

1997 RUTGERS Turfgrass Proceedings



THE NEW JERSEY TURFGRASS ASSOCIATION

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The Rutgers Turfgrass Proceedings is published yearly by the Rutgers Center for Turfgrass Science, Rutgers Cooperative Extension, and the New Jersey Agricultural Experiment Station, Cook College, Rutgers University in cooperation with the New Jersey Turfgrass Association. The purpose of this document is to provide a forum for the dissemination of information and the exchange of ideas and knowledge. The proceedings provide turfgrass managers, research scientists, extension specialists, and industry personnel with opportunities to communicate with co-workers. Through this forum, these professionals also reach a more general audience, which includes the public. Articles appearing in these proceedings are divided into two sections.

The first section (white pages) includes lecture notes of papers presented at the 1997 New Jersey Turfgrass Expo. Publication of the New Jersey Turfgrass Expo Notes provides a readily

available source of information covering a wide range of topics. The Expo Notes include technical and popular presentations of importance to the turfgrass industry.

The second section (green pages) includes technical research papers containing original research findings and reviews covering selected subjects in turfgrass science. The primary objective of these papers is to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

Special thanks are given to those who have submitted papers for this proceedings, to the New Jersey Turfgrass Association for financial assistance, and to those individuals who have provided support to the Rutgers Turf Research Program at Cook College - Rutgers, The State University of New Jersey.

Dr. Ann B. Gould, Editor
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PERFORMANCE OF BENTGRASS CULTIVARS AND SELECTIONS IN NEW JERSEY TURF TRIALS

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Bentgrass species used for close-cut turf include creeping bentgrass (*Agrostis palustris*, also known as *Agrostis stolonifera*), colonial bentgrass (*Agrostis tenuis* or *Agrostis capillaris*), highland or dryland bentgrass (*Agrostis castellana*), and velvet bentgrass (*Agrostis canina*). Creeping bentgrasses have relatively vigorous stolon growth and are generally the best adapted of the bentgrass species for use on golf courses in both the cool, temperate and the warm, humid environments of the United States. Creeping bentgrasses are particularly useful for golf course putting greens because they form a fine-textured, dense, low growing turf with good tolerance of low mowing heights.

Colonial bentgrass, also referred to as browntop, produces a turf with fine-textured, upright-growing leaves and a bunch-type to weakly creeping (short rhizomes) growth habit. Compared to the creeping bentgrasses, colonial bentgrasses are typically brighter green and have better color retention during cool weather. Dryland bentgrasses are similar in adaptation and appearance to colonial bentgrasses, but are more bluegreen in color and are more likely to have rhizomes. Rhizomes increase the capacity of these grasses to recover from damage. Velvet bentgrasses are very fine-leaved grasses that can form an attractive turf of very high density with limited stoloniferous growth and a bright green color. Velvet bentgrass is sometimes used instead of creeping bentgrass in cool, moist maritime climates. Recent trials suggest that heat tolerance in velvet bentgrass is greater than previously reported; however, red thread can be a problem on some cultivars.

The number of commercially available bentgrass cultivars has increased steadily in recent years largely due to the increasing popularity of golf in the United States and other parts of the world. The number of golfers in the United States increased from 17.5 to 25 million between 1985 and 1990.

To adequately assess turfgrasses, it is important to evaluate the performance of cultivars over time and under various environmental conditions, particularly in the region of intended use. Data from evaluation trials can help turf managers select the best adapted cultivars for use in establishment, overseeding, or conversion of golf course turfs. Golf course superintendents frequently face the challenges of maintaining cost effective operations, meeting increasing player demands, and managing the potential environmental risks associated with water, fertilizer and pesticide use. Management strategies that minimize pesticide use and enhance efficacy are important in a comprehensive, environmentally sound turf management program. Selection of species and cultivars, based on field performance and resistance to important disease and insect pests, is an extremely valuable component of a pest management program that should not be overlooked.

The New Jersey Agricultural Experiment Station participates in the National Turfgrass Evaluation Program (NTEP) which evaluates many species of turfgrasses, including bentgrasses, throughout the United States. The Rutgers turfgrass breeding program also conducts a number of independent bentgrass trials of material

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generated by its program as well as other turfgrass breeding programs.

