10-2000

Turfgrass Research Summary: 1999

Leo Schleicher
South Dakota State University

SDSU

SOUTH DAKOTA STATE UNIVERSITY
College of Agriculture & Biological Sciences
Department of Horticulture, Forestry, Landscape & Parks

Contents

Turfgrass Research Summary 1999

SOUTH DAKOTA STATE UNIVERSITY
College of Agriculture & Biological Sciences
Department of Horticulture, Forestry, Landscape & Parks

1999 SDSU Turfgrass Science Team

Dr. Marty Draper	Extension Plant Pathologist
Dr. Anne Fennell	Associate Professor, Horticulture
Dr. David Graper	Extension Horticulture Specialist
Ms. Sarah Headley	Undergraduate Research Assistant
Mr. Justin Laursen	Undergraduate Research Assistant
Mr. Martin Maca	Associate Professor, Landscape Design
Mr. Wayne Ness	Agricultural Research Technician
Dr. Leo Schleicher	Assistant Professor, Turfgrass Science

South Dakota State University turfgrass research does not endorse any product or commodity mentioned in the annual Turfgrass Research Summary, but objectively evaluates research and reports the results. Applications of pesticides or other chemicals used in research may not conform to label rates. It is the responsibility of the pesticide applicator to follow label directions for the specific pesticide being used. SDSU, the South Dakota Turfgrass Foundation, and the authors of this publication assume no liability from misuse of pesticide applications detailed in this report.

Published in accordance with an act passed in 1881 by the 14th Legislative Assembly, Dakota Territory, establishing the Dakota Agricultural College and with the act of re-organization passed in 1887 by the 17th Legislative Assembly, which established the Agricultural Experiment Station at South Dakota State University. South Dakota State University is an Affirmative Action/Equal Opportunity Employer (Male/Female) and offers all benefits, services, education, and employment opportunities without regard for ancestry, age, race, citizenship, color, creed, religion, gender, disability, national origin, sexual preference, or Vietnam Era veteran status.
C 265: 360 printed at a cost of $2.46 each, October 2000.

Thanks for the support . . .

The SDSU Turfgrass Program and the South Dakota Turfgrass Foundation would like to thank the following supporters of turfgrass who have contributed equipment, chemicals, fertilizer, seed, and/or donations.

Arrowhead CC
Central Valley GC
Hillsview GC
Hydrologic
Moccasin Creek CC
National Turfgrass Evaluation Program
North Star Turf Supply
Pennington Seed Inc.
Peterson Seed Co.
Rhone Poulenc
Roberts Seed
SDSU Agricultural Experiment Station
SDSU Department of Horticulture, Forestry, Landscape and Parks
Sharps Bros. Seed Co.
South Dakota Golf Course Superintendents Association
Stock Seed Co.
Textron
The Scotts Company
Turf Seed, Inc.
University of Nebraska Turfgrass Program
Westward Ho CC
Zimco Supply Co.

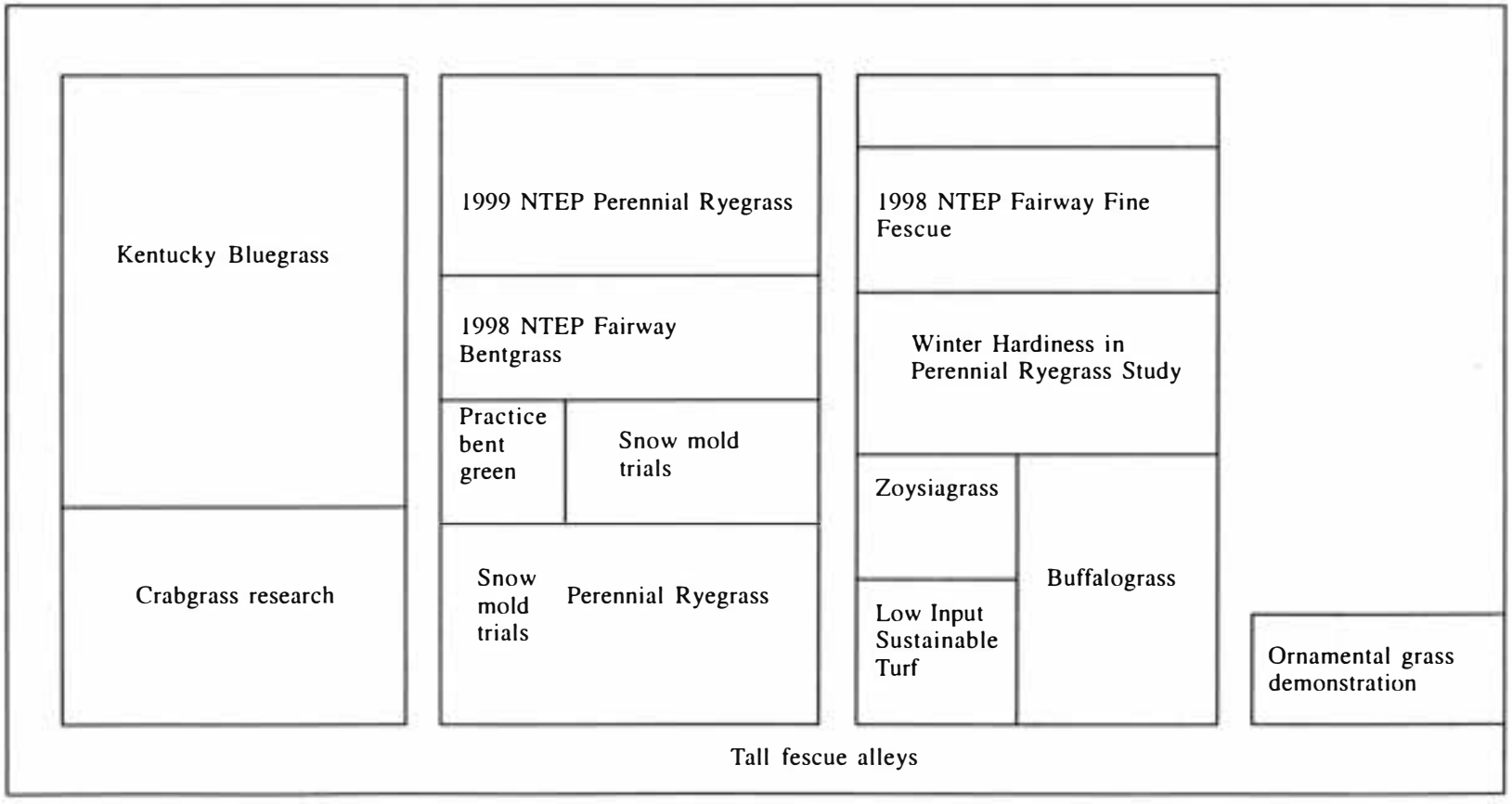
Special thanks go to North Star Turf Supply for providing turf maintenance equipment and to The Scotts Company for providing the fertilizer needs of SDSU turf research.

Also, to Mike Smith, Central Valley GC; Dick Novak, Arrowhead CC; Ross Santjer, Moccasin Creek CC; Dean Heymans, Hillsview GC; and their respective golf courses for maintaining SDSU turfgrass research on site: our deepest thanks.

If we have inadvertently missed a turf research supporter we sincerely apologize. Please let us know so that you will be listed in next year's annual report.

Turfgrass Research 1999
N.E. Hansen Research Farm
Brookings, SD

N →



Foreword

Tremendous progress in the turfgrass program was made in 1999, thanks to the efforts of many individuals and organizations who support the advancement of the turf industry in South Dakota.

In addition to evaluating current research that began in 1998, several new studies were initiated in 1999, including the NTEP Perennial Ryegrass Cultivar Trial, regional turfgrass species/cultivar evaluations in Aberdeen and Rapid City, laboratory freezing-resistance testing, evaluation of a native sedge for golf courses and native landscapes, and an ornamental grass demonstration.

One of the most significant accomplishments in 1999 was the restructuring of the South Dakota Turf Foundation (SDTF). The SDTF is now able to use annual membership dues to support turfgrass research. I would like to thank Mr. Mike Smith for his assistance in amending the SDTF by-laws, Mr. Tedd Evans for assuming the office of SDTF president, and the SDTF Board of Directors: Mr. Steve Harrer, Ms. Sheila Adrian Wright, Mr. Rich Vining, Mr. Gary Outka, Mr. Roger Legge, Mr. Gary Burley, and Mr. Steve Pabst.

