

Evaluation of Various Grasses for Use on Putting Greens

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Summary

Two tests were established in 2007 to evaluate various grasses for use on putting greens. The test undertaken at Salmon Arm established at a slower rate than did the Calgary trial, no doubt as a result of weather conditions. Generally, the creeping bentgrass varieties established more quickly than did the velvet bentgrass. At Salmon Arm, the varieties that established the best were Alpha, Pennlinks II, L-93, and Penneagle II. Those varieties that established most rapidly at the Calgary site were Cobra 2, L-93, Penncross and Declaration, all creeping bentgrass varieties. Velvet bentgrass was slower to establish than was the creeping bentgrass. Penneagle II had the highest score on the rating scale for colour at Salmon Arm and was considered to be equal to Declaration, Penn A-4, and CY2 creeping bentgrass and to Legendary and Vesper velvet bentgrass. At Calgary, colour of the various grasses was very similar. The density of the two velvet bentgrass varieties was superior to the creeping bentgrass varieties in the Salmon Arm study. The best varieties for density in Calgary were Cobra 2, L-93, and Declaration, all creeping bentgrass varieties. For overall quality in Salmon Arm, the best varieties were Penneagle II, Declaration, Penn A-4, T1, Kingpin, Pennlinks II, CY2, Alpha, Memorial, Penn G-1 and Cobra 2. At the Calgary site, Cobra 2, L-93, Penn A-4, Declaration and Penneagle II were the best varieties for overall turf quality. *Poa trivialis* produced poor quality, possibly due to its inability to withstand close mowing.

Results from this trial were very inconsistent between the two sites. In addition, the ratings need to be consistently higher if they are to be considered a reliable evaluation of the grasses in this trial.

Introduction

Many new bentgrasses have been developed for use on cool season putting greens since the last test that was completed in 2003 at Red Deer Golf and Country Club. The previous study showed that there was a significant improvement of some of the new creeping bentgrass cultivars over the previous industry standard cultivar, Penncross. At that time, Penn A-4 had the highest quality ratings, while Penn A-4, Penn A-1, Penn G-2, Penn G-6, Imperial and Southshore had higher quality ratings than the industry standard, Penncross.

Velvet bentgrasses have never been tested in the cold climate of Alberta. It is generally thought that this species requires less input of fertilizer and water and may have an application in a number of situations.

Two tests were initiated in 2007, one in Salmon Arm, British Columbia and one in Calgary, Alberta, in order to determine their suitability for use in these two environments. It is expected that data from this trial will be collected for another three years.

Materials and Methods

Fourteen cultivars of creeping bentgrass, two cultivars of velvet creeping bentgrass and two cultivars of *Poa trivialis* (rough stalk bluegrass) were seeded on a bentgrass nursery at the Salmon Arm Golf and Country Club on June 21. In Calgary, 12 creeping bentgrasses and two velvet bentgrasses were seeded on a nursery site at The Canal at Delacour Golf Club on August 7. The bentgrass cultivar Penncross was designated as the standard entry for the trial (Table 1).

Plots were replicated four times in a Randomized Complete Block Design (RCBD). The plots measured 1.5m by 2m and the rootzone was a sand/peat mixture at both sites. At the Salmon Arm site, plots were initially mowed at a height of 0.50" 43 days after seeding. The first fertilizer application was applied 33 days after seeding and then weekly beginning 50 days after seeding. Fertility applications rates were approximately 0.75kg N/100m² (1.5lb N/1000ft²) per growing month. At Calgary, mowing commenced 23 days after seeding and the first application of fertilizer was 15 days after seeding. In both tests, plots were irrigated to maintain a moist rootzone during the establishment period. A preventative snow mould fungicide was applied in the fall.

Table 1 – List of grasses for putting green study, Salmon Arm.

Bentgrasses	Seeding rate
Alpha	0.5kg/100m ²
Cobra 2	0.5kg/100m ²
CY2	0.5kg/100m ²
Declaration	0.5kg/100m ²
Independence	0.5kg/100m ²
Kingpin	0.5kg/100m ²
L-93	0.5kg/100m ²
Memorial	0.5kg/100m ²
Penn G-1	0.5kg/100m ²
Penn A-4	0.5kg/100m ²
Penncross	0.5kg/100m ²
Penneagle II	0.5kg/100m ²
Pennlinks II	0.5kg/100m ²
T1	0.5kg/100m ²
Velvet Bentgrasses	
Legendary	0.5kg/100m ²
Vesper	0.5kg/100m ²
Poa trivialis	
Dark Horse	0.75kg/100m ²
Sabre	0.75kg/100m ²

Table 2 – List of grasses for putting green study, Calgary.