PROCEDURES

Bentgrass evaluation trials were established in May 1994 (Table 1 and 2), September 1995 (Table 3 and 4), and September 1996 (Table 5) at the Rutgers Turfgrass Research Facility in North Brunswick, New Jersey. The two trials seeded in May 1994 included all entries of the 1993 National Bentgrass Test coordinated by NTEP. The trials seeded in September 1995 and 1996 included named cultivars, but the majority of entries were experimental selections. One test seeded in May 1994 (Table 1) simulated putting green conditions on an unmodified Nixon loam. The other four tests were managed to approximate fairway conditions on a Nixon loam. All sites were well-drained and had an open exposure to both sunlight and air circulation. Plot size was 4 X 6 ft in the trials seeded May 1994, 4 x 6 ft in the September 1995 seeded trial, and 2.5 x 3.5 ft in the September 1996 trial. A 6-inch unseeded border surrounded each plot to minimize seed contamination from adjacent plots. Plots were hand-seeded at a rate of approximately 0.5 lb/1000 ft². All tests used a randomized complete block design with three replications.

The annual rate of nitrogen fertilization and mowing height for each test are presented in Table 6. The greens test was mowed five to six times per week during periods of active growth with a triplex reel mower equipped to collect clippings. The fairway tests were mowed and clippings were removed three times per week with a triplex reel mower during periods of active growth. Soil pH was maintained in the range of 6.0 to 6.5 with agricultural limestone. All tests were irrigated to avoid severe drought stress.

All tests received Betasan in spring of 1997 for preemergence control of summer annual weeds. The tests seeded in May 1994 received two applications of Turcam and one application of Dursban for insect control, and one application of Daconil 2787 and two applications of

Chipco 26019 to control diseases in 1997. No pest control was applied to the 1995 and 1996 trials.

The trials did not receive core cultivation in 1997. Topdressing, using a 90:10 sand-peat mixture, was applied June 1997 to the putting green trial. Two applications of Aquaduct and one application of Primer, both soil wetting agents, were made to control localized dry spots and fairy rings in the putting green and fairway trials seeded in May 1994.

Plots were evaluated frequently during the growing season for overall turf quality (i.e., turf density, texture, uniformity, color, growth habit, and freedom from disease and insect damage). Turf quality, spring-up, color, density, disease, and turf cover were rated on a 1 to 9 scale, where 9 represented the most desirable turf characteristic. All data were subjected to analysis of variance. Means were separated using the least significant difference (LSD) multiple comparisons test.

RESULTS AND DISCUSSION

Based on the 4-year (1994 to 1997) quality average from the greens test seeded May 1994 (Table 1), many of the newer creeping bentgrass cultivars performed better than the older cultivars. Performance of the creeping bentgrasses was better than the colonial bentgrasses, particularly at a greens height of cut (Table 1). Ratings from the fairway/tee trial seeded in May 1994 indicated that colonial bentgrasses performed better at a higher height of cut (Table 2).

Ratings from the fairway/tee trial seeded September 1995 also indicated that many of the newer creeping bentgrass cultivars and selections performed better than older cultivars (Tables 3). Turf quality ratings among colonial bentgrasses in the test seed September 1995 indicated that differences in adaptation to New Jersey growing conditions exist (Table 4).

A relatively broad range of color and density was observed in the bentgrass tests seeded May

1994 (Tables 1 and 2). Compared to the older standard Pennncross, a number of bentgrass cultivars produced more upright growth with a finer leaf texture and higher shoot density.

Ratings for dollar spot incidence indicated a range in susceptibility was apparent among creeping bentgrass cultivars (Table 5). Brown patch ratings also indicated that a range in susceptibility to this disease also exists among creeping bentgrasses (Table 5). Similarly, a range in susceptibility of creeping bentgrass to copper spot disease was observed (Table 3).

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Table 1. Performance of bentgrass cultivars and selections in a greens trial seeded in May 1994 at North Brunswick, NJ.
(Includes 1993 National Bentgrass Greens Test - NTEP.)