I would also like to thank the 43 individuals and organizations that have joined the SDTF so far.

As we head into the 21st Century, the SDSU turfgrass program will be ready to respond to the needs of the turfgrass industry in South Dakota.

Sincerely,

Leo C. Schleicher, Ph.D.

1999 Regional Weather Summary

In 1999, temperatures were considerably above normal. Mean annual temperature deviations for Aberdeen, Brookings, Pierre, Rapid City, and Sioux Falls were +2.4, +2.9, +4.1, +3.1, and +2.0 F, respectively. Monthly mean temperatures from March through September were highest in Pierre (Fig 1). Cumulative temperature differences among locations are shown in Figure 2.

Annual precipitation deviation was above normal in Aberdeen (+3.72"), Rapid City (+5.62"), and Pierre (+4.65") but below normal in Brookings (-2.36") and Sioux Falls (-1.95"). Within-month precipitation amounts varied widely among locations (Fig 2). Averaged over all sites, monthly precipitation was greatest during June. Eighty-nine percent of the annual precipitation in the five locations occurred in the 6-month period from April through September (Fig 3).

Figure 1. Monthly mean temperature at five South Dakota turfgrass research sites in 1999.

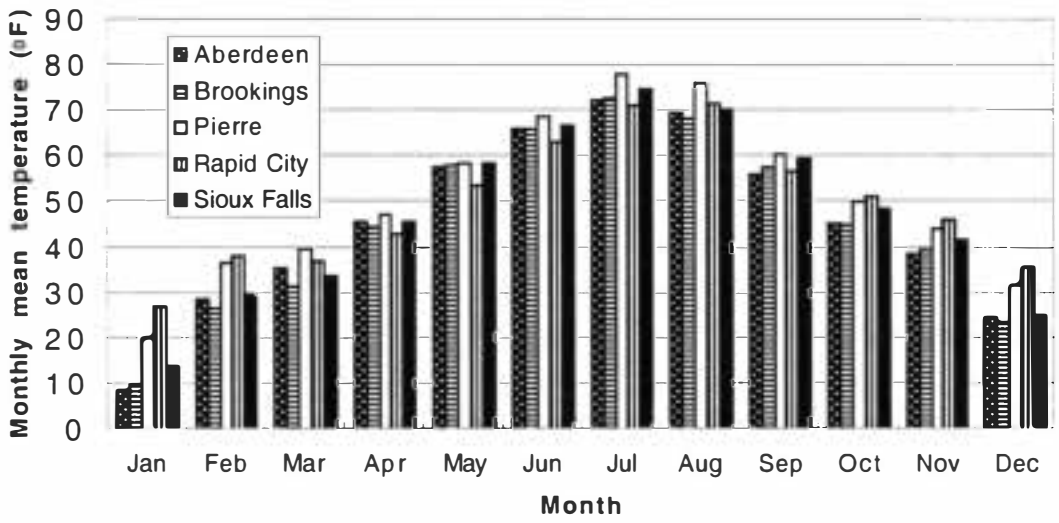


Figure 2. Cumulative growing degree days, base 50, of five South Dakota turfgrass research sites in 1999.

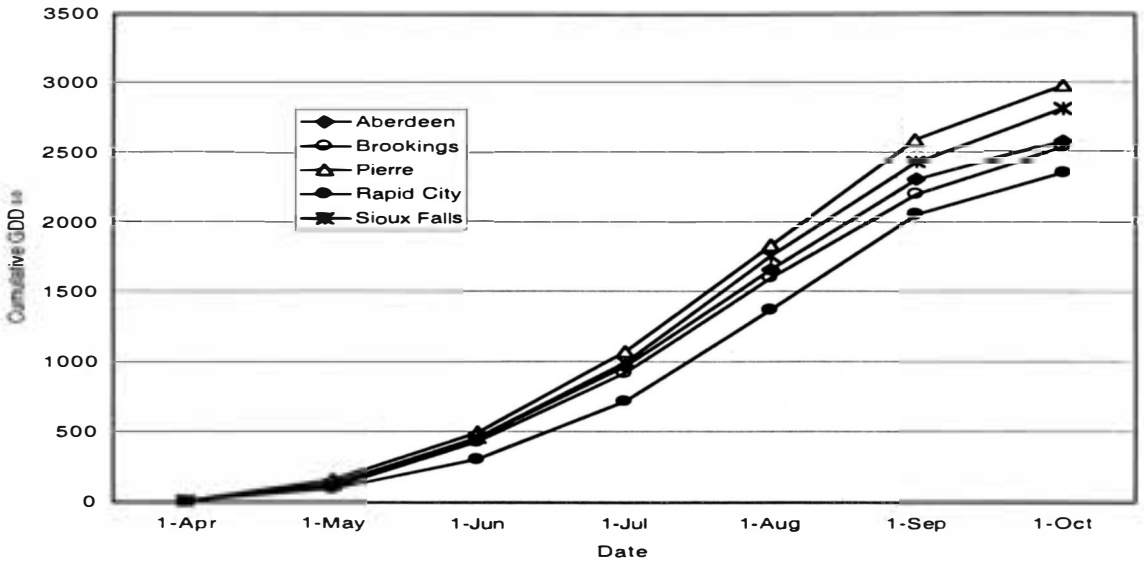
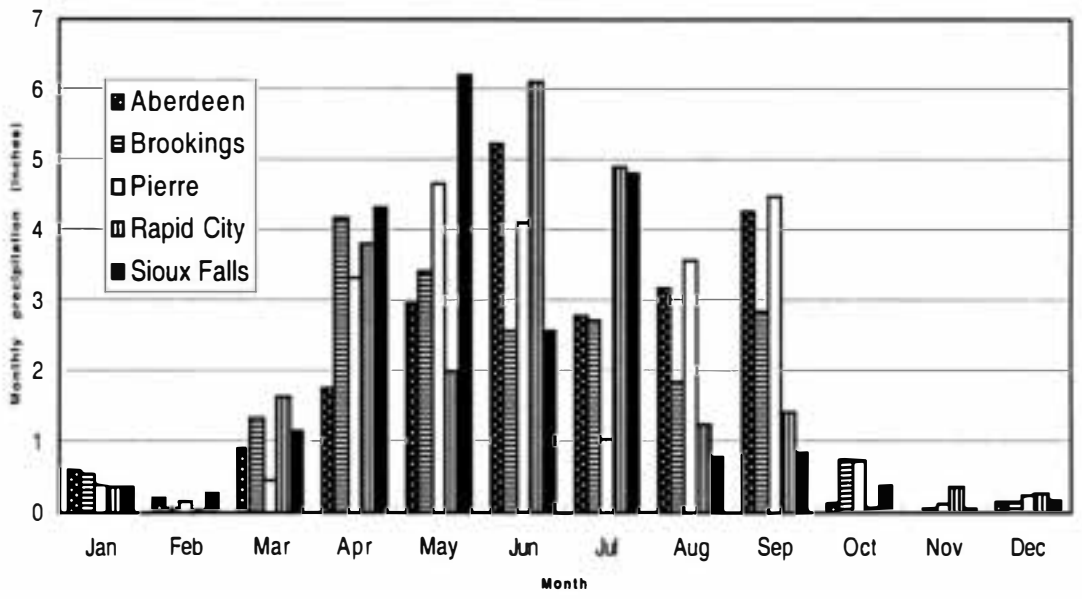


Figure 3. Monthly precipitation at five South Dakota turfgrass research sites in 1999.



Evaluating Perennial Ryegrass Cultivars for Winter Hardiness

Leo C. Schleicher and Anne Fennell

INTRODUCTION

Although perennial ryegrass provides excellent playability at mowing heights as low as one-half inch on golf course fairways, winter injury is frequently reported. Freezing stress resistance may be influenced by cultivar, mowing height, and fertility. The objectives of this study are to identify perennial ryegrass cultivars suitable for the Northern Plains, as influenced by mowing height and fertility, and to investigate the reliability of a laboratory screening procedure.

