

# **Performance of Bentgrass Cultivars and Selections under Fairway Conditions (1993-97)**

P.J. Landschoot, A.S. McNitt, D. Livingston, and B.S. Park

Funding Sources: National Turfgrass Evaluation Program, The Pennsylvania Turfgrass Council

## **Introduction**

Tests of commercially-available turfgrass cultivars and experimental selections are conducted annually in University Park, PA to provide turfgrass managers, seed industry representatives, county extension agents, and other interested persons with information about turfgrass characteristics and performance. In September 1993, 21 bentgrass cultivars and selections were established at the Joseph Valentine Turfgrass Research Center in University Park, PA. Entries were supplied by the National Turfgrass Evaluation Program (NTEP). The following is a report on the performance of these entries from 1993 to 1997.

## **Materials and Methods**

Entries were seeded on September 14, 1993 in 4 by 6 foot plots at a rate of 0.6 pounds of seed per 1000 square feet. The entire test site received full sunlight. Three replicate plots of each entry were used in this test and plots were arranged in a randomized complete block design. Prior to seeding, the test area received starter fertilizer at a rate of 1.0 pound of nitrogen (N), 0.5 pound of phosphate, and 0.5 pound potash per 1000 square feet. The test was initially mowed with a fairway mower at 0.5 inch in height. In 1994, the mowing height was lowered to 3/8 inch and remained at that height for the duration of the test. The test received between 3-4 lbs N/1000 square feet each year split into three to four applications. The test was core aerated in the spring of 1995 and 1996 and was irrigated frequently during the summer.

## ***Assessments of Turfgrass Performance***

All assessments of turfgrass performance were made on a visual basis. Care was taken to ensure consistent and accurate evaluations. The following performance criteria were used to assess bentgrass cultivars and selections.

Quality: Quality indicates the overall appearance of the turf and can incorporate several components including: density, texture (measure of leaf width), uniformity, and freedom from disease and insect damage. Quality is rated using a scale of 1 to 9, where 9 = highest quality.

Seedling vigor: This rating is a visual estimate of percent ground cover and plant height during the early stages of seedling establishment and reflects the rate of establishment. The plots were rated shortly after seeding using a scale of 1 to 9, where 9 = most vigorous seedling growth.

Spring green-up: Spring green-up provides an indication of how soon the turf breaks out of winter dormancy. The plots were rated for spring green-up using a scale of 1 to 9 where 9 = the most uniform green color.

Color: Color ratings reflect the inherent color of the entry, not yellowing or browning due to mower injury, drought stress, disease, etc. Color ratings are taken when grass is not under stress. Color is rated on a scale of 1-9, with 9 = the darkest green color.

Texture: This rating provides an indication of the relative coarseness/fineness of turf leaf width. Texture is rated on a scale of 1-9, where 9 = the finest-textured turf.

Density: Density is a visual estimate of the number of plants per unit area. Density is rated on a scale of 1-9, with 9 = the most dense turf.

Disease ratings: Disease ratings provide an indication of an entry's reaction to a particular disease. Disease ratings are based on a scale of 1-9 (with 1 = extensive disease damage and 9 = no disease present) *or* on a percent disease basis where the number reported indicates the percentage of plot area diseased. Disease ratings of dollar spot, brown patch, and gray snow mold are included in this report. All disease infestations occurred naturally.

Poa annua: The degree of *Poa annua* infestation in 1996 was expressed on a scale of 1-9, where 9 = 100% infestation and 1 = no visible infestation.

## **Results and Discussion**

### ***Interpretation of Results***

Data for the above criteria are presented in Tables 1, 2, and 3. Cultivars that are commercially-available are in bold type and experimental selections are in plain type. Differences between two entries are statistically significant only if the LSD (Least Significant Difference) value, listed at the bottom of each column in Tables 1, 2, and 3 is exceeded by the numerical difference between two entries. For example, if cultivar 'A' is 3.0 units higher in quality than cultivar 'B', then this difference is only significant if the LSD value is 3.0 or less. If

the LSD is greater than 3.0, then the numerical difference between the two cultivars may be due to inherent variability in the test area or some other element of chance.

