EXECUTIVE SUMMARY
GROW-IN AND CULTURAL IMPACTS ON USGA PUTTING GREENS AND THEIR MICROBIAL COMMUNITIES
UNIVERSITY OF NEBRASKA

Dr. R.E. Gaussoin, Principal Investigator
Dr. Rhae Drijber, Dr. William Powers, Mine Aslan, Milda Vaitkus, Leonard Wit, Cooperators

The overall goal of this project is to develop a better understanding of the impact of grow-in procedures on putting green establishment and performance. Impacts on the physical, chemical, and microbiological factors associated with the USGA root zones and rhizosphere are emphasized in the project.

The five year project is composed of three phases, One: Construction and Grow-in, Two: Microbial Community Assessments, and Three: Grow-in Procedure Impacts on the Long-term performance of the Putting Green. Phases One and Two span three year periods, while Phase Three will involve experiments repeated over the five years of the project.

Two separate USGA-specification root zone mixtures - one composed of sand and peat (80/20 ratio) and one a combination of sand, soil, and peat (80/5/15 ratio) - were developed in 1996. Materials used for construction complied with USGA Greens recommendations for physical characteristics and organic matter content. Greens were constructed in late summer of 1996, allowed to settle over the winter, and were seeded with Providence creeping bentgrass (1.5 lbs/1000ft^2) in the spring (May 30) of 1997.

Preliminary results from 1997 indicate the following:

Higher inputs will initially increase cover during grow-in. This increase may not translate to earlier opening for play if environmental stress conditions occur that result in damage to lush, immature turf.

A root zone mix containing soil will establish quicker and recover from environmental stress faster than a soilless mix. A soil-containing mix will also be harder and may result in longer ball roll distance.

Addition of soil to the root zone mix will not effect water infiltration during the establishment year.

Results of microbial assessments are pending.

I. Title: **GROW-IN AND CULTURAL IMPACTS ON USGA PUTTING GREENS AND THEIR MICROBIAL COMMUNITIES**

II.Principal Investigator: Dr. R.E. Gaussoin, Principal Investigator
Cooperators: Dr. Rhae Drijber, Dr. William Powers, Mine Aslan, Milda Vaitkus, Leonard Wit

III. Purpose: The overall goal of this project is to develop a better understanding of the impact of grow-in procedures on putting green establishment and performance. Impacts on the physical, chemical, and microbiological factors associated with the USGA root zones and rhizosphere are emphasized in the project.

IV. Location: The project is being conducted at the University of Nebraska's John Seaton Anderson Turfgrass Research Facility located near Mead, NE.

V. Introduction: The five year project is composed of three phases, One: Construction and Grow-in, Two: Microbial Community Assessments, and Three: Grow-in Procedure Impacts on the Long-term performance of the Putting Green. Phases One and Two span three year periods, while Phase Three will involve experiments repeated over the five years of the project.

VI. Methods: Two separate USGA-specification root zone mixtures - one composed of sand and peat (80/20 ratio) and one a combination of sand, soil, and peat (80/5/15 ratio) - were developed in 1996. Materials used for construction complied with USGA Greens recommendations for physical characteristics and organic matter content. Greens were constructed in late summer of 1996, allowed to settle over the winter, and were seeded with Providence creeping bentgrass (1.5 lbs/1000ft^2) in the spring (May 30) of 1997.

Accelerated and Controlled treatments were applied prior to and after seeding according to the treatment schedule outlined in Table 1.

Data were collected on (1) % vegetative cover, (2) color (1-9=most green), (3) quality (1-9=best quality), (4) ball roll distance (Stimpmeter), (5) verdure development (dry weight) and (6) surface hardness (Clegg).

In September, soil samples were taken to determine rhizosphere microbial community temporal and spatial patterns during grow-in. These samples were analyzed using current methods for analysis of PH-FAMES.

Soil physical properties were also examined in September. Infiltration rates were measured in the field using a single-ring infiltrometer. Soil cores were sampled and will be being analyzed for water retention and total porosity using pressure plate techniques.

Year two plots were also constructed. They will be allowed to settle over the winter and will be seeded in the spring of 1998.

VII. Results: (1) Vegetative cover was greater for plots with soil in the mix than the soilless mix (78 vs. 68 %) on July 3 and for accelerated vs. controlled (84 vs. 63 %) on this same date.