Following establishment in the fall of 1998, 22 perennial ryegrass cultivars were evaluated in the field during the 1999 growing season for winter injury, genetic color, snow mold injury, rust disease, and turfgrass quality. Additionally, laboratory freezing resistance tests were initiated in December.

Field Study

METHODS:

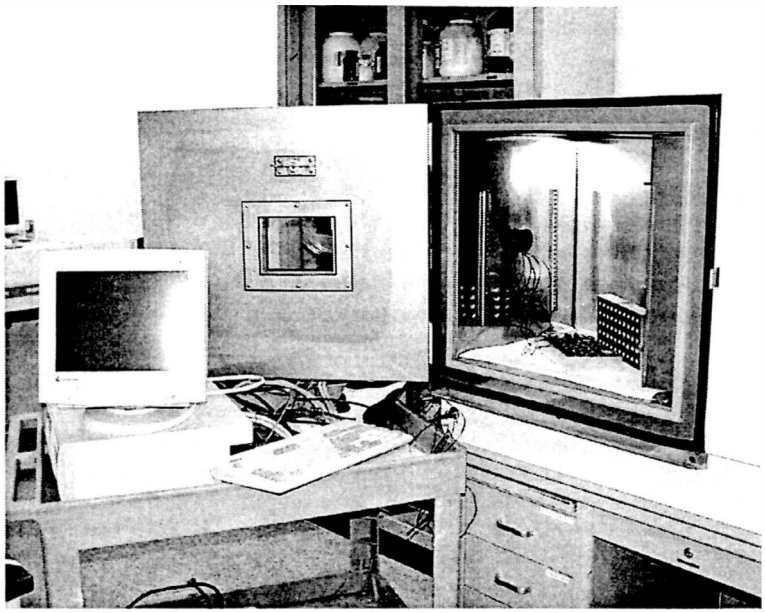
Twenty-two perennial ryegrass cultivars were established at Brookings, Pierre, and Hartford on 17 Aug, 29 Aug, and 11 Sept 1998, respectively. Brookings is located in east-central South Dakota, Pierre in the center of the state, and Hartford in the southeast. Cultivars were seeded at 342 kg PLS ha^{-1}, and an 18-22-6 starter fertilizer was applied at 49 kg N ha^{-1} during seeding. Plots were 1.5 m x 1.5 m in a split-split-plot design with a 22 x 2 x 2 factorial of cultivar x mowing height x fertilizer treatment. Treatments were replicated three times. Plots were mowed every other day at 1.6 or 2.5 cm and irrigated as needed to prevent drought stress. Fertilizer regime A consisted of a 25-4-12 fertilizer applied at 49 kg N ha^{-1} in May, late August, and late September. Fertilizer regime B was similar to fertilizer regime A, except an additional application of fertilizer at 49 kg N ha^{-1} was applied in late October.

RESULTS AND DISCUSSION:

Fertilizing perennnial ryegrass cultivars at Central Valley GC in Hartford

Brookings—The winter of 1999/2000 was uncharacteristically mild with above normal average temperatures. No apparent low temperature injury or injury from winter desiccation was observed in spring 1999. However, snow cover remaining until mid-April apparently promoted the development of gray snow mold disease. All cultivars received some snow mold injury, although injury was slight for nearly all cultivars (Table 1).

There was an interaction effect between mowing height and fertilizer regime, so each mowing height by fertilizer regime combination was analyzed separately. Plots receiving no October fertilizer and mowed at the lower mowing height suffered the greatest injury. 'Wind Star' suffered greater injury from snow mold than other cultivars, at a level considered unacceptable.



Computerized temperature chamber for determining freezing resistance at SDSU's Northern Plains Biostress Laboratory

Averaged over mowing heights and fertilization regimes, 'Wind Dance' rated higher than all other cultivars in genetic color except 'Paragon' (Table 2). In 1998, Wind Dance also had the highest genetic color rating value. 'Pennfine,' 'Elka,' and 'Regal' had the poorest genetic color ratings in 1999. Since there was no interaction between mowing height and fertilization regime for genetic color, ratings from 1.6 and 2.5 cm plots were combined for each fertilization regime analysis and ratings from fertilization regimes A and B were combined for each mowing height analysis. The highest ranking and lowest ranking cultivars were consistent across mowing heights and fertilization regimes. Differences in genetic color between fertilization regimes and between mowing heights were highly significant. Surprisingly, mean genetic color ratings for fertilization regime B plots, which received the additional fertilizer application in October, rated poorer than fertilizer regime A plots. Mean genetic color ratings for plots mowed at 1.6 cm were lower than plots mowed at 2.5 cm, which would be expected due to decreased canopy shading.

Visual turfgrass quality ratings are presented for each mowing height x fertilization regime (Tables 3, 4, 5, 6). Overall, turfgrass quality was highest in September and lowest in April and May, followed by August. Fertilization regime B, containing an additional nitrogen application in October, provided better overall turfgrass quality compared to fertilization regime A. Additionally, plots mowed at 2.5 cm rated higher in turfgrass quality than plots mowed at 1.6 cm. Mean turfgrass quality ratings for the year did not indicate an individual cultivar outstanding among the top 7 to 10 cultivars. However, Regal and Pennfine consistently rated the poorest in turfgrass quality, regardless of mowing height or fertilization regime.

Hartford—Central Valley GC, located on an open plateau approximately 60 miles south of Brookings, maintains little snow cover due to windy conditions across the open plain. There were no indications of snow mold disease at this site in 1999.

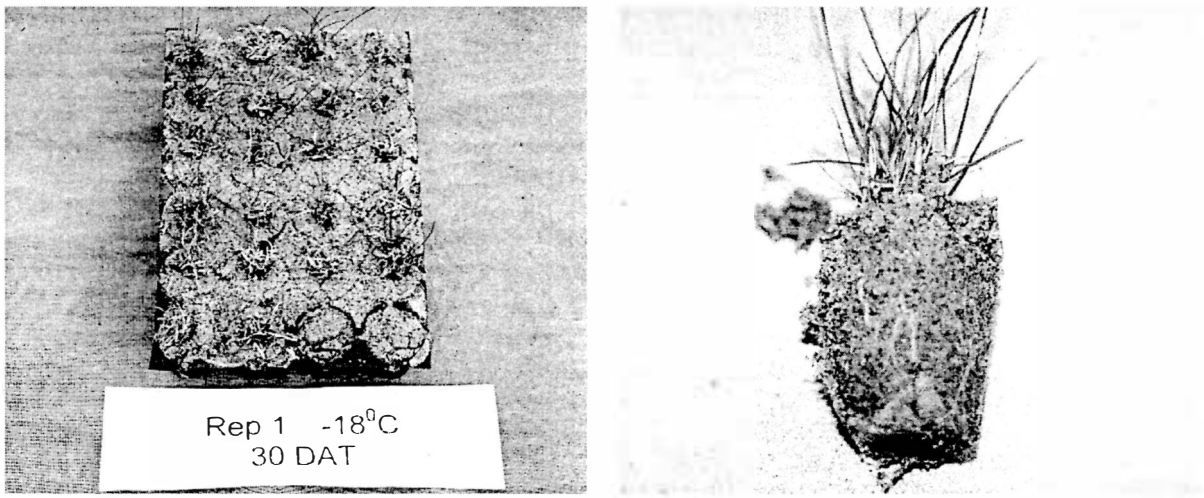
The analysis of genetic color data indicated an interaction effect between mowing height and fertilizer regime, therefore each mowing height by fertilizer regime combination was analyzed

separately (Table 7). 'Wind Dance' rated highest in genetic color across all four mowing x fertilizer combinations, as well as rating highest at the Brookings site. 'Pennfine' had the poorest genetic color.

Overall, turfgrass quality at the Hartford site was lowest in April. Although visual turfgrass ratings data for the Hartford site (Tables 8, 9, 10, 11) were analyzed separately from the Brookings site for this report, the highest rated cultivars were consistent across both sites. 'Wind Dance' and 'Paragon' rated highest regardless of site, mowing height, or fertilization.

