

Evaluation of Putting Green Bentgrass Cultivars and Blends

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SUMMARY: To evaluate the adaptation of various commercial and experimental bentgrass cultivars and blends to research putting green conditions in a cool-humid climate located in West Lafayette, IN.

MATERIALS AND METHODS

This field study was conducted at the W.H. Daniel Turfgrass Research and Diagnostic Center in West Lafayette, IN on a calcareous sand-based research putting green with a soil pH of 7.9 and 2.4% organic matter on a site with full sun exposure. This test was planted in participation with the National Turfgrass Evaluation Program (NTEP) 2008 putting green evaluation test (17 creeping bentgrass and 2 velvet bentgrass cultivars). In addition, 31 commercially available creeping bentgrass cultivars or blends were also planted. The blends were created from the commercially supplied seed in order to observe the performance of potentially compatible cultivars, Declaration + 007, or potentially incompatible cultivars, Penncross/Penn A-4/L-93, which would be potentially undesirable primarily due to contrasting shoot densities and leaf textures. A complete list of cultivars, blends and the source of seed is contained in Table 1. All cultivars except LS-44 were originally planted on 8 Sept., 2008 at 1 # seed/1000 ft², LS-44 was seeded on 4 Oct., 2008. At planting Milorganite (6-2-0) was surface applied with the seed at the rate of ½ lb. of N 1000 ft² and the entire area received 1.0 lb. P205 from triple super phosphate fertilizer.

Throughout the growing season the study site received approximately 4 lbs. of nitrogen (N) per 1000 ft² yr⁻¹. Granular applications, ½ lb. of N 1000 ft², were applied mid-April and 5 days prior to September core cultivation. Granular applications were supplemented by liquid urea 0.2 lbs. N 1000 ft² applications applied approximately every 10-14 days from June through early September. Liquid applications also included trinexapac-ethyl (Primo Maxx) at 6 fl. oz/Acre alternated with trinexapac-ethyl +flurprimidol (Legacy) at 10 fl. oz/A and a commercially available liquid chelated iron product. The study area was mowed daily mid-April - Oct. with a triplex mower set to 0.140 inches. The study area was irrigated to promote growth via an overhead irrigation system to supplement natural rainfall. Sand topdressing was applied five times during the growing season, approximately 0.5 cu. ft. 1000 ft² and core cultivation occurred in September with cores removed. Fungicides were applied primarily to control dollar spot on a curative basis using chlorothalonil alone or a propiconazole+chlorothalonil tank-mix.

Data collected included visual ratings, approximately twice monthly during active growth, for putting green quality on a 1-9 scale where; 1=poor; 9=optimum greenness, density and uniformity and 6=acceptable putting surface. Genetic color, shoot density and leaf texture were also rated on a 1-9 scale where 9=best. Additionally, disease incidence and severity was periodically evaluated. Two diseases were rated in 2011, pink snow mold (*Microdochium* spp. patch) and dollar spot. Pink snow mold was evaluated on a 1-9 scale where 9=no disease present and 1=severe plot blight and percentage plot affected. Dollar spot

was assessed by counting the number of infection centers per plot.

Each cultivar was replicated three times in 4 x 6 plots arranged in a randomized complete block design. Data was subjected to analysis of variance using the SAS (Statistical Analysis Systems, SAS Institute, Cary, NC) and treatment means separated using Fisher's protected LSD at $p=0.05$.

RESULTS AND DISCUSSION

Visual turfgrass quality: (Tables 2 and 3)

- After three consecutive seasons of ratings eight cultivars ranked in the top statistical category for visual appearance or turfgrass quality. These include: V8, PST-OJO, MacKenzie/Tyee blend, T-1, A08-TDN2, Tyee/007 blend, 007 and MVS-AP-101.

- When evaluating quality for only the summer period (mid-June through mid-Sept.) 14 cultivars were in the top statistical category. These include: V8, PST-OJO, A08-TDN2, T-1, MVS-AP-101, MacKenzie/Tyee blend, Tyee/007 blend, 007, SR1150, SRP-1WM, Declaration/007 blend, Tyee, Declaration and LTP-FEC

Disease incidence: (Table 4):

- These cultivars were most susceptible to dollar spot: T-1, PST-OJO, Cato/Backspin/Mariner/96-2, Cato/Backspin, Penncross/A-4 SRP-1BLTR3, 96-2, and Backspin
- These cultivars were most susceptible to pink snow mold: Penn A-4 and Penn G-2



Figure 1. Overview of the bentgrass putting green cultivars and cultivar response to disease. Photo: 16 March, 2011

Table 1. Overview of the bentgrass cultivars, species and seed sources.