(2) After an extended period of high humidity and no precipitation in July, plots exhibited symptoms of summer decline. Samples taken from plots showed evidence of *Pythium* sp. as well as direct high temperature injury. To document this observation. decline was evaluated on August 1 using a scale of 1-9, with 9 indicating greatest decline. The accelerated treatment exhibited greater decline than the controlled grow-in (7.5 vs. 2.3). This response was also reflected in the quality data obtained on that date; quality of accelerated plots was 3.0 vs. 8.3 for controlled plots. On August 15 quality data showed a significant interaction between grow-in and root zone mix (Table 2). When grow-in was accelerated, the mix containing soil had better quality than the soilless mix. When grow-in was controlled or when soil was included in the root zone mix, quality was not affected.

(3) A significant interaction between treatments was found for ball roll distance on October 22 (Table 3). The root zone mix containing soil had longer ball roll than the non-soil mix. This response was not evident in the accelerated grow-in treatments. Regardless of root zone mix, controlled grow-in plots had longer ball roll than the accelerated plots. The root zone mix containing soil consistently had a higher surface hardness than the soilless mix (Table 4).

(4) Verdure and ball roll distance were not significant sources of variability from data obtained on July 7 and September 4 (verdure) or August 4 and September 16 (ball roll distance), indicating that grow -in procedure or soil type had no effect on these attributes during the early stages of grow-in.

(5) Based on analysis of variance, water infiltration rate was not a significant source of variability.

VII. Discussion: Preliminary results from 1997 indicate the following:

Higher inputs will initially increase cover during grow-in. This increase may not translate to earlier opening for play if environmental stress conditions occur that result in damage to lush, immature turf.

A root zone mix containing soil will establish quicker and recover from environmental stress faster than a soilless mix. A soil-containing mix will also be harder and may result in longer ball roll distance.

Addition of soil to the root zone mix will not effect water infiltration during the establishment year.

Table 1. Establishment and grow-in treatments for GCSAA/USGA Greens Construction Project. University of Nebraska. 1997. All rates in pounds per 1000ft^2 unless noted.

	Accelerated				Controlled			
		N	P	K		N	P	K
Preplant Treatments								
STEP (83113)	16	-	-	-	11	-	-	-
Started (16-25-12)	12	2	3	1.4	6	1	1.5	.7
15-0-29 (8845)	9	1.35	0	2.6	4.5	.7	0	1.3
38-0-0 (8820)	7.25	2.75	0	0	3.6	1.34	0	0
Totals		6.1	3	4		3.04	1.5	2
Postplant Treatments								
Starter (16-25-12)	Full rate - Weekly				Half Rate - Every 2 weeks			
STEP	100#/A				60#/A			
	(45/90 days post planting)							
Mowing	3/8' to 3/16'							
Verticutting	Canopy only (7-10 days)							
Topdressing	Light, frequent (7-10 days)							
Roilling	1X weekly				1X every 2 weeks			
Disease Control	Preventative							
Insect Control	Preventative							
Weed Control	Preemergence; Preventative							

Table 2. Quality Means for USGA/GCSAA Greens Construction Project
John Seaton Anderson Turfgrass Research Facility Mead, NE August 15, 1997

	Grow-in (1-9 9=best quality)	
Root Zone Mix	Accelerated	Controlled
Sand/Peat (80:20)	5.7Aa	7.3 Ba
Sand/Peat/Soil (80:15:5)	7.7Ab	8.0 Aa

•Data within rows followed by different upper case letters are significantly different based on a LSD (P=0.05).
•Data within columns followed by different lower case letters are significantly different based on a LSD (P=0.05).

Table 3. Ball Roll Distance (Stimpmeter) for USGA/GCSAA Greens Construction Project. John Seaton Anderson Turfgrass Research Facility, Mead, NE. October 22, 1997.

	Grow-in (1-9 9=best quality)	
Root Zone Mix	Accelerated	Controlled
	cm	
Sand/Peat (80:20)	122 Aa	136 Ba
Sand/Peat/Soil (80:15:5)	126 Aa	147 Bb

•Data within rows followed by different upper case letters are significantly different based on a LSD (P=0.05).
•Data within columns followed by different lower case letters are significantly different based on a LSD (P=0.05).

Table 4. Surface Hardness (Clegg) for USGA/GCSAA Greens Construction Project. John Seaton Anderson Turfgrass Research Facility, Mead, NE.

	CLEGG		
	8/4	9/16	10/22
Sand/Peat (80:20)	48	56	56
Sand/Peat/Soil (80:15:5)	60	68	68

Data within evaluation dates significantly different based on analysis of variance (P = 0.05).