Rust (*Puccinia* spp.) was a problem on many of the cultivars at the Hartford site and plots were rated for rust on 12 August. Plots mowed at 1.6 cm were less affected by rust than plots mowed at 2.5 cm. 'Wind Dance' was affected less by rust and 'Pennfine' was affected more by rust than all other cultivars (Table 12).

Pierre—Uneven irrigation practices during establishment across the research site at Hillsview GC in 1998 prevented valid treatment comparisons in 1999. It was decided to delay evaluations at this site until 2000.



Regrowth of cultivars surviving -18 °C for a duration of 2 hours.

Freezing Resistance Study

METHODS:

In Dec 1999, 1.6 cm dia x 3.8 cm long plugs were removed from field plots of 22 perennial ryegrass cultivars at the N.E. Hansen Research Center in Brookings to test freezing resistance. Plugs were obtained only from plots mowed at 1.6 cm and fertilized under fertilization regime A. Survival, shoot dry weight, and root dry weight were measured 45 days following exposure to temperatures of -5, -12, -14, -16, -18, or -20 C in a freezing chamber for a duration of 2 hours. Treatments were replicated three times. All plugs, including the control, were acclimated at 4 C for 24 hours prior to freezing treatments. Following freezing treatments, plugs were placed in a greenhouse under optimum growing conditions until harvested.

RESULTS AND DISCUSSION:

Cultivar survival began segregating at -18 C (Table 13). 'Top Hat,' 'LP1,' 'Secretariat,' and 'Charger II' survived temperatures to at least –20 C for all replications. Root and shoot dry weights at -5 and -12 C, averaged over all cultivars, were not different than weights obtained from the 4 C control (Fig 1). At temperatures less than -12 C, root and shoot weights decreased.

At -18 C, root and shoot weights were less than half of those measured in the control. Cultivars surviving at -20 C averaged only 31 and 29% of the control root and shoot weights, indicating that turf injury at this temperature would be extremely severe and turf recovery would be limited.

Additional plug samples were obtained from the same field plots in late March 2000 and were subjected to the same freezing procedures as plugs taken in December. Plugs obtained in March are expected to die at warmer temperatures than samples obtained in December, since they will most likely be dehardened from increasing temperatures in early spring. Previous research has also shown that fluctuating temperatures in spring, when turfgrass has dehardened, may be at least as important as minimum annual winter temperatures to freezing injury. The results of the spring 2000 sampling will appear in the 2000 report. In the fall of 2000, the study will be repeated over a smaller range of temperatures for a duration longer than 2 hours and will include all combinations of mowing heights and fertilization regimes. Laboratory results will be compared with field data to derive a predictive model for perennial ryegrass cultivar survivability in the Northern Plains.

Figure 1. Effect of temperature on perennial ryegrass shoot and root weight

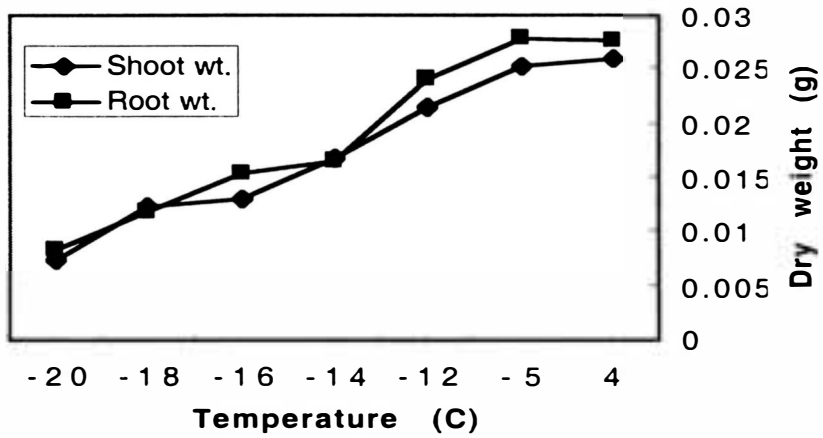


Table 1. Snow mold injury ratings of perennial ryegrass cultivars at the N.E. Hansen Research Center, Brookings, S.D., on 21 April.

Cultivar	Mowing height x fertility: 1.6 cm x fert A[1]	1.6 cm x fert B[2]	2.5 cm x fert A	2.5 cm x fert B	Mean
	Visual injury[3]				
Elka	8.67	9.00	9.00	9.00	8.92
Pennfine	8.67	9.00	8.67	9.00	8.83
Penguin	9.00	9.00	8.33	8.67	8.75
Laredo	8.00	9.00	9.00	9.00	8.75
Morning Star	8.67	8.67	8.67	8.67	8.67
Top Hat	8.33	9.00	8.67	8.67	8.67
Wind Dance	8.33	8.67	8.67	9.00	8.67
Archer	8.00	8.67	8.67	8.67	8.67
Sunshine	8.00	8.67	9.00	9.00	8.67
Cutter	8.33	8.33	8.67	9.00	8.58
Paragon	7.67	9.00	9.00	8.67	8.58
Omni	8.33	8.67	8.67	8.33	8.50
LP22	8.00	9.00	8.33	8.67	8.50
Essence	8.67	8.33	9.00	7.67	8.42
Charger II	8.33	9.00	8.00	8.33	8.42
Secretariat	8.00	8.67	8.67	8.33	8.42
Gator II	7.67	9.00	8.67	8.33	8.42
LP1	7.33	8.33	9.00	9.00	8.42
Palmer III	8.00	8.00	9.00	8.33	8.33
Regal	8.33	8.00	8.00	8.67	8.25
Calypso II	8.33	8.67	8.00	6.33	7.83
Wind Star	4.67	5.33	5.00	7.67	5.67
Mean	8.06	8.55	8.48	8.50	8.40
L.S.D. (0.05)	1.29	0.92	1.19	1.34	0.63

[1] 49 kg N ha^{-1} in late May, late Aug, and late Sep.
[2] 49 kg N ha^{-1} in late May, late Aug, late Sep, and late Oct.
[3] Visual injury, 1 to 9, where 1=total plot kill, 9=no visual injury

Table 2. Genetic color ratings of perennial ryegrass cultivars at the N.E. Hansen Research Center, Brookings, S.D., on 21 April.

	Treatment				
	Mowing height[1]		Fertilization regime[2]		
Cultivar	1.6 cm	2.5 cm	Fert A	Fert B	Mean
	---------- Color[3] ----------				
Wind Dance	7.33	7.66	7.50	7.50	7.50
Paragon	7.16	7.16	7.66	6.66	7.17
Sunshine	6.50	7.33	7.00	6.83	6.83
Penguin	6.50	7.00	7.00	6.50	6.75
LP22	6.50	7.00	6.66	6.83	6.75
LP1	6.66	6.66	6.83	6.50	6.67
Palmer III	6.33	6.83	6.66	6.50	6.58
Laredo	6.50	6.50	6.50	6.50	6.50
Archer	6.16	6.83	6.50	6.50	6.50
Omni	6.16	6.50	6.33	6.33	6.33
Secretariat	6.00	5.83	6.00	5.83	6.33
Charger II	5.83	6.66	6.50	6.00	6.25
Essence	5.83	6.33	6.16	6.00	6.08
Gator II	5.83	6.00	6.00	5.83	6.00
Calypso II	5.66	6.33	6.16	5.83	6.00
Top Hat	5.83	6.16	5.83	6.16	5.75
Cutter	5.50	6.00	6.00	5.50	5.75
Wind Star	5.16	6.16	5.66	5.66	5.67
Morning Star	5.16	6.00	5.83	5.33	5.58
Regal	5.16	5.33	5.33	5.16	5.25
Elka	4.66	5.00	4.83	4.83	4.83
Pennfine	4.50	7.00	4.83	4.50	4.67
Mean	5.92	6.37	6.26	6.06	6.17
L.S.D. (0.05)	0.75	0.70	0.72	0.73	0.62

[1] 1.6 or 2.5 cm mowing height averaged over fertilization regimes

[2] Fertilization A (49 kg N ha^{-1} in late May, late Aug, and late Sep) or fertilization B (49 kg N ha^{-1} in late May, late Aug, late Sep, and late Oct) averaged over mowing heights

[3] Visual color, 1 to 9, where 9=darkest green

Table 3. Visual turfgrass quality ratings [1] of perennial ryegrass cultivars mowed at 1.6 cm with fertilization regime A [2] at the N.E. Hansen Research Center, Brookings, S.D., in 1999.