Entry	Cultivar†	Species‡	Seed Source¶	Entry	Cultivar	Species	Source
1	Penncross	CBG	Standard entry	26	Southshore	CBG	Jacklin Seed (Simplot)
2	Penn A-1	CBG	Standard entry	27	LS-44	CBG	Virginia Lehman
3	SR7200	VLT	Standard entry	28	Tyce	CBG	Seed Research
4	Declaration	CBG	Standard entry	29	007	CBG	Seed Research
5	Proclamation (LTP-FEC)	CBG	Lebanon Seabord Corp.	30	MacKenzie	CBG	Seed Research
6	L-93	CBG	Standard entry	31	Cato	CBG	Pickseed
7	T-1	CBG	Jacklin Seed (Simplot)	32	Mariner	CBG	Pickseed
8	Alpha	CBG	Jacklin Seed (Simplot)	33	96-2	CBG	Pickseed
9	Penn A-2	CBG	John Deere Landscapes	34	Backspin	CBG	Turf Merchants
10	MVS-AP-101	CBG	Mountain View Seeds	35	SR1150	CBG	Seed Research
11	A08-TDN2	CBG	The Scotts Co.	36	SRP-1WM	CBG	Seed Research
12	AFM	CBG	John Deere Landscapes	37	Dominant X-treme	CBG	Seed Research
13	Authority	CBG	John Deere Landscapes	38	MacKenzie/Tyce	CBG	Seed Research
14	SRP-IGMC	CBG	Seed Research	39	Tyce/007	CBG	Seed Research
15	SRP-IBLTR3	CBG	Seed Research	40	Penn A-1/A-4	CBG	Tee-2-Green
16	PST-OJO	CBG	Penncross Bentgrass Assoc.	41	Southshore/L-93	CBG	Jacklin (Simplot)
17	V8	CBG	Jacklin Seed (Simplot)	42	A-4/Declaration	CBG	---
18	Pin-up (HTM)	CBG	ProSeeds Marketing	43	Backspin/Declaration	CBG	---
19	Villa	VLT	NTEP Standard entry	44	Penncross/A-4	CBG	---
20	PennG-2	CBG	Tee-2-Green	45	Penncross/A-4/L-93	CBG	---
21	PennA-4	CBG	Tee-2-Green	46	Cato/Backspin	CBG	---
22	Pennlinks II	CBG	Tee-2-Green	47	Cato/Backspin/Mariner/96-2	CBG	---
23	Penneagle II	CBG	Tee-2-Green	48	Southshore/L-93/Declaration	CBG	---
24	Crystal Blue Links	CBG	Tee-2-Green	49	Declaration/007	CBG	---
25	Putter	CBG	Jacklin Seed (Simplot)	50	Declaration/A-4/Alpha/T-1	CBG	---

Entries 1-19 are all part of the National Turfgrass Evaluation Program (NTEP) official putting green trial.

† All cultivars except LS-44 were originally planted on 8 Sept., 2008 at 1 # seed/1000 ft², LS-44 was seeded on 4 Oct., 2008.

‡CBG=Creeping bentgrass, VLT=velvet bentgrass

¶ Seed sources were a combination of the National Turfgrass Evaluation Program 2008 putting green trial, individual seed companies and blends of cultivars of personal interest. All cultivar blends were assembled using equal amounts of each cultivar on a per weight basis.

Table 2. Mean annual visual turfgrass quality ratings for bentgrass cultivars and cultivar blends grown on a sand-based research putting green. Purdue University, 2011.