	Cultivar or Selection	-----Turf Quality ¹ -----					1997 Avg.	1994 Avg.	1995 Avg.	1996 Avg.	1997 Avg.	Spring Green-up ² April 1997	Color ³ July 1997
		1994-	1995	1996	1997	1997							
1	L-93	7.2	6.9	7.2	7.2	7.6	7.2	7.2	7.2	7.6	5.3	7.3	
2	A-1	6.9	7.0	7.0	6.4	7.0	6.4	7.0	6.4	7.0	6.0	7.0	
3	A-4	6.3	5.9	6.3	6.2	6.7	6.2	6.3	6.2	6.7	4.0	6.7	
4	G-6	6.2	6.5	6.2	5.4	6.8	5.4	6.2	5.4	6.8	6.0	5.7	
5	G-2	6.2	6.5	6.6	4.4	7.3	4.4	6.6	4.4	7.3	7.3	3.7	
6	Cato	6.1	5.7	6.5	5.6	6.7	5.6	6.5	5.6	6.7	3.7	7.0	
7	Providence	6.1	6.1	6.0	5.6	6.7	5.6	6.0	5.6	6.7	6.3	6.3	
8	Southshore	5.8	5.8	5.6	5.3	6.6	5.3	5.6	5.3	6.6	6.3	6.0	
9	Imperial	5.6	6.1	5.2	5.2	6.0	5.2	5.2	5.2	6.0	4.7	5.7	
10	MSUEB	5.4	5.8	4.9	5.2	5.7	4.9	4.9	5.2	5.7	4.3	4.7	
11	Century	5.4	5.7	4.8	5.0	6.0	4.8	4.8	5.0	6.0	6.7	4.0	
12	Regent	5.3	5.7	4.9	5.3	5.5	4.9	4.9	5.3	5.5	6.0	7.0	
13	BAR WS 42102	5.3	4.7	5.2	5.2	6.1	5.2	5.2	5.2	6.1	4.3	3.7	
14	Atlanta	5.3	5.5	5.7	4.3	5.5	5.7	5.7	4.3	5.5	2.7	4.7	
15	Putter	5.2	5.7	4.8	5.0	5.4	4.8	4.8	5.0	5.4	3.7	4.0	
16	ISI-AP-89150	5.2	5.3	5.2	4.9	5.3	5.2	5.2	4.9	5.3	4.7	5.7	
17	Pennlinks	5.2	5.3	5.5	4.8	5.2	5.5	5.5	4.8	5.2	4.7	4.3	
18	DG-P	5.1	5.3	4.9	5.3	4.8	4.9	4.9	5.3	4.8	3.7	5.0	
19	Backspin	5.0	6.0	4.3	4.5	5.0	4.3	4.3	4.5	5.0	4.3	3.3	
20	Cobra	4.9	5.6	4.3	4.7	4.9	4.3	4.3	4.7	4.9	6.0	4.7	

Table 1 (continued).

Cultivar or Selection	Turf Quality ¹					Spring Green-up ² April 1997	Color ³ July 1997
	1994-1997 Avg.	1994 Avg.	1995 Avg.	1996 Avg.	1997 Avg.		
21 Pro/Cup	4.9	5.6	4.7	4.5	4.9	3.3	4.7
22 Crenshaw	4.8	6.4	3.6	3.7	5.4	5.0	8.3
23 Trueline	4.6	5.8	4.3	3.9	4.5	1.7	5.3
24 SR-1020	4.6	5.0	4.6	3.9	4.8	4.0	5.0
25 Lopez	4.4	5.7	4.6	3.9	3.7	2.0	4.0
26 Mariner	3.9	5.2	3.6	3.0	3.9	3.7	4.3
27 18th Green	3.9	5.1	3.6	3.3	3.5	4.3	8.7
28 Penncross	3.8	4.5	3.5	3.6	3.7	3.0	4.0
29 Exeter	3.1	2.4	2.7	3.1	4.3	6.3	5.3
30 BARAS 493	3.0	3.4	2.9	2.5	3.1	7.3	3.3
31 Tendez	2.7	4.1	2.5	1.9	2.2	5.0	
32 Seaside	2.3	2.8	1.9	1.8	2.4	3.0	3.7
LSD at 5% =	0.5	0.6	0.5	0.8	1.1	2.2	1.3

¹9 = best turf quality
²9 = brightest green color
³9 = darkest green color

Table 2. Performance of bentgrass cultivars and selections in a fairway/tee turf trial seeded in May 1994 at North Brunswick, NJ. (Includes 1993 National Bentgrass Fairway/Tee Test - NTEP.)