Bentgrasses	Seeding rate
Alpha	0.5kg/100m ²
Cobra 2	0.5kg/100m ²
CY2	0.5kg/100m ²

Declaration	0.5kg/100m ²
Independence	0.5kg/100m ²
L-93	0.5kg/100m ²
Penn A-1	0.5kg/100m ²
Penn A-4	0.5kg/100m ²
Penncross	0.5kg/100m ²
Penneagle II	0.5kg/100m ²
Pennlinks II	0.5kg/100m ²
T1	0.5kg/100m ²
Velvet Bentgrasses	
Legendary	0.5kg/100m ²
Vesper	0.5kg/100m ²

Initially the plots were evaluated for area cover to determine the rate of establishment. Following that, plots were rated for three turfgrass quality factors: colour, density, and area cover. These individual factors were also combined to give a single overall quality rating. These ratings were based on the National Turfgrass Evaluation Program (NTEP) protocols when numeric values are assigned to individual plots where 9 is best and 1 is poorest, and 6 is considered acceptable. Colour was evaluated by 1 is a brown dormant turf and 9 is a very uniform dark green colour. Rating for turf density, a visual estimate of number of shoots, was based on 1 is a thin, weak turf stand and 9 is a very dense tight-knit stand. The third factor rated was area cover and values ranged from a 1 for a complete absence of turf to a 9 for complete cover with the desired turf. The presence of weeds or voids in the turf reduced this rating. Initial area cover was used to evaluate the establishment of the various grasses in the trial.

Results

Establishment Data

Weather conditions for germination and establishment were quite different at each site. At Salmon Arm, conditions were hot and dry for the first six weeks after seeding, whereas, Calgary was cool and wet for the initial stages of establishment.

At Salmon Arm, as far as species were concerned the creeping bentgrass established more quickly than did the rough bluegrass which established more quickly than the velvet bentgrass. The bentgrass cultivars that established the best were Alpha, Pennlinks II, L-93, and Penneagle II (Table 3).

Table 3 - Establishment data for putting green grasses study, Salmon Arm, 2007.

Cultivar	Days After Seeding				Overall
	30 Days	60 Days	90 Days	120 Days	
	Area Cover				
	----- 1-9 scale -----				
Alpha	4.8a	7.3ab	8.5a	8.5a	6.0a
Pennlinks II	2.8bcde	8.0a	8.5a	8.5a	5.7ab
L-93	3.8abc	7.5ab	8.3ab	8.3ab	5.7ab
Penneagle II	3.5abcd	7.5ab	8.3ab	8.3ab	5.7ab

Kingpin	4.0ab	7.3ab	7.5bc	7.3cd	5.4bc
Penncross	2.0ef	6.8abc	8.3ab	8.3ab	5.2cd
Memorial	2.8bcde	7.0abc	7.8abc	7.8abc	5.2cd
Penn G-1	2.5cde	7.3ab	7.5bc	7.5bc	5.1cd
CY2	2.3def	7.3ab	7.5bc	7.5bc	5.1cd
Declaration	3.0bcde	7.0abc	7.3c	7.3cd	5.1cd
T1	2.8bcde	7.3ab	7.3c	7.0cd	5.0cd
Cobra 2	3.0bcde	6.8abc	7.3c	7.3cd	5.0cd
Penn A-4	2.0ef	6.3bc	7.3c	7.8abc	4.8de
Independence	2.0ef	5.5c	7.0cd	7.3cd	4.5ef
Sabre	2.0ef	5.5c	6.3de	6.5de	4.2f
Dark Horse	2.0ef	5.5c	6.0e	6.0e	4.1f
Vesper	1.0f	3.5d	5.0f	4.5f	3.0g
Legendary	1.0f	3.0d	5.0f	4.8f	2.9g
LSD _{0.05} =	1.4	1.6	0.9	0.8	0.4

* Values that have the same letter as a suffix are not considered to be significantly different from each other

Establishment data for the Calgary site was rated in the fall of 2007 and throughout 2008 (Table 4). Those varieties that established most rapidly were Cobra 2, L-93, Penncross and Declaration, all creeping bentgrass varieties.

As far as species were concerned, the velvet bentgrass varieties established more slowly than did the creeping bentgrass varieties.

Table 4 - Establishment data for putting green grasses study, Calgary.

