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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