		Rating period			
		----- Putting green quality (1-9 scale) ¶ -----			
V8	CBG	8.4	7.3	8.2	8.0
PST-OJO	CBG	8.2	7.5	7.9	7.9
MacKenzie/Tyee	CBG	7.6	7.9	7.9	7.8
T-1	CBG	7.9	7.2	8.0	7.7
A08-TDN2	CBG	7.9	7.6	7.6	7.7
Tyee/007	CBG	7.5	7.6	7.7	7.6
007	CBG	7.8	7.3	7.8	7.6
MVS-AP-101	CBG	8.0	7.0	7.7	7.6
SRP-1WM	CBG	8.0	6.8	7.8	7.5
SR1150	CBG	7.7	7.4	7.5	7.5
Declaration/007	CBG	7.8	7.2	7.6	7.5
Declaration	CBG	7.9	6.8	7.8	7.5
Proclamation (LTP-FEC)	CBG	7.8	7.2	7.4	7.5
Tyee	CBG	7.4	7.3	7.6	7.5
HTM	CBG	7.4	7.2	7.7	7.4
Authority	CBG	7.4	6.9	8.0	7.4
Dominant X-treme	CBG	7.4	7.1	7.6	7.4
SRP-1GMC	CBG	7.4	6.9	7.8	7.3
Crystal Blue Links	CBG	7.3	6.9	7.6	7.2
A-4/Declaration	CBG	7.5	6.7	7.4	7.2
Backspin/Declaration	CBG	7.4	6.7	7.5	7.2
Alpha	CBG	7.1	7.0	7.4	7.2
AFM	CBG	6.9	6.9	7.7	7.2
Declaration/A-4/Alpha/T-1	CBG	7.3	6.8	7.4	7.2
Penneagle II	CBG	6.9	6.9	7.5	7.1
SRP-1BLTR3	CBG	6.9	6.8	7.6	7.1
Penn A-1/A-4	CBG	7.2	6.5	7.5	7.1
Penn A-4	CBG	6.9	6.6	7.6	7.0
Penn A-1	CBG	7.0	6.4	7.5	7.0
Backspin	CBG	6.8	6.7	7.3	6.9
MacKenzie	CBG	7.0	6.7	7.1	6.9
L-93	CBG	6.7	6.5	7.3	6.9
96-2	CBG	6.6	6.7	7.2	6.8
Southshore/L-93/Declaration	CBG	6.8	6.4	7.1	6.8
Cato/Backspin	CBG	6.4	6.3	7.5	6.7
PennG-2	CBG	6.5	6.2	7.4	6.7
LS-44	CBG	6.7	5.8	7.1	6.7
Penn A-2	CBG	6.3	6.2	7.2	6.6
Penncross/A-4/L-93	CBG	6.5	6.1	7.2	6.6
Penncross/A-4	CBG	6.4	5.7	7.3	6.5
Cato	CBG	6.4	5.8	7.0	6.4

Southshore/L-93	CBG	6.3	5.8	7.0	6.4
Cato/Backspin/Mariner/96-2	CBG	6.2	6.0	6.8	6.3
Putter	CBG	6.0	6.0	6.7	6.2
Villa	VLT	6.7	5.9	5.8	6.1
Pennlinks II	CBG	6.0	5.7	6.5	6.1
Southshore	CBG	5.8	5.6	6.4	5.9
SR7200	VLT	6.5	5.4	5.8	5.9
Mariner	CBG	5.2	5.3	6.1	5.6
Penncross	CBG	5.2	4.8	6.0	5.3
LSD (0.05)		0.4	0.6	0.5	0.4

† All cultivars were originally planted on 8 Sept., 2008 at 1 # seed/1000 ft². LS-44 was not include in analysis due to the substantially slower establishment of this late-seeded cultivar.

‡CBG=Creeping bentgrass, VLT=velvet bentgrass

¶ Visual putting green quality was rated on a 1-9 scale where; 1=poor, 9=optimum greenness, density and uniformity and 6=acceptable putting surface.

*Means in the same column followed by the same letter are not significantly different according the LSD t-test (p=0.05).

Cultivars surrounded by the **red box** are in the highest statistical category for turfgrass quality.

Those surrounded by the **yellow box** are all similar to **Declaration**, those surrounded by the **blue box** are all similar to **Penn A-4** and those surrounded by the **green box** are similar to **L-93**.

Table 3. Mean summer visual turfgrass quality ratings for bentgrass cultivars and cultivar blends grown on a sand-based research putting green. Purdue University, 2011.