Cultivar	Apr	May	Jun	Jul	Aug	Sep	Mean
Paragon	5.33	5.00	6.00	7.66	6.66	8.00	6.44
Sunshine	5.33	5.33	6.00	6.66	6.66	8.33	6.39
LP22	5.33	5.66	7.00	6.66	6.00	7.33	6.33
Laredo	5.33	4.66	6.33	6.66	6.33	8.33	6.28
Essence	6.00	4.00	6.33	6.33	6.00	8.00	6.11
Penguin	5.66	4.66	6.00	6.33	6.00	7.66	6.05
LP1	5.33	5.00	6.00	6.00	6.00	8.00	6.05
Top Hat	6.00	4.33	5.66	6.66	6.00	7.66	6.05
Wind Dance	4.66	5.66	5.66	6.00	6.66	7.66	6.05
Morning Star	5.66	4.00	6.00	6.33	6.00	8.00	6.00
Calypso II	6.00	4.00	6.33	6.66	5.66	7.33	6.00
Omni	5.00	4.66	6.00	6.33	6.00	8.00	5.99
Palmer III	6.00	3.66	6.00	6.66	6.33	7.33	5.99
Elka	4.66	5.66	6.33	7.00	5.00	6.66	5.89
Gator II	5.66	4.00	6.00	6.00	6.33	7.33	5.89
Secretariat	5.00	4.66	6.00	6.33	6.00	7.33	5.88
Archer	5.33	4.66	6.00	6.33	5.66	6.66	5.77
Wind Star	4.66	4.66	5.66	6.66	5.66	7.00	5.66
Charger II	5.66	4.00	6.00	5.66	5.33	7.00	5.61
Cutter	5.00	3.66	5.66	6.00	6.00	7.00	5.55
Pennfine	5.66	3.33	6.66	6.00	4.66	6.00	5.39
Regal	5.33	3.00	5.66	5.00	4.33	6.00	4.89
Mean	5.39	4.45	6.06	6.36	5.87	7.39	5.92
L.S.D. (0.05)	1.09	0.95	0.85	1.52	1.11	1.33	0.63

[1] Visual quality, 1 = dead turf, 5 = acceptable, 9 = excellent
[2] 49 kg N ha^{-1} in late May, late Aug, and late Sep

Table 4. Visual turfgrass quality ratings [1] of perennial ryegrass cultivars mowed at 1.6 cm with fertilization regime B [2] at the N.E. Hansen Research Center, Brookings, S.D., in 1999.

Cultivar	Apr	May	Jun	Jul	Aug	Sep	Mean
LP22	6.66	4.66	7.00	7.33	7.00	8.33	6.83
Paragon	6.00	4.66	6.33	7.66	6.66	8.66	6.66
Essence	6.66	4.33	6.66	7.00	6.33	8.00	6.50
Penguin	6.33	4.33	6.33	7.00	6.33	8.33	6.44
Charger II	6.66	4.00	6.00	7.00	6.66	8.00	6.39
Wind Dance	5.00	5.33	6.33	5.66	7.00	9.00	6.39
Sunshine	6.66	5.00	6.00	6.33	6.66	7.66	6.39
Calypso II	7.00	3.66	6.33	6.33	6.66	8.00	6.33
Cutter	6.66	3.33	6.33	7.33	6.33	8.00	6.33
Palmer III	6.00	4.66	6.33	7.00	6.33	7.66	6.33
Gator II	6.33	4.00	6.66	7.00	6.00	7.66	6.27
Laredo	6.33	4.33	6.00	6.66	6.66	7.66	6.27
LP1	6.66	4.00	6.00	6.66	5.66	7.66	6.11
Elka	5.66	5.00	6.33	6.66	5.33	7.00	6.00
Archer	6.33	4.66	6.00	6.00	5.66	7.33	6.00
Top Hat	6.33	4.00	6.00	6.66	6.00	7.00	6.00
Morning Star	5.66	4.33	6.00	6.66	5.66	7.33	5.94
Secretariat	6.33	4.33	6.00	6.00	5.66	6.33	5.77
Wind Star	5.00	4.00	6.00	6.00	5.66	7.33	5.67
Regal	6.00	3.00	6.00	5.66	5.00	6.00	5.27
Pennfine	5.66	2.66	5.66	6.33	4.66	6.66	5.27
Mean	6.19	4.21	6.21	6.62	6.10	7.60	6.15
L.S.D. (0.05)	1.07	1.04	0.66	1.20	0.97	1.30	0.54

[1] Visual quality, 1 = dead turf, 5 = acceptable, 9 = excellent
[2] 49 kg N ha^{-1} in late May, late Aug, late Sep, and late Oct

Table 5. Visual turfgrass quality ratings [1] of perennial ryegrass cultivars mowed at 2.5 cm with fertilization regime A [2] at the N.E. Hansen Research Center, Brookings, S.D., in 1999.

Cultivar	Apr	May	Jun	Jul	Aug	Sep	Mean
LP22	6.00	7.66	8.33	8.00	7.33	9.00	7.72
Paragon	6.66	6.66	7.66	8.33	8.00	9.00	7.72
Wind Dance	5.00	7.33	7.00	7.66	8.00	8.66	7.27
LP1	5.66	6.66	7.66	7.66	7.00	9.00	7.27
Palmer III	5.33	6.66	7.66	8.00	7.33	8.33	7.22
Archer	6.00	7.00	7.33	7.33	7.33	8.33	7.22
Secretariat	5.66	6.33	7.66	8.33	7.00	8.33	7.22
Penguin	6.00	5.66	7.66	7.66	7.33	8.66	7.16
Calypso II	6.33	5.33	7.33	8.00	7.33	8.33	7.11
Sunshine	5.66	5.33	7.66	7.66	7.33	8.66	7.05
Gator II	6.00	5.66	7.33	8.00	6.66	8.33	7.00
Top Hat	6.00	5.66	7.00	7.66	7.00	8.00	6.89
Omni	5.66	5.66	7.00	7.66	7.33	8.00	6.88
Charger II	6.00	5.66	7.33	7.00	7.00	8.00	6.83
Essence	5.33	6.33	7.33	7.33	6.66	7.66	6.78
Laredo	5.33	5.33	7.00	7.33	7.33	8.33	6.77
Elka	5.33	6.33	7.00	7.66	6.00	8.00	6.72
Morning Star	5.66	5.33	7.33	7.33	6.33	8.00	6.66
Cutter	6.00	5.33	7.33	6.66	6.00	8.00	6.55
Wind Star	4.33	5.33	6.66	7.00	6.66	8.33	6.39
Pennfine	5.66	4.33	7.00	6.33	4.66	6.66	5.77
Regal	5.33	4.33	7.00	6.00	5.00	6.33	5.66
Mean	5.68	5.90	7.33	7.48	6.84	8.18	6.90
L.S.D. (0.05)	1.26	0.95	0.82	1.29	0.92	1.04	0.51

[1] Visual quality, 1 = dead turf, 5 = acceptable, 9 = excellent
[2] 49 kg N ha^{-1} in late May, late Aug, and late Sep

Table 6. Visual turfgrass quality ratings [1] of perennial ryegrass cultivars mowed at 2.5 cm with fertilization regime B [2] at the N.E. Hansen Research Center, Brookings, S.D., in 1999.