Cultivar	Fall 2007	Early Spring 2008	Late Spring 2008	Summer 2008	Fall 2008	Overall Area Cover
1-9 scale						
Cobra 2	6.3a	6.0a	8.0a	8.0a	7.3a	7.3a
L-93	6.7a	6.6a	8.0a	7.0a	7.3a	7.0ab
Penncross	6.0a	6.3a	7.6a	7.6a	7.6a	7.0ab
Declaration	6.3a	6.6a	7.0a	7.3a	7.6a	6.8abc
Penn A-1	6.0a	6.6a	7.3a	7.0a	6.6a	6.6bc
Penneagle II	5.7a	6.3a	6.6a	7.0a	7.3a	6.6bc
Independence	6.3a	6.3a	7.0a	7.0a	6.6a	6.5bc
Pennlinks II	6.3a	6.3a	6.6a	7.3a	7.3a	6.5bc
Alpha	6.0a	6.6a	6.3a	7.3a	7.0a	6.5bc
Penn A-4	6.0a	6.3a	7.0a	7.0a	6.6a	6.5bc
CY2	6.3a	6.3a	7.0a	6.6a	6.6a	6.4c
T1	6.0a	6.3a	6.3a	6.3a	7.3a	6.4c
Legendary	5.3a	5.0a	5.3a	5.6a	6.0a	5.4d
Vesper	5.3a	5.0a	5.0a	5.6a	5.3a	5.4d
LSD _{0.05} =	n/s	n/s	n/s	n/s	n/s	0.5

* Values that have the same letter as a suffix are not considered to be significantly different from each other

Turfgrass Colour

Penneagle II had the highest score on the rating scale for colour and was considered to be equal to Declaration, Penn A-4, and CY2 creeping bentgrass and to Legendary and

Vesper velvet bentgrass (Table 5). The two *Poa trivialis* rated the poorest for colour. Penncross, the industry standard, rated the lowest of the Creeping Bentgrasses.

Table 5 - Turf colour for putting green grasses, Salmon Arm.

Cultivar	Fall 2007	Spring 2008	Fall 2008	Overall Colour
	1-9 scale			
Penneagle II	5.0ab	5.7a	6.2ab	6.0a
Declaration	5.5a	5.7a	6.0ab	5.8a
Legendary	3.0c	4.7bc	6.5a	5.6ab
Vesper	3.3c	4.7bc	6.2ab	5.5abc
Penn A-4	5.5a	5.2abc	5.7bc	5.5abc
CY2	4.5b	5.5ab	5.5bc	5.5abc
Penn G-1	4.8ab	5.0abc	5.5bc	5.2bcd
T1	5.5a	4.7bc	5.5bc	5.1bcde
Memorial	4.5b	4.7bc	5.5bc	5.1bcde
Kingpin	4.3b	4.7bc	5.5bc	5.1bcde
Cobra 2	5.3a	5.0abc	5.2cd	5.1bcde
Pennlinks II	4.8ab	5.0abc	5.2cd	5.1bcde
Independence	4.3b	5.0abc	5.0cd	5.0cdef
Alpha	4.5b	4.7bc	5.0cd	4.8def
L-93	5.0ab	4.5c	4.7d	4.6ef
Penncross	4.8ab	4.5c	4.5d	4.5f
Sabre	3.0c	3.0d	3.0e	3.0g
Dark Horse	3.0c	3.0d	3.0e	3.0g
LSD _{0.05} =	0.7	0.8	0.7	0.5

* Values that have the same letter as a suffix are not considered to be significantly different from each other

When considering overall colour in the Calgary study the varieties were very similar (Table 6). Generally, the velvet bentgrass varieties had slightly inferior colour, but were very close to the creeping bentgrass.

Table 6 - Turf colour for putting green grasses, Calgary.