Keep in mind that the results of this test reflect cultivar performance for the management regime imposed at this site and environmental conditions in central Pennsylvania.

### *Summary of results*

Seedling vigor (Table 2) was greatest with **Providence, Penncross, Seaside, Crenshaw, Southshore**, and OM-At-90163. The selection that was slowest to establish was BAR As 493.

The cultivars with the highest average seasonal quality (Table 1) for four consecutive years were **Penneagle** and **Cato**. Both cultivars showed excellent color, density, uniformity, and disease resistance throughout the test period. Other entries showing high quality ratings over the test period included BAR Ws 42102, **Penn G-6, Penn G-2, Southshore, and Providence**. Entries that ranked lowest in turf quality included **Exeter, Seaside, BAR As 493, and Tendez**.

Differences in spring green-up (Table 2) were most evident during the spring of 1995. In general, the colonial bentgrasses showed better spring green-up than the creeping bentgrasses. **Penn G-2** and **18th Green** showed the slowest spring green-up in 1995.

Although cultivar color is usually not considered an important criterion in terms of playability, it can be a consideration when trying to achieve a uniform-appearing stand with a blend of several cultivars. **18th Green** showed the darkest blue/green color, whereas **Tendez, Crenshaw, Providence, Southshore, and Cato** showed a medium to dark-blue/green color (Table 2). Although some of the colonial bentgrasses received high color ratings, they tended to impart a yellow/green rather than a blue/green hue. **Seaside** was the lightest green (yellow/green) entry.

**Cato, BAR Ws 42102, Penn G-6, and Penn G-2** were the finest-textured entries (Table 2) and **Penneagle, Southshore, Providence, Cato, and SR 7100** received the highest density ratings when ratings were combined from 1994 to 1996 (Table 2). Although some other cultivars and selections received high density ratings on certain dates during the test period, periodic disease outbreaks and unfavorable environmental conditions brought ratings down after data was combined over the 1994 - 1996 test period.

Differences in disease susceptibility were noticed among entries during the test period and are reported in Table 3. Colonial bentgrasses generally showed excellent resistance to dollar spot during the test period. Some creeping bentgrasses (**Providence, Cato, and Penn G-2**) showed good resistance to dollar spot while others (**Crenshaw, 18th Green, and Trueline**) were extremely susceptible. Colonial bentgrasses were highly susceptible to brown patch, whereas the creeping bentgrasses were generally more resistant.

A severe infestation of gray snow mold occurred during the winter of 1996. The severity of the infestation was a result of prolonged snow cover and the lack of a preventative fungicide application. The entries that were most severely damaged included **Seaside II, Penn G-2, Penn G-6, BAR Ws 42102, Crenshaw, Seaside, Trueline, and Lopez Tendez, SR 7100, ISI-At-90162, OM-At-90162, Penneagle, Cato, Exeter, and BAR As 493** received the least amount of damage.

Table 1. Quality ratings of bentgrass cultivars and selections for 1994 - 97. This trial was established in September, 1993 at the Joseph Valentine Research Center, University Park, PA.