Cultivar	Apr	May	Jun	Jul	Aug	Sep	Mean
Paragon	6.66	6.66	7.66	8.66	7.33	9.00	7.66
Palmer III	7.00	5.66	7.33	8.66	7.33	8.66	7.44
LP22	5.33	7.00	8.00	8.33	6.66	9.00	7.38
Top Hat	6.66	5.33	7.33	8.66	7.00	9.00	7.33
Sunshine	6.00	5.33	7.66	8.33	7.33	9.00	7.27
Secretariat	6.33	6.00	7.66	8.00	7.33	8.33	7.27
Penguin	6.33	6.00	7.33	8.00	7.00	8.66	7.22
Wind Dance	5.66	7.00	7.33	7.33	7.33	8.66	7.22
Gator II	6.66	5.66	7.33	8.00	7.00	8.33	7.17
LP1	6.66	6.00	7.33	7.66	6.33	9.00	7.16
Archer	6.33	6.33	7.00	8.00	6.66	8.66	7.16
Charger II	6.00	5.66	7.00	8.33	7.00	8.66	7.11
Laredo	5.66	5.33	7.00	7.33	7.66	8.66	6.94
Calypso II	6.00	5.00	7.66	8.00	6.66	8.33	6.94
Essence	6.00	5.33	7.00	8.00	6.66	8.00	6.83
Wind Star	6.33	5.33	7.66	7.33	6.66	8.33	6.77
Elka	5.00	5.66	7.00	7.00	6.33	8.33	6.55
Cutter	6.33	5.00	7.00	7.00	6.00	8.00	6.55
Morning Star	6.00	5.00	7.00	7.66	5.33	7.66	6.44
Regal	6.00	4.00	7.00	6.33	4.66	6.33	5.72
Mean	6.10	5.57	7.27	7.77	6.69	8.39	6.96
L.S.D. (0.05)	1.19	1.06	0.68	1.17	1.01	0.87	0.51

[1] Visual quality, 1 = dead turf, 5 = acceptable, 9 = excellent
[2] 49 kg N ha^{-1} in late May, late Aug, late Sep, and late Oct.

Table 7. Genetic color ratings of perennial ryegrass cultivars at Central Valley GC, Hartford, S.D., on 28 April.

Cultivar	Mowing height x fertility: 1.6 cm x fert A[1]	1.6 cm x fert B[2]	2.5 cm x fert A	2.5 cm x fert B	Mean
	Color[3]				
Wind Dance	8.00	8.00	8.00	8.00	8.00
Paragon	7.67	7.00	7.33	7.17	7.29
Sunshine	7.33	7.00	7.00	7.00	7.08
Archer	7.00	6.67	7.33	7.00	7.00
LP1	7.00	7.00	7.00	7.00	7.00
LP22	6.67	7.00	7.00	7.00	6.92
Palmer III	6.67	6.67	7.00	6.83	6.79
Laredo	7.00	6.33	7.00	6.67	6.75
Secretariat	6.33	6.67	7.00	6.83	6.71
Penguin	6.67	6.67	6.67	6.67	6.67
Omni	6.33	6.00	6.67	6.33	6.33
Charger II	6.33	6.00	6.33	6.17	6.21
Essence	6.00	6.00	6.33	6.17	6.13
Top Hat	6.00	6.00	6.00	6.00	6.00
Gator II	6.00	6.00	6.00	6.00	6.00
Calypso II	6.33	5.33	6.33	5.83	5.95
Morning Star	6.00	5.67	5.67	5.67	5.75
Wind Star	6.00	5.67	5.67	5.67	5.75
Cutter	5.67	5.67	5.67	5.67	5.67
Elka	5.33	5.00	5.33	5.17	5.21
Regal	5.33	5.00	5.33	5.17	5.21
Pennfine	4.33	4.67	4.33	4.50	4.46
Mean	6.36	6.18	6.41	6.30	6.31
L.S.D. (0.05)	0.72	0.58	0.83	0.52	0.47

[1] 49 kg N ha^{-1} in late May, late Aug, and late Sep
[2] 49 kg N ha^{-1} in late May, late Aug, late Sep, and late Oct
[3] Visual color, 1 to 9, where 9 = darkest green

Table 8. Visual turfgrass quality ratings[1] of perennial ryegrass cultivars mowed at 1.6 cm averaged over both fertilization regimes[2] at Central Valley GC, Hartford, S.D., in 1999.

Cultivar	Apr	May	June	Aug	Oct	Mean
Wind Dance	6.67	7.67	8.50	6.33	7.17	7.27
Paragon	6.67	7.17	8.33	7.17	6.33	7.13
LP1	6.33	7.33	7.50	7.00	6.33	6.90
Essence	6.17	7.00	7.67	6.33	6.67	6.77
LP22	5.67	7.17	8.00	6.50	6.33	6.73
Palmer III	6.17	6.33	7.67	6.67	6.50	6.67
Sunshine	6.00	6.83	7.17	6.33	6.50	6.57
Elka	6.00	7.00	6.67	6.17	6.83	6.53
Laredo	6.33	6.67	7.17	6.33	6.17	6.53
Omni	6.17	6.83	7.50	6.33	5.83	6.53
Calypso II	6.17	6.33	7.17	6.33	6.50	6.50
Gator II	6.00	6.33	6.83	6.33	6.17	6.33
Penguin	5.83	6.83	7.17	6.00	5.83	6.33
Wind Star	5.83	6.33	6.50	6.33	6.67	6.33
Charger II	6.00	6.50	6.50	6.00	6.33	6.27
Top Hat	5.83	6.67	7.17	6.17	5.50	6.27
Cutter	5.50	6.00	6.00	6.17	6.50	6.03
Morning Star	5.83	6.17	6.00	5.50	6.00	5.90
Pennfine	6.00	5.67	6.33	5.50	5.33	5.77
Archer	4.33	6.83	6.33	5.83	5.17	5.70
Regal	5.33	5.50	6.17	5.17	5.50	5.53
Secretariat	4.50	6.83	5.67	5.33	4.83	5.43
Mean	5.88	6.64	7.00	6.17	6.14	6.37
LSD (0.05)	0.57	0.58	0.81	0.88	0.68	0.41

[1] Visual quality, 1 = dead turf, 5 = acceptable, 9 = excellent

[2] Fertilization regime A = 49 kg N ha-1 in late May, late Aug, and late Sep; Fertilization regime B = 49 kg N ha-1 in late May, late Aug, late Sep, and late Oct

Table 9. Visual turfgrass quality ratings[1] of perennial ryegrass cultivars mowed at 2.5 cm averaged over both fertilization regimes[2] at Central Valley GC, Hartford, S.D., in 1999.

Cultivar	Apr	May	June	Aug	Oct	Mean
LP1	6.33	8.00	8.00	7.00	6.50	7.17
Paragon	6.33	7.50	8.67	6.67	6.50	7.13
Wind Dance	6.67	8.00	8.50	5.67	6.83	7.13
Elka	6.00	7.17	8.00	7.00	7.17	7.07
LP22	5.67	7.83	8.50	6.83	6.50	7.07
Palmer III	6.50	7.33	8.50	6.67	6.33	7.07
Omni	6.50	7.67	7.83	6.33	6.00	6.87
Essence	6.17	7.33	7.83	6.83	6.00	6.83
Laredo	6.17	7.50	7.83	6.33	6.00	6.77
Penguin	6.00	7.50	8.00	6.17	6.00	6.73
Calypso II	6.17	6.67	7.83	6.50	6.33	6.70
Sunshine	6.00	7.33	7.83	6.17	6.07	6.67
Charger II	6.00	7.33	7.83	5.67	6.33	6.63
Gator II	6.00	7.17	7.83	6.00	6.17	6.63
Top Hat	6.17	6.83	7.67	6.17	6.33	6.63
Wind Star	6.00	6.83	7.67	6.67	6.00	6.63
Morning Star	6.17	7.00	7.50	6.00	6.00	6.53
Archer	5.00	7.83	6.67	5.83	5.67	6.20
Pennfine	5.83	6.33	7.17	5.33	6.17	6.17
Cutter	5.67	6.33	7.00	5.50	5.83	6.07
Regal	5.67	6.17	6.67	5.33	5.67	5.90
Secretariat	4.67	7.00	6.83	5.50	5.00	5.80
Mean	5.98	7.21	7.73	6.19	6.15	6.65
LSD (0.05)	0.50	0.59	0.63	0.78	0.55	0.35

[1] Visual quality, 1 = dead turf, 5 = acceptable, 9 = excellent

[2] Fertilization regime A = 49 kg N ha-1 in late May, late Aug, and late Sep; Fertilization regime B = 49 kg N ha-1 in late May, late Aug, late Sep, and late Oct

Table 10. Visual turfgrass quality ratings[1] of perennial ryegrass cultivars fertilized under fertilization regime A[2] averaged over 1.6 and 2.5 cm mowing heights at Central Valley GC, Hartford, S.D., in 1999.

