WORLD CUP SOCCER REPORT

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INTRODUCTION

In June 1994, the Pontiac Silverdome will host four first-round World Cup soccer games. This is history in the making. Held only every four years, the World Cup will, for the first time ever, be played in the United States. Most importantly, the games at the Silverdome will be played on a natural grass field, a requirement for all World Cup matches and a first for indoor sports stadiums. More than one billion people worldwide will watch the Silverdome games on television. Events associated with the games are expected to pump $120 million into the Detroit-Pontiac economy, much of it from international travelers. In addition to the 1994 games, at least one major international game will be played on natural grass inside the Silverdome in June 1993.

MATERIALS & METHODS

In 1992, Michigan State University was asked by the Detroit-World Cup host committee and Pontiac Silverdome officials to provide technical assistance for installation and maintenance of a high quality turfgrass field inside the stadium. Insufficient light is the major obstacle to growing turf inside the stadium--approximately only 5% of sunlight penetrates to the stadium floor due to the high density cover. Research began in June 1992, and factors studied included supplemental light, grass species, and types of soil mixes.

Nearly 200 wooden boxes, 16 ft^2 (4' X 4') and 6 inches deep, were constructed out of 3/4" plywood and filled with one of two different sand and peat mixes. Holes in the bottom of the boxes provided drainage. The soil mixtures were compacted and the boxes sodded with either Kentucky bluegrass or perennial ryegrass both grown on a media over plastic. The sod was allowed to root outside for nine days, June 13-22. Plant growth regulators (PGRs), flurprimidol and paclobutrazol, were applied to some of the plots to evaluate their potential for improving traffic tolerance of the turfgrass. Several sub-label rates were evaluated. These PGRs were selected for their ability to inhibit plant cell elongation, caused by a predominance of low energy light wavelengths in shaded situations. Suppression of plant cell elongation would hopefully provide a stouter, sturdier turf.

On June 23 the experimental boxes were moved inside the Silverdome and organized in a randomized complete block design. All treatments were replicated three times. The effect of supplemental light was the whole plot treatment: High pressure sodium lamps were used to provide light levels approaching 10% of natural sunlight on a sunny day. Soil types, grass species, and PGR treatments were included in both supplemental and ambient light treatments. In addition, traffic treatments were imposed on one–half of the turf inside each box by multiple passes by persons wearing cleated soccer shoes.

Surface hardness of the turf plots was measured with a Clegg impact hammer (2.25 kg). Shear resistance, or the horizontal torque required to rip the turf in a circular motion, was measured using an Eijkelkamp shear vane apparatus. Quality ratings were collected every five to ten days; color and density of the turf was evaluated on a scale from 1 to 9.

RESULTS AND DISCUSSION

Observations at the Pontiac Silverdome indicated that PGRs could improve traffic tolerance. Turf treated with PGRs appeared darker in color than untreated turf. No significant differences between the two types of PGRs were noted, although only sub–label rates were evaluated.

The effects of supplemental light were striking. After four weeks, most turf that did not receive supplemental light was dead or dying, while most turf that received supplemental light retained good color and quality. Generally, the Kentucky bluegrass plots showed superior quality to the perennial ryegrass plots. However, the Kentucky bluegrass sod was older than the perennial ryegrass sod and had a thicker mat, increasing the turf's resilience to traffic. Lack of rooting was a significant problem with both grass types, particularly with the Kentucky bluegrass, due to the short time allowed for rooting outside before moving into the stadium. The lack of additional rooting inside the stadium even with limited supplemental lighting provides important data for turfgrass maintenance in domed stadiums. The soil depth of six inches proved adequate in terms of supporting turfgrass and resiliency.

CURRENT AND FUTURE RESEARCH

The time frame for experiments at the Pontiac Silverdome was abbreviated due to the impending Detroit Lions football season and a mid–summer concert. However, the experiments at the Silverdome have been expanded and are being conducted this winter at the new indoor turfgrass research dome constructed at Michigan State University. The air–supported research dome simulates the Pontiac Silverdome environment. The temperature is controlled, humidity is monitored, and the same fiberglass covering used at the Silverdome was installed to provide similar ambient light quality and quantity. An asphalt surface was added to facilitate investigation of installation procedures for the turfgrass field.

The experimental treatments at the MSU dome include evaluation of a wide range of PGR concentrations. Several different soil types and an array of fertility regimes will help to determine long–term management strategies for indoor turf. Finally, seven different light levels, from ambient light to one–third full sunlight, are being evaluated to define the amount of light required to maintain a quality sports turf.

Data being collected include surface hardness, shear resistance, and turf quality. In addition, soccer ball bounce studies and soccer player evaluations are being conducted. Players from the Michigan State University soccer team will impose actual soccer–style traffic on a miniature soccer field, actually running, sliding, and playing on the turf. The miniature soccer field will be constructed using prototypes of the steel modules, filled with soil and sod, which will be used inside the Pontiac Silverdome. Elimination of noticeable seams between the modules will be a critical objective to achieve as well as achieving an overall playing quality acceptable at a World class level.

CONCLUSION

Our research has and continues to show that long–term installation of natural turfgrass in domed stadiums is feasible. Most stadiums in the U.S. are multi–purpose, and may always require the flexibility provided by artificial turf which can be removed for rodeos, truck pulls, and other events. In Europe and Japan, however, many stadiums are dedicated solely for sports such as soccer. These nations have shown a profound interest in construction of domed stadiums once it is demonstrated that natural turf can be installed. Even in the U.S. a trend exists to replace artificial turf with natural grass fields.

At MSU, we are defining the minimum amount of light needed for maintaining a high quality sports turf inside domed stadiums. We are also learning how PGRs can improve turfgrass quality under shaded conditions. In addition, we are defining the fertility requirements of different grass types in shaded, high traffic situations. Using time domain reflectrometry, we will also establish water–use rates under well–defined shade and light treatments. All of these management techniques will be useful for sports stadiums, golf courses, and lawn care situations.