Entry <sup>2</sup>	Species <sup>3</sup>	Turfgrass Quality Ratings <sup>1</sup>				
		Season Average 1994	Season Average 1995	Season Average 1996	Season Average 1997	Combined Season Ave. 1994-97
<b>Penneagle</b>	CRB	7.1	6.7	8.2	7.8	7.5
<b>Cato</b>	CRB	7.1	6.8	8.2	7.6	7.4
BAR Ws 42102	CRB	6.0	6.1	8.2	8.7	7.3
<b>Penn G-6</b>	CRB	6.6	6.6	7.5	8.0	7.2
<b>Penn G-2</b>	CRB	6.8	6.7	6.0	8.8	7.1
<b>Southshore</b>	CRB	6.2	6.0	8.4	7.7	7.1
<b>Providence</b>	CRB	6.6	6.6	7.9	6.9	7.0
<b>Seaside II</b>	CRB	5.7	6.5	7.3	6.9	6.6
<b>Crenshaw</b>	CRB	5.8	6.0	7.4	6.9	6.5
<b>Lopez</b>	CRB	5.6	6.2	6.4	5.7	6.0
<b>Procup</b>	CRB	5.7	5.4	6.3	5.8	5.8
<b>SR 7100</b>	COB	6.1	6.1	6.1	4.6	5.7
ISI-At-90162	COB	6.2	6.3	5.9	3.6	5.5
<b>Penncross</b>	CRB	5.8	5.3	5.6	5.1	5.5
<b>Trueline</b>	CRB	5.3	5.8	6.1	4.8	5.5
<b>18th Green</b>	CRB	5.3	5.4	6.1	4.9	5.4
OM-At-90163	COB	6.0	5.2	5.9	3.9	5.3
<b>Tendez</b>	COB	6.3	5.6	4.6	2.7	4.8
BAR As 493	COB	5.4	5.6	4.2	2.2	4.4
<b>Seaside</b>	CRB	4.2	3.4	3.6	3.1	3.6
<b>Exeter</b>	COB	4.4	4.3	1.9	1.0	2.9
LSD at 5% level <sup>4</sup>		0.7	1.0	0.7	1.0	--

<sup>1</sup> Refer to 'evaluation and interpretation of results' for an explanation of performance criteria ratings.

<sup>2</sup> Names that are in bold type are commercially-available cultivars, those that are in plain type are experimental selections (not available to the general public).

<sup>3</sup> Bentgrass species designated by the following letters: CRB = creeping bentgrass, COB = colonial bentgrass.

<sup>4</sup> LSD = least significant difference. The LSD values at the bottom of each column represent the minimum difference between any two entries necessary to be 95% confident that the difference is not attributable to chance.

Table 2. Ratings of bentgrass cultivars and selections for 1993 - 96. This trial was established in September, 1993 at the Joseph Valentine Research Center, University Park, PA.

Entry <sup>2</sup>	Species <sup>3</sup>	Turfgrass Ratings <sup>1</sup>				
		Seedling Vigor <sup>1</sup> 9/93	Spring Green-up <sup>1</sup> 4/7/95	Color <sup>1</sup> Combined Season Ave. (1994-96)	Texture <sup>1</sup> Combined Season Ave. (1994-96)	Density <sup>1</sup> Combined Season Ave. (1994-96)
<b>Penneagle</b>	CRB	5.3	4.0	6.2	6.3	7.7
<b>Cato</b>	CRB	4.7	3.0	6.9	9.0	7.4
BAR Ws 42102	CRB	2.7	2.3	6.3	9.0	6.8
<b>Penn G-6</b>	CRB	2.7	2.0	5.9	8.3	6.8
<b>Penn G-2</b>	CRB	2.7	1.0	5.8	8.2	6.5
<b>Southshore</b>	CRB	5.7	3.3	6.9	7.3	7.6
<b>Providence</b>	CRB	6.7	2.7	6.9	7.3	7.5
<b>Seaside II</b>	CRB	4.0	2.7	5.2	6.8	7.1
<b>Crenshaw</b>	CRB	6.0	3.3	7.3	7.8	6.5
<b>Lopez</b>	CRB	4.0	4.7	6.1	4.3	6.2
<b>Procup</b>	CRB	4.7	3.7	6.1	5.5	5.9
<b>SR 7100</b>	COB	5.0	7.0	5.6	6.3	7.1
ISI-At-90162	COB	5.0	6.0	6.1	6.2	6.9
<b>Penncross</b>	CRB	6.7	4.3	5.9	4.7	6.1
<b>Trueline</b>	CRB	4.0	4.7	6.3	4.7	6.1
<b>18th Green</b>	CRB	5.0	1.3	8.1	6.8	5.2
OM-At-90163	COB	5.7	5.3	6.3	5.8	6.8
<b>Tendez</b>	COB	4.7	7.7	7.4	5.8	6.4
BAR As 493	COB	1.3	6.0	5.3	4.3	5.7
<b>Seaside</b>	CRB	6.3	4.3	3.6	1.7	4.1
<b>Exeter</b>	COB	4.7	6.3	5.5	4.3	4.8
LSD at 5% level <sup>4</sup>		1.1	0.9	0.5	0.9	0.6

<sup>1</sup> Refer to 'evaluation and interpretation of results' for an explanation of performance criteria ratings.