Cultivar†	Species‡	Summer Rating period			
		2009	2010	2011	3-yr Mean
----- Putting green quality (1-9 scale) ¶ -----					
V8	CBG	8.6	7.1	8.2	7.9
PST-OJO	CBG	8.2	7.5	7.8	7.8
A08-TDN2	CBG	8.0	7.4	7.8	7.7
T-1	CBG	8.0	7.1	8.1	7.7
MVS-AP-101	CBG	8.1	7.0	8.0	7.7
MacKenzie/Tyee	CBG	7.6	7.9	7.7	7.7
Tyee/007	CBG	7.7	7.5	7.8	7.7
007	CBG	7.9	7.1	8.0	7.7
SR1150	CBG	7.8	7.3	7.8	7.6
SRP-1WM	CBG	8.2	6.4	8.2	7.6
Declaration/007	CBG	7.8	7.0	8.0	7.6
Tyee	CBG	7.4	7.4	7.8	7.5
Declaration	CBG	8.0	6.6	8.0	7.5
LTP-FEC	CBG	7.9	7.0	7.6	7.5
HTM	CBG	7.5	7.0	7.8	7.4
Authority	CBG	7.5	6.6	8.0	7.4
Dominant X-treme	CBG	7.5	6.9	7.7	7.3
A-4/Declaration	CBG	7.6	6.6	7.8	7.3
Crystal Blue Links	CBG	7.4	6.6	7.7	7.2
Alpha	CBG	7.3	6.9	7.5	7.2
Backspin/Declaration	CBG	7.5	6.5	7.7	7.2
SRP-1GMC	CBG	7.4	6.4	7.8	7.2
Penn A-1/A-4	CBG	7.4	6.4	7.8	7.2
SRP-1BLTR3	CBG	7.0	6.7	7.8	7.2
AFM	CBG	6.9	6.9	7.8	7.2
Declaration/A-4/Alpha/T-1	CBG	7.3	6.7	7.5	7.2
Penn A-4	CBG	7.0	6.5	7.8	7.1
Penneagle II	CBG	7.0	6.8	7.5	7.1
Backspin	CBG	7.0	6.8	7.4	7.1
MacKenzie	CBG	7.0	6.7	7.3	7.0
Penn A-1	CBG	7.0	6.3	7.7	7.0
L-93	CBG	6.9	6.3	7.6	6.9
96-2	CBG	6.8	6.5	7.4	6.9
Cato/Backspin	CBG	6.7	6.1	7.7	6.8
Southshore/L-93/Declaration	CBG	6.9	6.1	7.2	6.7
Penncross/A-4/L-93	CBG	6.6	6.0	7.6	6.7
Penn A-2	CBG	6.6	6.1	7.4	6.7
PennG-2	CBG	6.6	5.9	7.7	6.7
LS-44	CBG	6.9	5.5	7.4	6.6
Cato/Backspin/Mariner/96-2	CBG	6.4	6.1	6.9	6.5
Southshore/L-93	CBG	6.5	5.7	7.1	6.4

Penncross/A-4	CBG	6.4	5.6	7.2	6.4
Cato	CBG	6.5	5.5	7.0	6.3
Putter	CBG	6.1	5.9	6.8	6.3
Villa	VLT	6.9	5.8	5.8	6.2
Pennlinks II	CBG	6.0	5.4	6.7	6.0
Southshore	CBG	5.9	5.5	6.5	6.0
SR7200	VLT	6.6	5.1	5.9	5.9
Mariner	CBG	5.4	5.1	6.1	5.5
Penncross	CBG	5.3	4.7	6.0	5.3
LSD (0.05)		0.4	0.6	0.5	0.4

† All cultivars were originally planted on 8 Sept., 2008 at 1 # seed/1000 ft². LS-44 was not include in analysis due to the substantially slower establishment of this late-seeded cultivar.

‡CBG=Creeping bentgrass, VLT=velvet bentgrass

¶ Visual putting green quality was rated on a 1-9 scale where; 1=poor, 9=optimum greenness, density and uniformity and 6=acceptable putting surface. *Summer ratings were from mid-June through mid-September.*

*Means in the same column followed by the same letter are not significantly different according the LSD t-test (p=0.05).

