SOD ESTABLISHMENT & MAINTENANCE PROCEDURES STUDY FOR ATHLETIC TURF IN SAND BASED ROOTZONES.

T.M. Krick, J.C. Stier, J.N. Rogers III, and J.R. Crum
Department of Crop and Soil Sciences
Michigan State University
East Lansing, MI

INTRODUCTION

Public and athlete attitudes are shifting the use of artificial turf surfaces for athletic fields back towards the use of natural turfgrass (Cockerham, 1989; Canaway, 1990). Following two years of research at Michigan State University's Hancock Turfgrass Research Center (HTRC), data indicated that sod establishment was superior compared to seeding for sand based athletic fields (Krick et al., 1993). Color, density, quality, and shear-vane measurements collected fall, 1993 were significantly higher for sod establishment plots, particularly if the turf is subjected to heavy use in the first year. The purpose of this study was to evaluate and determine the most efficient sodding strategy for establishing a high quality sports turf in a sand based rootzone given the parameter that the field will be subjected to use shortly after establishment.

MATERIALS & METHODS

The experimental design of this study was a two factor split-plot randomized complete block design (RCBD). Six sodding regimes comprised the first factor, and two levels of plant growth regulator (PGR) were split over the second. The sod treatments were Kentucky bluegrass (*Poa pratensis*) leave in/perennial ryegrass (*Lolium perenne*) blend grown on plastic, perennial ryegrass (PRG) blend grown on plastic, Kentucky bluegrass (KBG) blend grown on plastic, washed KBG blend, KBG blend grown on mineral soil, and *Poa supina* grown on plastic.

Starter fertilizer (Scott's 16-25-12 at a rate of 3.0 lbs P/M) was applied just prior to the laying of sod. Sod treatments grown on soil were laid 6 July 1994 and those treatments grown on plastic were laid 2 August. The approximate cost of the sod treatments grown on plastic was $\$0.40/ft^2$, while the conventional sod treatments ran about $\$0.20/ft^2$. The sod treatments were laid on a modified sand soil of which the top four inches consisted of 80% sand and 20% peat (by volume) while a 100% sand medium was present underneath to a depth of approximately 8-10 inches. All sod treatments were rolled using a Jacobsen Greens King triplex unit along with hand watering to ensure rooting and prevent desiccation. PGR treatments were applied one week after the last sod treatment was put down. Trinexapac-ethyl (*Primo*) was applied at labeled rates (0.75 oz/M). It was hypothesized that the use of the plant growth regulator may improve the overall turf system, particularly during the establishment phase.

The field was topdressed three times on 16 August, 23 August, and 30 August.

The 80/20 soil/peat mix was used for the topdressing applications as a means to ensure a uniform soil profile. The rate of soil applied per topdressing was approximately $0.56 yds^3/M$. All sod treatments were hand watered initially to prevent any desiccation and later by overhead irrigation on an as needed basis.

Traffic simulation began in late August and continued through early November using the Brinkman Traffic Simulator. At an average of 14 cleats per square foot per roller, the simulator makes 56 cleat dents per square foot, the equivalent of one football game within the Zone of Traffic Concentration (ZOTC), in two passes (Cockerham and Brinkman, 1989). Data collected included color, density, quality, root biomass, and traction. Traction was measured with a field shear-vane apparatus, type 1B, Eijkelkamp, the Netherlands (van

Wijk, 1980). This apparatus consists of 12 fins welded at right angles to a cutting head (7.0 cm diameter). The fins were 1.0 and 2.0 cm long and alternatively placed around the cutting head. The fins had a penetration depth of 1.6 cm. Torque was applied and the maximum was read from the calibrated gauge on top of the apparatus (Rogers and Waddington; 1989). Means of three measurements per plot were recorded and are given in Newton-meters (Nm)

RESULTS & DISCUSSION

Color:

Turfgrass color was significantly higher for the KBG/PRG sod treatment throughout the study (Table 1). *Poa supina* rated lowest but this was to be expected since this species is inherently very light green in color. *Primo* provided significantly better color ratings in the form of darker green color. Although turfgrass color is relative and does not reflect turfgrass performance, the ability of the PGR to provide a darker green color does improve aesthetics.

Density:

Turfgrass densities were best for bluegrass sod treatments grown on plastic (Table 2). This may be due to their respective growth habits and mat layer. Mat is an organic layer buried and/or intermixed with soil from topdressing. It is partially decayed thatch that has become part of the soil profile. Both the mineral grown and washed KBG blend sod treatments did not have the extensive mat layer which the plastic grown sod treatments possessed. The wear tolerance of a turf is greater where a controlled amount of mat is present (Beard, 1973). *Primo* treatments received a slightly lower density rating prior to initiating traffic but were significantly higher in density after traffic application began. Some phytotoxicity was evident for approximately three weeks after the growth regulator application which explains the low initial density rating. Sod treatments rebounded nicely and lateral growth was observed as a result of the *Primo* application. Although the effects of the *Primo* application were not apparent by mid-September, the lateral growth allowed for higher densities after traffic simulation. This trend was consistent for all sod treatments.