	Cultivar or Selection	-----Turf Quality'-----					Spring		Density ³ May 1997	Color ⁴ July 1997
		1994-1997 Avg.	1994 Avg.	1995 Avg.	1996 Avg.	1997 Avg.	Green-up ² April 1997			
1	Cato	6.8	6.8	7.2	6.4	6.7	5.0	7.0	7.0	
2	G-6	6.8	7.4	6.5	6.2	7.1	6.3	7.3	5.7	
3	L-93	6.7	6.7	6.9	6.3	6.9	5.0	7.0	5.2	
4	G-2	6.5	7.0	6.5	5.4	6.9	5.0	8.0	5.5	
5	Providence	6.3	6.2	6.5	6.2	6.4	4.7	6.0	5.7	
6	Penneagle	6.1	6.3	6.2	5.9	6.0	6.0	5.7	4.8	
7	Atlanta	6.0	6.7	5.7	5.5	6.0	3.7	6.7	4.3	
8	Southshore	6.0	6.3	6.0	5.7	5.9	5.8	6.3	4.8	
9	Putter	5.9	6.6	5.8	5.4	5.8	6.0	5.0	5.0	
10	Crenshaw	5.8	7.5	4.9	4.7	5.9	5.7	5.3	7.0	
11	Pennlinks	5.7	5.6	5.7	5.9	5.8	6.0	5.0	4.7	
12	Seaside II	5.5	5.7	5.6	5.3	5.2	5.0	6.3	4.3	
13	Cobra	5.5	5.8	5.2	5.2	5.7	6.3	4.8	5.4	
14	BAR WS 42102	5.2	5.3	5.2	5.1	5.2	2.7	6.7	4.0	
15	ISI-At-90162	5.2	5.7	5.1	5.4	4.7	6.3	5.7	6.3	
16	Trueline	5.1	5.9	5.1	4.5	5.1	3.7	4.3	5.5	
17	SR 7100	5.1	5.1	5.0	5.4	4.9	8.7	6.3	5.3	
18	Lopez	5.0	5.8	5.0	4.2	5.1	4.0	3.7	5.3	
19	Pro/Cup	4.8	5.5	4.4	4.1	5.1	5.0	3.7	5.3	
20	Pennncross	4.7	5.0	4.6	4.3	5.0	5.7	3.7	4.8	

Table 2 (continued).

Cultivar or Selection	-----Turf Quality ¹ -----					Spring Green-up ² April 1997	Density ³ May 1997	Color ⁴ July 1997
	1994-1997 Avg.	1994 Avg.	1995 Avg.	1996 Avg.	1997 Avg.			
21 BARAS 493	4.4	4.3	4.6	4.5	4.2	8.0	3.7	4.5
22 18th Green	4.3	5.2	3.6	3.6	4.7	4.0	3.0	5.8
23 Pebble	4.2	4.9	4.3	4.1	3.6	6.0	4.3	6.2
24 Exeter	4.0	2.9	4.0	4.4	4.8	5.7	3.5	4.5
25 Tendez	3.3	4.5	3.6	2.4	2.5	6.3	1.7	4.7
26 Seaside	2.6	3.1	2.1	2.3	2.7	4.7	1.3	3.7
LSD at 5% =	0.5	0.7	0.6	0.8	1.0	2.5	1.2	1.4

¹9 = best turf quality
²9 = brightest green color
³9 = densest turf
⁴9 = darkest green color

Table 3. Performance of creeping bentgrass cultivars and selections in a fairway trial seeded in September 1995 at North Brunswick, NJ.