<sup>2</sup> Names that are in bold type are commercially-available cultivars, those that are in plain type are experimental selections (not available to the general public).

<sup>3</sup> Bentgrass species designated by the following letters: CRB = creeping bentgrass, COB = colonial bentgrass.

<sup>4</sup> LSD = least significant difference. The LSD values at the bottom of each column represent the minimum difference between any two entries necessary to be 95% confident that the difference is not attributable to chance.

Table 3. Ratings of bentgrass cultivars and selections for 1994 - 96. This trial was established in September, 1993 at the Joseph Valentine Research Center, University Park, PA.

Entry <sup>2</sup>	Species <sup>3</sup>	Turfgrass Ratings <sup>1</sup>				
		Dollar Spot <sup>1</sup> Season Ave. 1994	Dollar Spot 9/15/95	Brown Patch <sup>1</sup> 8/7/95	Gray Snow Mold <sup>1</sup> 4/2/96	Poa annua <sup>1</sup> 5/96
		--- 1-9 scale ---	--- % disease ---			
<b>Penneagle</b>	CRB	7.5	4.7	1.0	25.0	1.0
<b>Cato</b>	CRB	7.9	5.7	0.0	31.7	2.7
BAR Ws 42102	CRB	5.5	5.3	1.3	60.0	2.0
<b>Penn G-6</b>	CRB	6.6	6.3	0.0	65.0	2.3
<b>Penn G-2</b>	CRB	7.3	7.7	6.0	71.7	2.3
<b>Southshore</b>	CRB	5.8	6.0	0.0	48.3	1.7
<b>Providence</b>	CRB	7.2	7.7	0.0	47.7	1.0
<b>Seaside II</b>	CRB	6.6	7.3	0.7	78.3	1.7
<b>Crenshaw</b>	CRB	4.0	2.7	0.0	58.3	1.7
<b>Lopez</b>	CRB	6.0	5.3	1.0	50.0	2.0
<b>Procup</b>	CRB	4.7	4.7	0.0	43.3	1.7
<b>SR 7100</b>	COB	8.5	8.3	53.3	17.3	2.7
ISI-At-90162	COB	8.7	9.0	41.7	17.7	3.3
<b>Penncross</b>	CRB	5.7	6.7	1.0	38.3	1.3
<b>Trueline</b>	CRB	5.3	4.3	0.0	55.0	2.7
<b>18th Green</b>	CRB	3.7	4.3	0.0	37.0	3.7
OM-At-90163	COB	7.9	8.3	55.0	21.7	3.3
<b>Tendez</b>	COB	8.7	9.0	68.3	12.0	3.7
BAR As 493	COB	8.9	9.0	28.3	36.7	3.3
<b>Seaside</b>	CRB	7.0	7.0	7.0	56.7	3.7
<b>Exeter</b>	COB	7.5	8.7	53.3	31.7	7.0
LSD at 5% level <sup>4</sup>		1.7	1.6	20.9	26.0	1.4

<sup>1</sup> Refer to 'evaluation and interpretation of results' for an explanation of performance criteria ratings.

<sup>2</sup> Names that are in bold type are commercially-available cultivars, those that are in plain type are experimental selections (not available to the general public).

<sup>3</sup> Bentgrass species designated by the following letters: CRB = creeping bentgrass, COB = colonial bentgrass.

<sup>4</sup> LSD = least significant difference. The LSD values at the bottom of each column represent the minimum difference between any two entries necessary to be 95% confident that the difference is not attributable to chance.