Quality:

Turfgrass quality ratings are presented in Table 3. Quality ratings were assigned on a scale of 1-9 and were based upon both color and density characteristics. Once again, the KBG/PRG mix grown on plastic provided significantly higher quality ratings compared to the other sod treatments. One note of interest was the washed KBG blend treatment quality ratings through the course of the study. Initial quality ratings were very promising but as traffic simulation increased its ratings began to drop steadily. The other sod treatment of note was the *Poa supina* sod treatment. The *Poa supina* treatment had lower quality ratings through the study but they did not decline like the washed KBG blend treatment. The growth habit of *Poa supina* is strongly stoloniferous and for this reason was able to maintain adequate density, which explains its adequate quality rating. It is interesting to note that the quality rating of *Poa supina* also reflects a low color rating, an attribute dependent on its surroundings. *Primo* also enhanced quality significantly throughout the study.

Shear-vane Measures:

The Kentucky bluegrass sod treatments grown on plastic received the highest shear-vane measures, with the KBG/PRG mix getting the highest (Table 4). Growth habit differences along with mat layer thickness are the likely factors that allowed for these differences. As mentioned previously, both the mineral grown and washed KBG blend sod treatments did not have the extensive mat layer which the plastic grown sod treatments possessed. The perennial ryegrass treatment grown on plastic had a bunch-type growth habit which explains its lower shear measures. No shear-vane differences were noted amongst the plant growth regulator factor.

Root Biomass:

Root biomass was collected 16 December. Samples were obtained using a conventional cupcutter having a cup diameter of 10.4 cm. One soil plug was taken for each plot. Biomasses were calculated for 0-5 cm and 5-10 cm depths. Roots were separated from soil with the hydropneumatic elutriation system (Smucker

et al, 1982). No differences were noted for either depth for any study factor treatments. The lack of differences between PGR treatments in both root biomass and shear-vane measurements allows the conclusion that a *Primo* application does not adversely affect turfgrass rooting. The ability of the turf manager to apply a growth regulator to reduce mowing and increase density 4-5 weeks prior to a high traffic situation could be beneficial in terms of season long management strategies.

CONCLUSIONS

This study indicated that a KBG/Rye mix sod grown initially on plastic and established on a sand-base provides a superior athletic surface. The KBG/Rye mix sod treatment grown on plastic performed significantly better under traffic conditions compared to other treatments. This trend for the KBG/Rye sod treatment continued for the fall. In terms of color the aforementioned sod treatment along with the KBG grown on mineral soil received the highest ratings with *Poa supina* rated the lowest. The plastic grown sod treatments had significantly higher densities while the washed KBG blend was lowest. Again, the quality ratings were highest throughout the study for the KBG/Rye mix grown on plastic. *Poa supina* had lower quality ratings within the first two months of the study but maintained adequate quality ratings as traffic simulation continued. This may be due to its better response to cooler temperatures and stoloniferous growth habit as compared to the other treatments.

The washed KBG blend had the lowest quality ratings in months of October and November. Shear-vane measures further promoted the KBG/Rye mix treatment followed by the KBG blend grown on plastic. The use of a plant growth regulator such as *Primo* can further maximize the overall surface, particularly in terms of color and quality. Sod densities were lower initially on those treatments where *Primo* was applied but rebounded and received significantly higher densities for the remainder of the study. Many benefits were observed in applying a PGR to sod, although no root biomass differences were noted, lateral topgrowth was enhanced. *Primo*, when applied, increased overall turf densities which increases the wear tolerance. This study continued to increase the limited pool of knowledge in the area of sand-based athletic field establishment and will hopefully provide beneficial information to field managers planning to establish and maintain superior athletic field surfaces.

REFERENCES

Beard, J.B. 1973. Turfgrass:Science and culture. Prentice-Hall, Englewood Cliffs, NJ. 496pp.

Canaway, P.M. 1990. A comparison of different methods of establishment using seed and sod on the cover and playing quality of turf for football. J. Sports Turf Research Institute. 66:28-41

Cockerham, S.T. 1989. An insider looks at sand-filled basin sports fields. Grounds Maintenance. 24(5):37-92.

Cockerham, S.T., and D.J. Brinkman. 1989. A simulator for cleated-shoe sports traffic. California Turfgrass Culture. 39(3,4):9-10.

Krick, T.M., J.N. Rogers III. and J.R. Crum. 1993. Nutrient requirements and establishment methods of athletic turf in sand based rootzones. p.160. *In* Agronomy Abstracts. ASA, Cincinnati, OH.