	Cultivar or Selection	Species	-----Turf Quality ¹ -----			Copper Spot ² Aug. 1997
			1996- 1997 Avg.	1996 Avg.	1997 Avg.	
1	G-2	creeping	6.0	6.5	5.5	5.3
2	PST Syn ODA	creeping	5.7	6.3	5.1	5.7
3	G-6	creeping	5.6	6.0	5.1	7.7
4	PST Syn OVS	creeping	5.4	6.1	4.7	6.3
5	PST Syn OVL	creeping	5.4	6.0	4.7	6.3
6	PST Syn OVM	creeping	5.3	6.1	4.5	8.0
7	L-93	creeping	5.3	5.9	4.8	7.3
8	SRX 1119	creeping	5.1	5.7	4.5	6.0
9	IBM8-14	creeping	5.1	5.9	4.3	7.5
10	A-4	creeping	5.1	6.2	4.0	5.3
11	Seaside II	creeping	4.5	4.8	4.1	5.3
12	SR 1020	creeping	4.5	5.2	3.7	5.7
13	PST Syn Biltmore	creeping	4.4	4.7	4.1	7.0
14	Penneagle	creeping	4.3	4.8	3.8	7.3
15	Pennlinks	creeping	4.3	4.4	4.2	8.0
16	Providence	creeping	4.2	4.9	3.4	6.3
17	PST Syn OBS	creeping	4.1	4.5	3.8	5.3
18	Penncross	creeping	3.6	4.4	2.7	8.0
19	3011	creeping	2.9	2.5	3.2	6.3
LSD at 5% =			0.4	0.5	0.7	2.0

¹9 = best turf quality

²9 = least disease

Table 4. Performance of velvet and colonial bentgrass cultivars and selections in a fairway trial seeded in September 1995 at North Brunswick, NJ.

	Cultivar or Selection	Species	-----Turf Quality ¹ -----		
			1996-1997 Avg.	1996 Avg.	1997 Avg.
1	SR 7200	velvet	6.7	6.0	7.4
2	7VB Germ	velvet	6.3	5.8	6.8
3	Amherst GC-2	colonial	5.0	5.8	4.2
4	Amherst GC-3	colonial	4.5	5.2	3.9
5	PST Syn OHG	colonial	4.5	5.0	3.9
6	SK Bent-1	colonial	4.2	4.7	3.7
7	MD Nat Cem-6	colonial	4.2	5.0	3.4
8	Keene GC-1	colonial	4.1	4.6	3.5
9	3006	colonial	4.1	4.6	3.5
10	Prouts Neck GC-6	colonial	4.0	4.8	3.1
11	3005	colonial	4.0	4.7	3.2
12	Prouts Neck GC-5	colonial	4.0	4.6	3.3
13	Amherst GC-1B	colonial	3.9	4.5	3.2
14	SK Bent-4	colonial	3.8	4.8	2.8
15	7 Belt	colonial	3.8	4.9	2.7
16	Converse Coll	colonial	3.7	4.7	2.7
17	PST Syn 0456	colonial	3.7	4.5	2.9
18	3001	colonial	3.6	4.4	2.9
19	3003	colonial	3.6	4.5	2.6
20	3010	colonial	3.4	3.5	3.3
21	MD Nat Cem-4	colonial	3.4	4.1	2.6
	LSD at 5% =		0.9	0.3	1.3

¹9 = best turf quality

Table 5. Performance of bentgrass cultivars and selections in a fairway trial seeded in September 1996 at North Brunswick, NJ.