Cultivars surrounded by the **red box** are in the highest statistical category for turfgrass quality.

Those surrounded by the **yellow box** are all similar to **Declaration**, those surrounded by the **blue box** are all similar to **Penn A-4** and those surrounded by the **green box** are similar to **L-93**.

Table 4. Visual disease ratings for bentgrass cultivars and cultivar blends grown on a sand-based research putting green. Purdue University, 2011.

Cultivar†	Species‡	Disease rating¶		
		<i>Microdochium</i> patch		Dollar spot
		2010 % plot	2011 1-9 scale	3-yr Mean centers plot ⁻¹
Pennlinks II	CBG	5.0	7.3	0.0
Declaration/A-4/Alpha/T-1	CBG	0.3	8.3	0.0
LTP-FEC	CBG	0.2	8.7	0.0
L-93	CBG	0.3	8.7	0.0
MVS-AP-101	CBG	0.0	9.0	0.0
SRP-1WM	CBG	0.0	9.0	0.0
Declaration/007	CBG	0.0	9.0	0.0
HTM	CBG	0.0	9.0	0.0
A-4/Declaration	CBG	0.0	9.0	0.0
LS-44	CBG	0.0	9.0	0.0
Villa	VLT	0.0	9.0	0.0
PennG-2	CBG	7.5	6.3	0.3
V8	CBG	1.7	8.0	0.3
MacKenzie/Tyee	CBG	0.4	8.0	0.3
Authority	CBG	0.8	8.0	0.3
A08-TDN2	CBG	0.2	8.7	0.3
007	CBG	0.1	8.7	0.3
Declaration	CBG	0.0	9.0	0.3
SRP-1GMC	CBG	0.0	9.0	0.3
Backspin/Declaration	CBG	0.0	9.0	0.3
Crystal Blue Links	CBG	0.7	8.3	0.7
AFM	CBG	0.0	9.0	0.7
Penncross	CBG	0.1	9.0	0.7
Penn A-1/A-4	CBG	0.1	8.7	1.0
Tyee	CBG	0.0	9.0	1.0
Southshore/L-93/Declaration	CBG	0.0	9.0	1.0
Southshore/L-93	CBG	0.0	9.0	1.0
Penneagle II	CBG	3.2	7.3	1.3
SR1150	CBG	0.8	8.3	1.3
SR7200	VLT	0.0	8.7	1.3
Dominant X-treme	CBG	0.2	8.7	2.0
Penn A-2	CBG	0.1	8.7	2.3
Putter	CBG	0.1	8.7	2.3
Southshore	CBG	0.0	9.0	2.3
Tyee/007	CBG	0.1	8.7	3.0
MacKenzie	CBG	0.0	9.0	3.0
Penn A-1	CBG	0.8	8.3	3.3
Penn A-4	CBG	25.3	5.7	4.3
Penncross/A-4/L-93	CBG	0.0	9.0	4.3
Cato	CBG	0.0	9.0	5.0

Mariner	CBG	1.0	8.3	5.3
Alpha	CBG	0.7	8.0	6.3
T-1	CBG	3.4	7.0	6.7
PST-OJO	CBG	0.2	8.7	7.0
Cato/Backspin/Mariner/96-2	CBG	0.0	9.0	8.3
Cato/Backspin	CBG	0.0	9.0	8.7
Penncross/A-4	CBG	0.1	8.7	9.0
SRP-1BLTR3	CBG	0.0	9.0	11.7
96-2	CBG	0.3	8.3	16.0
Backspin	CBG	0.0	9.0	17.0
LSD (0.05)		10.5	1.7	6.3

† All cultivars were originally planted on 8 Sept., 2008 at 1 # seed/1000 ft². LS-44 was not include in analysis due to the substantially slower establishment of this late-seeded cultivar.

‡CBG=Creeping bentgrass, VLT=velvet bentgrass

¶ Disease was visually rated for *Microdochium* patch and dollar spot. *Microdochium* patch was rated on a 1-9=no disease scale and also for percentage plot affected. Dollar spot was rated on the number of infection centers per plot..

*Means in the same column followed by the same letter are not significantly different according the LSD t-test (p=0.05).