Rogers, J.N., III., and D.V. Waddington. 1989. The effect of cutting height and verdure on impact absorption and traction characteristics in tall fescue turf. J. Sports Turf Res. Inst. 65:80-90.

Smucker, A.J., S.L. McBurney, and A.K. Srivastava. 1982. Quantitative separation of roots from compacted soil profiles by the hydropneumatic elutriation system. Agron. J. 74:500-503

van Wijk, A.L.M. 1980. *A soil technological study on effectuating and maintaining adequate playing conditions of grass sports fields.* Agric. Res. Rep. 903. Centre for Agri. Publishing and Documentation. Wageningen. Netherlands 124pp

Table 1: The effect of sod treatment and plant growth regulator on turfgrass color[1] under trafficked conditions, Hancock Turfgrass Research Center, Michigan State University, 1994.

	26 Aug.	23 Sept.	28 Oct.	9 Nov.
Sod Treatment			Color	
KBG/PRG mix grown on plastic	7.5	7.4	7.0	6.9
Ryegrass blend grown on plastic	7.3	7.5	7.2	6.0
KBG blend grown on plastic	6.7	6.8	6.1	5.6
Washed KBG blend	7.3	7.1	5.5	5.7
KBG blend grown on mineral soil	7.6	7.7	6.4	6.3
Poa supina grown on plastic	5.2	5.5	5.2	5.5
LSD at 0.05 level	0.4	0.7	0.4	NS
PGR Treatment				
Primo	7.5	7.4	6.6	6.5
No *Primo*	6.4	6.6	5.8	5.5
*=Significant at 0.05 level	*	*	*	*
Games simulated via Brinkman Simulator	---	16	22	24

[1]1-9 scale; 1=brown, 9=dark green and 5 acceptable.

Table 2: The effect of sod treatment and plant growth regulator on turfgrass density under trafficked conditions, Hancock Turfgrass Research Center, Michigan State University, 1994.

	26 Aug.	23 Sept.	28 Oct.	9 Nov.
Sod Treatment			%	
KBG/PRG mix grown on plastic	99	89	87	88
Ryegrass blend grown on plastic	99	88	78	76
KBG blend grown on plastic	99	91	89	85
Washed KBG blend	92	80	68	69
KBG blend grown on mineral soil	97	82	76	75
Poa supina grown on plastic	95	88	78	78
LSD at 0.05 level	4	5	4	5
PGR Treatment				
Primo	96	89	81	81
No *Primo*	98	84	78	76
*=Significant at 0.05 level	*	*	*	*
Games simulated via Brinkman Simulator	---	16	22	24

Table 3: The effect of sod treatment and plant growth regulator on turfgrass quality[1] under trafficked conditions, Hancock Turfgrass Research Center, Michigan State University, 1994.

	26 Aug.	23 Sept.	28 Oct.	9 Nov.
Sod Treatment			Quality	
KBG/PRG mix grown on plastic	8.1	7.8	6.7	7.3
Ryegrass blend grown on plastic	8.0	6.7	6.5	6.5
KBG blend grown on plastic	7.4	7.0	6.2	6.5
Washed KBG blend	7.2	7.2	5.5	5.3
KBG blend grown on mineral soil	8.1	7.5	5.8	6.4
Poa supina grown on plastic	5.6	5.8	6.1	6.3
LSD at 0.05 level	0.4	0.6	0.5	0.3
PGR Treatment				
Primo	7.5	7.5	6.6	6.9
No *Primo*	7.3	6.4	5.7	5.8
*=Significant at 0.05 level	*	*	*	*
Games simulated via Brinkman Simulator	---	16	22	24

[1]1-9; 1=bare ground, 9=ideal turf and 5 acceptable.

Table 4: The effect of sod treatments and plant growth regulator on turfgrass shear-vane measures under trafficked conditions, Hancock Turfgrass Research Center, Michigan State University, 1994.

	26 Aug.	23 Sept.	28 Oct.	9 Nov.
Sod Treatment			Nm	
KBG/PRG mix grown on plastic	30.3	35.8	29.7	30.9
Ryegrass blend grown on plastic	23.4	21.0	20.2	21.3
KBG blend grown on plastic	25.5	30.6	27.8	29.0
Washed KBG blend	24.2	23.1	21.8	25.3
KBG blend grown on mineral soil	22.3	22.3	21.0	21.6
Poa supina grown on plastic	23.8	22.0	22.5	23.1
LSD at 0.05 level	3.7	2.9	2.0	1.6
PGR Treatment				
Primo	---	26.0	24.0	25.0
No *Primo*	---	26.0	23.0	26.0
*=Significant at 0.05 level	---	NS[1]	NS	NS
Games simulated via Brinkman Simulator	---	16	22	24

[1]NS=Not significant