daily applications versus weekly applications will be investigated to determine if toxicity effects occur or if periodical applications are adequate. In addition, research will investigate the effects of particular fructose applications (based on above experiment) on various turf species with different plant growth regulators under low light conditions.

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DETERMINING THE EFFECTS OF STANDUP AND PRIMO ON DIFFERENT SPECIES IN A MODULAR TURF SYSTEM INDOORS

J.C. Sorochan and J.N. Rogers, III
Department of Crop and Soil Sciences
Michigan State University

Introduction:

Specific management practices for the management of turfgrasses under reduced irradiance have been ascertained. However, any advancement for the management of turfgrasses under these conditions will greatly benefit turfgrass managers. Previous research has determined that the use of a plant growth regulator (Primo) will increase the wear and performance of turfgrass under low light conditions. However, the effects of using a potassium silicate (Standup) to increase the turgor of turfgrass under reduced lighting have not been determined. The objective of this study is to compare the effects of Standup and Primo on different turfgrass species (Kentucky bluegrass, supina bluegrass, and tall fescue) under low light levels.

Turfgrass is a living organism and with enough use, stress and possibly death will occur. This occurrence is even more likely to occur when the turfgrass is subjected to low light conditions. In addition, stadiums are becoming multi-use facilities. This puts a tremendous amount of pressure on the turfgrass playing surface. The use of a modular turfgrass system is one way to assure that the stadium can be used as a multi-use facility while eliminating the unnecessary use of the turfgrass playing surface. For this experiment the performance of the different turfgrass will be tested using Hummer Turf Tiles. The Hummer Turf Tiles are a modular system that utilizes a shallow root zone profile (3 inches).

This study was initiated on 22 November 2000 and will run until June 2001. Results and conclusions will be published on the aforementioned web site at the conclusion of the investigation.

STUDYING THE EFFECTS OF DIFFERENT SEEDING RATIOS OF KENTUCKY BLUEGRASS AND TALL FESCUE FOR COVERED STADIA

J.C. Sorochan and J.N. Rogers, III
Department of Crop and Soil Sciences
Michigan State University

Introduction:

In August 2000 a study was initiated to test the performance of supina bluegrass and tall fescue seeded at different ratios (0, 5, 25, 100% supina bluegrass) for use as an athletic turf under low light conditions. The objective of the study is to determine the competitiveness of each species under low light conditions. Final establishment for turfgrass maturity will be done indoors under low light conditions. Results and conclusions will be provided at the end of the investigation in August 2001 and posted on the aforementioned web site.

SEEDING DIFFERENT TURFGRASSES UNDER REDUCED LIGHT FOR COVERED STADIA

J.C. Sorochan and J.N. Rogers, III
Department of Crop and Soil Sciences
Michigan State University

Introduction:

Beginning 18 December 2000, four turfgrass species will be compared for turfgrass establishment from seed under low light conditions. The four turves include supina bluegrass, Kentucky bluegrass, tall fescue, and tufted hairgrass. Results and conclusions will be provided at the end of the investigation in June 2001 and posted on the aforementioned web site.

FERTILITY AND SIMULATED TRAFFIC EFFECTS ON KENTUCKY BLUEGRASS / SUPINA BLUEGRASS MIXTURES

J.C. Sorochan, J.N. Rogers, III, J.C. Stier, and D.E. Karcher
Department of Crop and Soil Sciences
Michigan State University

Abstract

Poa supina has shown potential for athletic fields due to an aggressive stoloniferous growth habit. The objective of this study was to evaluate seeding mixtures of *Poa supina* 'Supra' (supina bluegrass) and *P. pratensis* 'Touchdown' (Kentucky bluegrass) under varying fertility and traffic treatments. Six seeding mixtures of *P. supina* and *P. pratensis* (0, 5, 10, 25, 50, and 100% *P. supina*) were established as whole plots on a sand based root zone mix in June 1995. Nitrogen fertility (low: 20 g N m^{-2} yr^{-1} and high: 30 g N m^{-2} yr^{-1}) and traffic, using the Brinkman Traffic Simulator, were stripped over these mixtures. Plant counts to determine species composition were done in the spring of each year (1997-2000). Turfgrass cover (% cover) and shear resistance (Nm) was also determined prior to and during traffic applications. Results indicate that increased traffic increases the aggressiveness of *P. supina*; by 2000 the trafficked plots seeded with only 5 and 10% *P. supina* were 99 and 96% *P. supina*. Trafficked plots seeded with 0 and 5% of *Poa supina* had the highest turfgrass cover and shear strength, indicative of the importance of the presence of *Poa pratensis* in these mixtures. The results suggest, seeding a mixture of only 5 or 10% *P. supina* is enough to increase the *P. supina* composition to dominate the stand while maintaining acceptable turfgrass shear strength.

Extended versions of this report are available via the aforementioned web site.