Cultivar	Fall 2007	Early Spring 2008	Late Spring 2008	Summer 2008	Fall 2008	Overall Colour
	1-9 scale					
Cobra 2	6.3a	5.6a	7.0a	7.6a	7.0a	6.9a
Declaration	6.0a	5.3a	7.0a	7.3a	7.0a	6.8ab
Penn A-4	5.7a	5.0a	7.0a	7.3a	7.0a	6.7abc
T1	6.3a	6.0a	7.0a	7.0a	6.6ab	6.6abc
Alpha	6.3a	5.6a	6.6a	7.0a	6.6ab	6.6abc
CY2	6.3a	5.6a	7.0a	7.0a	6.3b	6.6abc
L-93	6.0a	5.0a	6.6a	7.0a	7.0a	6.6abc
Penneagle II	5.7a	5.3a	7.0a	7.0a	6.0b	6.6abc
Independence	6.0a	4.3a	7.0a	7.0a	7.0a	6.6abc
Penn A-1	6.0a	5.3a	7.0a	6.3a	6.6ab	6.5abcd
Penncross	5.7a	5.0a	6.6a	6.6a	6.3b	6.4bcde
Pennlinks II	6.0a	4.0a	6.6a	7.0a	6.6ab	6.3cde
Vesper	5.0b	4.3a	7.0a	6.6a	6.0b	6.1de
Legendary	5.0b	3.6a	6.6a	6.6a	6.3b	6.0e

LSD _{0.05} =	0.6	n/s	n/s	n/s	0.6	0.4
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* Values that have the same letter as a suffix are not considered to be significantly different from each other

Turfgrass Density

The density of the two velvet bentgrass varieties was superior to the creeping bentgrass varieties in the Salmon Arm study (Table 7). The velvet bentgrass has a very fine leaf texture and has many more shoots per unit of area. The best creeping bentgrass varieties were Penneagle II, Penn A-4, Declaration, Memorial, and Penn G-1.

Table 7 - Turf density for putting green grasses, Salmon Arm.

Cultivar	Fall 2007	Spring 2008	Fall 2008	Overall Density
	1-9 scale			
Legendary	6.0a	6.0a	7.0a	6.5a
Vesper	6.0a	6.0a	6.7a	6.3a
Penneagle II	4.0c	4.7b	5.7b	5.2b
Penn A-4	4.0c	4.5b	5.7b	5.1bc
Declaration	4.0c	4.7b	5.2bcd	5.0bcd
Memorial	4.0c	4.2bc	5.5bc	4.8bcd
Penn G-1	4.0c	4.7b	5.0cde	4.8bcd
Kingpin	4.0c	4.2bc	5.2bcd	4.7cde
T1	4.0c	4.5b	5.0cde	4.7cde
Pennlinks II	4.0c	4.5b	5.0cde	4.7cde
CY2	4.0c	4.7b	4.7de	4.7cde
Cobra 2	4.0c	4.2bc	5.0cde	4.6def
L-93	4.0c	4.5b	4.7de	4.6def
Alpha	4.3b	4.0bc	4.7de	4.3ef
Independence	4.0c	3.7cd	4.7de	4.2f
Penncross	4.0c	3.2d	4.2e	3.7g
Sabre	3.8c	3.2d	3.2e	3.2h
Dark Horse	3.8c	3.2d	3.2e	3.2h

LSD _{0.05} =	0.2	0.7	0.6	0.4
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* Values that have the same letter as a suffix are not considered to be significantly different from each other

However, the density of the velvet bentgrass varieties in Calgary was reduced (Table 8). This may have been as a result of slow recovery from winter injury that had occurred during the winter of 2007-08. The best varieties for density were Cobra 2, L-93, and Declaration, all creeping bentgrass varieties.

Table 8 - Turf density for putting green grasses, Calgary.

Cultivar	Fall 2007	Early Spring 2008	Late Spring 2008	Summer 2008	Fall 2008	Overall Density
	1-9 scale					
Cobra 2	5.7a	4.3a	6.3a	7.6a	6.0abc	6.2a
L-93	5.3a	4.3a	6.0a	7.0ab	6.0abc	6.0ab
Declaration	5.3a	4.0a	5.3a	7.3ab	6.6a	5.8abc
Independence	5.7a	4.3a	5.3a	6.6abc	6.6a	5.7bc
Penneagle II	4.3a	4.3a	5.6a	7.3ab	5.6bc	5.7bc

Penn A-4	4.7a	4.0a	5.6a	7.3ab	6.0abc	5.7bc
Pennlinks II	5.3a	4.0a	5.3a	6.6abc	6.0abc	5.6bcd
CY2	5.0a	4.3a	5.0a	6.3bc	6.3ab	5.6bcd
Penncross	4.7a	4.3a	5.6a	6.6abc	5.6bc	5.6bcd
Alpha	5.3a	4.6a	5.0a	6.6abc	5.3c	5.5cde
T1	5.3a	4.0a	5.3a	6.6abc	6.0abc	5.5cde
Penn A-1	4.3a	4.0a	5.3a	6.6abc	5.3c	5.4cde
Legendary	4.7a	3.6a	4.6a	5.6c	5.6bc	5.2de
Vesper	4.7a	4.0a	4.3a	5.6c	5.3c	5.1e
LSD _{0.05} =	n/s	n/s	n/s	1.0	0.7	0.4

* Values that have the same letter as a suffix are not considered to be significantly different from each other

Turfgrass Quality Ratings

For overall quality in Salmon Arm, the best varieties were Penneagle II, Declaration, Penn A-4, T1, Kingpin, Pennlinks II, CY2, Alpha, Memorial, Penn G-1 and Cobra 2 (Table 9). The *Poa trivialis* rated poorly for turf quality and it is thought that the mowing height may have been too low for this species to proliferate.