Cultivar	Apr	May	June	Aug	Oct	Mean
Wind Dance	6.33	7.50	8.67	6.00	6.67	7.03
LP1	6.17	7.67	7.83	7.00	6.33	7.00
Paragon	6.33	7.33	8.33	6.50	5.83	6.87
LP22	5.50	7.17	8.17	6.67	6.33	6.77
Palmer III	6.00	6.83	8.00	6.50	6.50	6.77
Essence	6.00	7.17	7.67	6.50	6.33	6.73
Elka	5.67	6.83	7.33	6.17	7.00	6.60
Penguin	5.83	7.00	7.50	6.50	6.00	6.57
Laredo	6.00	7.17	7.33	6.00	6.00	6.50
Calypso II	6.00	6.33	7.33	6.33	6.33	6.47
Omni	6.33	7.00	7.33	6.00	5.67	6.47
Sunshine	5.83	7.00	7.17	6.33	6.00	6.47
Gator II	6.00	6.67	7.33	6.00	6.17	6.43
Wind Star	5.83	6.33	6.50	5.67	5.83	6.03
Archer	4.67	7.33	6.83	5.67	5.33	5.97
Pennfine	5.67	5.83	6.67	5.50	5.67	5.87
Cutter	5.50	5.83	6.33	5.50	6.00	5.83
Regal	5.67	5.67	6.33	5.33	5.33	5.67
Secretariat	4.33	6.83	6.33	5.33	5.00	5.57
Mean	5.79	6.79	7.29	6.07	6.02	6.39
LSD (0.05)	0.49	0.67	0.87	0.88	0.63	0.44

[1] Visual quality, 1 = dead turf, 5 = acceptable, 9 = excellent

[2] Fertilization regime A = 49 kg N ha-1 in late May, late Aug, and late Sep

Table 11. Visual turfgrass quality ratings[1] of perennial ryegrass cultivars fertilized under fertilization regime B[2] averaged over 1.6 and 2.5 cm mowing heights at Central Valley GC, Hartford, S.D., in 1999.

Cultivar	Apr	May	June	Aug	Oct	Mean
Paragon	6.67	7.33	8.67	7.33	7.00	7.40
Wind Dance	7.00	8.17	8.33	6.00	7.33	7.37
LP1	6.50	7.67	7.67	7.00	6.50	7.07
LP22	5.83	7.83	8.33	6.67	6.50	7.03
Elka	6.33	7.33	7.33	7.00	7.00	7.00
Palmer III	6.67	6.83	8.17	6.83	6.33	6.97
Omni	6.33	7.50	8.00	6.67	6.17	6.93
Essence	6.33	7.17	7.83	6.67	6.33	6.87
Laredo	6.50	7.00	7.67	6.67	6.17	6.80
Sunshine	6.17	7.17	7.83	6.17	6.50	6.77
Calypso II	6.33	6.67	7.67	6.50	6.50	6.73
Top Hat	6.17	6.83	7.50	6.50	6.17	6.63
Wind Star	6.00	6.67	7.17	6.50	6.67	6.60
Charger II	6.00	7.17	7.33	6.00	6.33	6.57
Gator II	6.00	6.83	7.33	6.33	6.17	6.53
Penguin	6.00	7.33	7.67	5.67	5.83	6.50
Morning Star	6.17	6.83	7.00	5.83	6.17	6.40
Cutter	5.67	6.50	6.67	6.17	6.33	6.27
Pennfine	6.17	6.17	6.83	5.33	5.83	6.07
Archer	4.67	7.33	6.17	6.00	5.50	5.93
Regal	4.83	7.00	6.17	5.50	4.83	5.67
Mean	6.08	7.06	7.45	6.30	6.27	6.63
LSD (0.05)	0.54	0.70	0.86	0.94	0.62	0.41

[1] Visual quality, 1 = dead turf, 5 = acceptable, 9 = excellent

[2] Fertilization regime A = 49 kg N ha-1 in late May, late Aug, late Sep, and late Oct

Table 12. Severity of rust infestation in perennial ryegrass cultivars at 1.6 cm and 2.5 cm mowing heights averaged over fertilization regimes at Central Valley GC, Hartford, S.D., on 12 Aug.

	Mowing height	
Cultivar	1.6 cm	2.5 cm
	- - - - - - - Severity[1] - - - - - - -	
Wind Dance	8.00	8.00
Paragon	7.50	7.17
Sunshine	7.17	7.00
Archer	7.00	7.00
LP1	6.67	7.00
LP22	6.67	7.00
Palmer III	6.67	6.83
Secretariat	6.33	6.83
Penguin	6.50	6.67
Omni	6.17	6.33
Charger II	6.50	6.17
Essence	6.17	6.17
Gator II	6.17	6.00
Top Hat	5.83	6.00
Calypso II	6.50	5.83
Morning Star	6.00	5.67
Wind Star	6.00	5.67
Cutter	5.83	5.67
Regal	5.50	5.17
Elka	5.00	5.17
Pennfine	4.50	4.50
Mean	6.35	6.30
L.S.D. (0.05)	0.51	0.51

[1] Rust disease, 1 to 9, where 1 = severe and 9 = no rust

Table 13. Lethal temperatures of perennial ryegrass cultivars obtained from field samples in December 1999.

Cultivar	Rep	Temperature °C							
		Control	-5	-10	-12	-14	-16	-18	-20
Top Hat	1								
	2								
	3								
Penguin	1								
	2								•
	3								•
Wind Dancer	1								•
	2		•						
	3								•
Pennfine	1								
	2	•							
	3							•	
LP1	1								
	2								
	3								
Cutter	1								
	2							•	•
	3						•		
Gator II	1						•		
	2								
	3								
LP22	1								
	2								•
	3								•
Palmer III	1								•
	2								•
	3								•
Paragon	1								
	2								•
	3								•
Wind Star	1								
	2								
	3								•

Cultivar	Rep	Temperature °C							
		Control	-5	-10	-12	-14	-16	-18	-20
Secretariat	1								
	2								
	3								
Calypso II	1								
	2								•
	3						•		•
Omni	1								
	2								•
	3						•		
Archer	1								
	2					•			
	3								
Regal	1								
	2								
	3								•
Laredo	1								•
	2								
	3								
Elka	1								
	2								•
	3							•	
Morning Star	1								
	2							•	
	3	•			•				•
Sunshine	1						•		
	2						•		•
	3								•
Essence	1								
	2					•			
	3								
Charger II	1								
	2								
	3								

1998 Buffalograss Cultivar Evaluation

Leo C. Schleicher

INTRODUCTION

In 1999, the buffalograss cultivars in this study continued to demonstrate the ability of this species to provide a dense, attractive turf for golf course roughs, low-input lawns, and utility areas. This warm-season, native turfgrass was once a major component of the short-grass and mixed-grass prairies of South Dakota. Buffalograss is known for its superior drought tolerance, cold hardiness, low fertility requirements, and low mowing tolerance.

The objective of this 3-year study is to evaluate both seeded and vegetative cultivars for color, height, density, winter injury, dormancy, and turfgrass quality.

MATERIALS AND METHODS

Sixteen cultivars, seven seeded and nine vegetative, were established in 1.5 m x 1.5 m plots in 1998 at the N.E. Hansen Research Center near Brookings, S.D., and at Hillsview GC in Pierre, S.D. Germplasm designated 'NE' are experimental accessions belonging to the University of Nebraska buffalograss breeding program.

In 1999, buffalograss plots at the N.E. Hansen Research Center received no supplemental irrigation and were mowed once, at 5 cm in late July. A 25-4-12 complete fertilizer was applied at 49 kg N ha^{-1} in June and July. Plots were occasionally hand weeded, but received no pesticides during the growing season. However, plots at Hillsview GC were severely injured with glyphosate in an attempt to control weeds prior to the growing season. The herbicide was evidently applied too late in the spring when the buffalograss was coming out of dormancy. Injured plots were allowed to reestablish in 1999 and evaluations were postponed until 2000.