	Cultivar or Selection	Species	Turf Quality ¹ 1997 Avg.	Emergence ² Oct. 1996	Cover ³ Nov. 1996	Brown Patch ⁴ 1997 Avg.	Dollar Spot ⁴ 1997 Avg.
1	SR 7200	velvet	6.1	7.3	5.7	9.0	7.8
2	G-6	creeping	5.6	5.5	7.0	8.5	5.7
3	DCAT-UM-86-01-95	creeping	5.2	6.7	6.0	8.7	5.5
4	PST Syn AIP	creeping	5.2	6.0	6.7	8.3	5.8
5	PST Syn OVN	creeping	5.2	7.7	7.7	7.5	6.7
6	SRX 1MO149	creeping	5.1	4.7	5.7	8.4	5.8
7	A2E-96	creeping	5.1	3.7	5.7	8.8	5.8
8	PST Syn OPE	creeping	5.1	6.7	7.0	8.3	6.5
9	G-2	creeping	5.0	5.3	5.7	8.8	4.8
10	SRX 1P101-34	creeping	4.9	5.0	6.0	7.1	5.5
11	SRX 1DG	creeping	4.9	5.0	6.7	8.7	5.0
12	SRX 1CRCO	creeping	4.9	5.0	7.3	7.8	6.0
13	SRX 1M150	creeping	4.9	7.0	7.0	7.9	5.5
14	L-93	creeping	4.8	7.0	7.0	7.5	6.2
15	SRX 1HTS	creeping	4.8	5.3	6.3	7.0	6.7
16	SRX 1STROL	creeping	4.7	5.7	7.3	6.8	6.5
17	SRX 1P98-29	creeping	4.6	5.3	6.7	7.5	5.7
18	SRX 1HTP	creeping	4.5	3.0	5.0	7.3	6.8
19	SRX 1119	creeping	4.5	2.0	3.7	8.1	6.0
20	Atlanta	creeping	4.5	6.3	6.0	6.6	5.3
21	Putter	creeping	4.5	4.7	5.7	6.9	6.3
22	DCAT-UM 86-02-96	creeping	4.4	6.3	6.3	8.5	5.7
23	PST Syn OVL	creeping	4.3	6.3	6.0	6.9	6.7
24	Pennlinks	creeping	4.3	3.7	4.7	7.4	6.0
25	ISI-AP3	creeping	4.3	4.0	6.3	7.1	6.2
26	G-1	creeping	4.2	2.7	3.7	8.3	5.5
27	18th Green	creeping	4.2	4.3	4.0	7.5	4.5
28	LRF-94-A5	creeping	4.2	2.7	4.3	7.6	6.5
29	OPU-95	creeping	4.2	6.0	6.3	6.8	6.0
30	Providence	creeping	4.1	3.7	5.0	5.8	6.5

Table 5 (continued).

	Cultivar or Selection	Species	Turf Quality ¹ 1997 Avg.	Emergence ² Oct. 1996	Cover ³ Nov. 1996	Brown Patch ⁴ 1997 Avg.	Dollar Spot ⁴ 1997 Avg.
31	SRX 1 Cincy	creeping	4.1	3.3	5.7	6.8	6.7
32	A-4	creeping	4.1	4.3	5.3	6.1	5.2
33	Cobra	creeping	4.1	6.0	7.7	6.3	6.3
34	Southshore	creeping	4.0	2.7	4.7	7.3	5.7
35	SR 1020	creeping	3.4	2.3	3.7	6.1	6.2
36	Seaside II	creeping	3.4	2.3	4.0	7.4	7.3
37	J-102	Idaho	3.2	5.3	5.0	6.7	8.0
38	J-101	Idaho	2.6	3.0	3.3	6.8	8.3
	LSD at 5% =		0.8	1.8	1.9	1.1	1.2

- ¹9 = best turf quality
- ²9 = best emergence
- ³9 = best turf cover
- ⁴9 = least disease

Table 6. Yearly nitrogen (N) applied and mowing height (Ht) on bentgrass tests established at North Brunswick NJ.

	1994		1995		1996		1997	
	N ¹	Ht ²	N	Ht	N	Ht	N	Ht
Table 1 (1994 Greens)	4.1	5/32	5.0	5/32	2.8	5/32	2.5	5/32
Table 2 (1994 Fairway)	4.1	17/32	3.0	17/32	3.3	13/32	1.5	13/32
Table 3 (1995 Fairway)					2.7	13/32	3.0	13/32
Table 4 (1995 Fairway)					2.7	13/32	3.0	13/32
Table 5 (1996 Fairway)							2.5	13/32

¹Annual N applied (lbs/1000 ft²).

²Mowing height in inches.