Table 9 - Turf quality for putting green grasses, Salmon Arm.

Cultivar	Fall	Spring	Fall	Overall quality
	2007	2008	2008	
	————— 1-9 scale —————			
Penneagle II	6.0a	5.7a	6.5a	6.1a
Declaration	5.5ab	5.7a	6.5a	6.1a
Penn A-4	5.7ab	5.2abc	6.5a	5.8ab
T1	5.5ab	5.2abc	6.2ab	5.7abc
Kingpin	5.2bc	5.2abc	6.2ab	5.7abc
Pennlinks II	5.7ab	5.5ab	6.0ab	5.7abc
CY2	5.2bc	5.5ab	6.0ab	5.7abc
Alpha	5.7ab	5.2abc	6.0ab	5.6abc
Memorial	5.2bc	5.2abc	6.0ab	5.6abc
Penn G-1	5.5ab	5.5ab	5.7bc	5.6abc
Cobra 2	5.5ab	5.5ab	5.7bc	5.6abc
L-93	5.7ab	5.2abc	5.7bc	5.5bc
Independence	5.2bc	5.0abc	5.7bc	5.3bc
Legendary	4.7cd	4.7bc	6.0ab	5.3bc
Vesper	4.7cd	4.7bc	5.7bc	5.2cd
Penncross	5.7ab	4.5c	5.0c	4.7d
Sabre	4.5de	3.2d	3.5d	3.3e
Dark Horse	4.0e	3.2d	3.5d	3.3e
LSD _{0.05} =	0.6	0.8	0.7	0.5

* Values that have the same letter as a suffix are not considered to be significantly different from each other

At the Calgary site, Cobra 2, L-93, Penn A-4, Declaration and Penneagle II were the best varieties for overall turf quality (Table 10).

Table 10 - Turf quality for putting green grasses, Calgary.

Cultivar	Fall	Early	Late	Summer	Fall	Overall Quality
	2007	Spring	Spring			
		2008	2008			

	1-9 scale					
Cobra 2	6.3a	6.0a	7.0a	7.6a	7.0a	6.7a
L-93	6.0a	5.6a	6.6a	7.3ab	7.0a	6.6ab
Penn A-4	5.3a	5.6a	6.3a	7.3ab	6.6a	6.3abc
Declaration	6.0a	5.6a	6.0a	7.3ab	7.0a	6.3abc
Penneagle II	5.3a	5.0a	6.0a	7.3ab	6.3a	6.3abc
Alpha	6.0a	6.0a	6.0a	7.0ab	6.3a	6.2bc
Independence	6.0a	5.3a	6.3a	7.0ab	6.6a	6.2bc
Pennlinks II	6.0a	5.3a	6.0a	7.0ab	6.6a	6.2bc
Penncross	5.7a	5.3a	6.3a	6.6bc	6.6a	6.2bc
Penn A-1	5.7a	5.6a	6.3a	6.6bc	6.3a	6.1c
CY2	5.7a	5.6a	6.0a	6.6bc	6.3a	6.1c
T1	5.7a	5.6a	5.6a	6.6bc	6.6a	6.0c
Legendary	5.0a	4.6a	5.3a	6.0c	6.0a	5.5d
Vesper	5.0a	5.0a	5.0a	6.0c	5.6a	5.5d
LSD _{0.05} =	n/s	n/s	n/s	0.8	n/s	0.4

* Values that have the same letter as a suffix are not considered to be significantly different from each other

Discussion

Results from this trial were very inconsistent between the two sites. In year one, the establishment in Salmon Arm was slowed due to a warm, dry period soon after seeding. Some winter damage occurred at the Calgary site in 2008, which negatively affected the ratings. In addition, the overall turf quality was only considered acceptable in year two of the study. The ratings need to be consistently higher if they are to be considered a reliable evaluation of the grasses in this trial.