RESULTS AND DISCUSSION

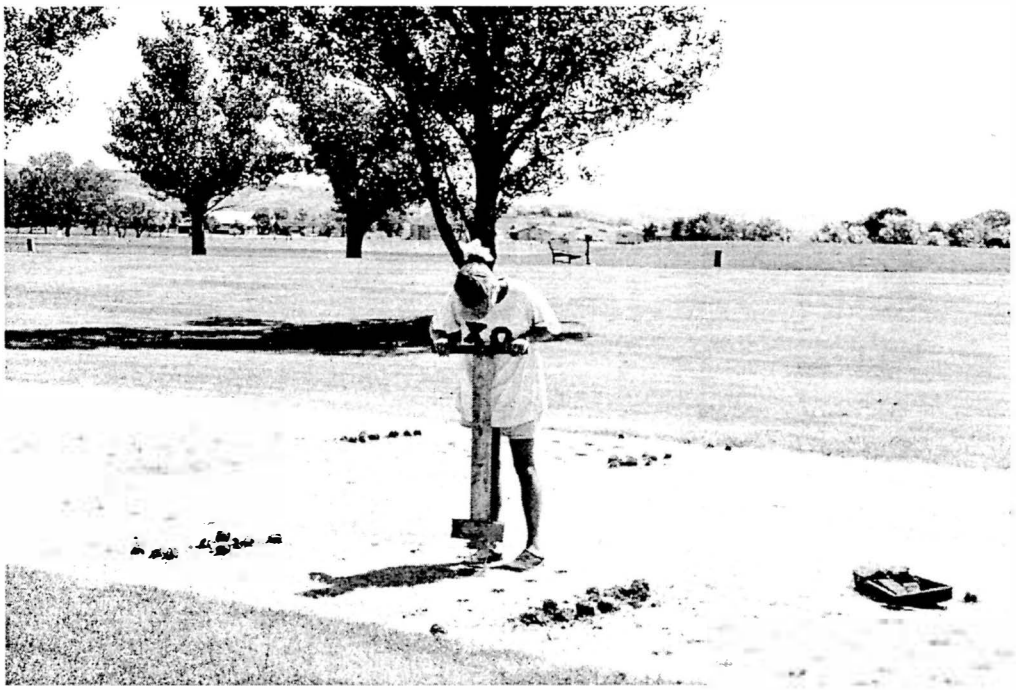
In Brookings, cultivar '609' suffered significant winter injury (62%), while the other cultivars received little or no winter injury (Table 1). This was not unexpected since previous research has shown that '609' is better adapted to regions south of South Dakota. 'Tatanka' and NE 91-118 received the highest color ratings, although they were not significantly different than 'Sharps Improved II,' NE 93-181,' 'Texoka,' and 'Sharpshooter.' Overall color ratings were lower than in 1998. Turfgrass color ratings in 1999 may have been somewhat affected by response to slight drought stress, since no supplemental irrigation was applied.

NE 93-166 rated highest in turfgrass quality, but was not significantly different than NE 86-61. Overall, vegetative cultivars rated higher in turfgrass quality than seeded cultivars. 'Tatanka' and 'Sharpshooter' rated highest among seeded cultivars. 'Sharps Improved' and 'Bison' turfgrass quality was unacceptable (< 5.0). 609 rated lowest in mean turfgrass quality in 1999 due to severe winter injury, although it had recovered by the 29 June rating (8.0).

'609,' 'Bison,' and NE 93-181 showed no apparent dormancy as late as 23 Sep, while NE-93-170, NE 86-61, NE 91-181, and NE 93-166 were nearly dormant at this date. It is of importance to note that '609' and 'Bison' were among the cultivars receiving winter injury, while the nearly dormant cultivars above showed no signs of winter injury. Previous research has shown a relationship between winter tolerance and early fall dormancy.

Low canopy height is a desirable feature because it can reduce mowing frequency or eliminate mowing at certain sites. When canopy height was measured on 28 June (Fig 1) and 23 Sep (Fig 2), vegetative cultivars had a lower overall canopy height than seeded cultivars. NE 93-166, the shortest cultivar on 28 June, was 55% of the 'Texoka' height. NE 91-118 was 50% shorter than 'Bison' on 23 Sep.

Results of buffalograss evaluation in 1999 demonstrate once again the potential of this low-input turfgrass species for South Dakota. Unfortunately, because of the genetic blue-gray color and dormancy characteristics of warm-season grasses, the full potential of buffalograss may only be realized when water, energy, pesticide, or labor inputs are restricted.



Plugging vegetative buffalograss cultivars at Hillsview GC in Pierre

Figure 1. Mean canopy height of buffalograss cultivars on 28 June prior to first mowing of the year.

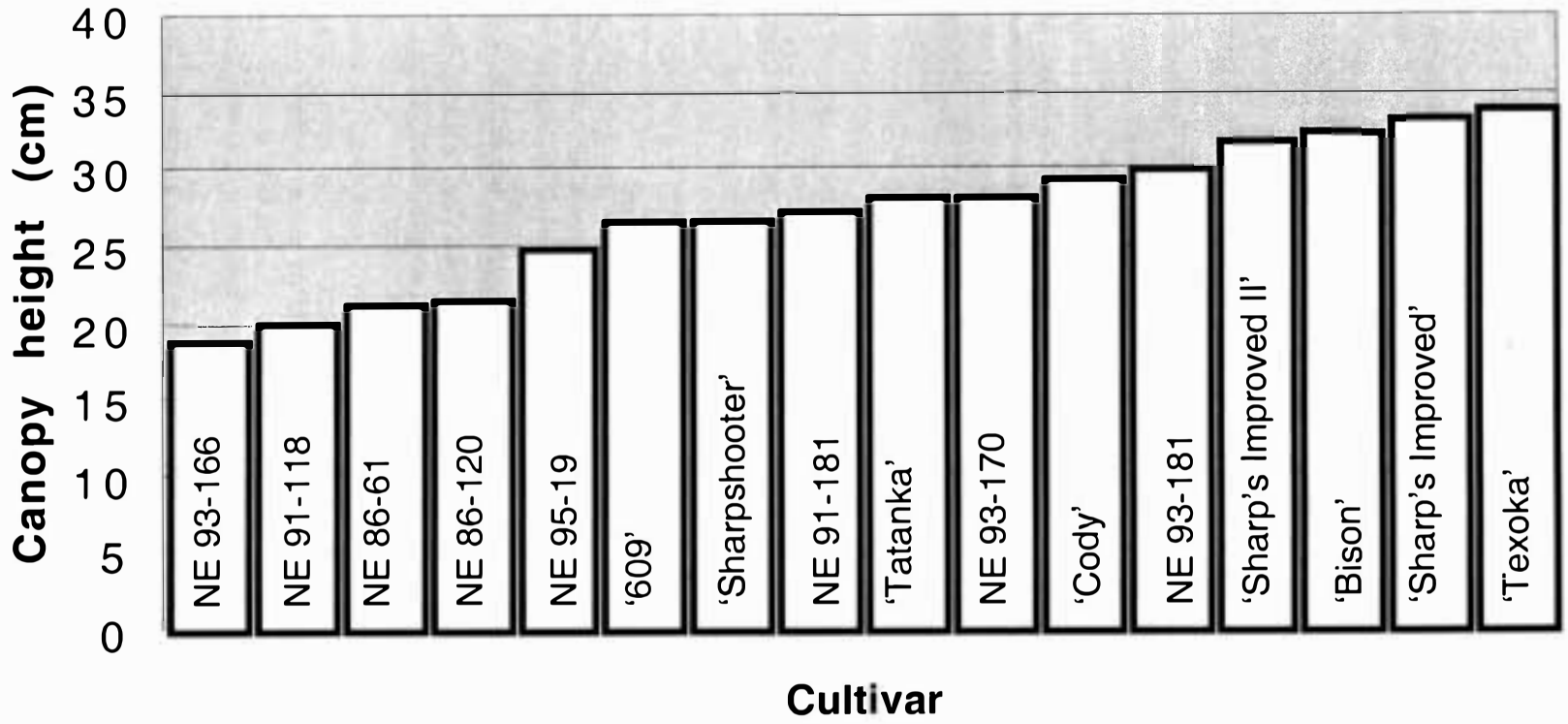


Figure 2. Mean canopy height of buffalograss cultivars on 23 September following early July mowing.

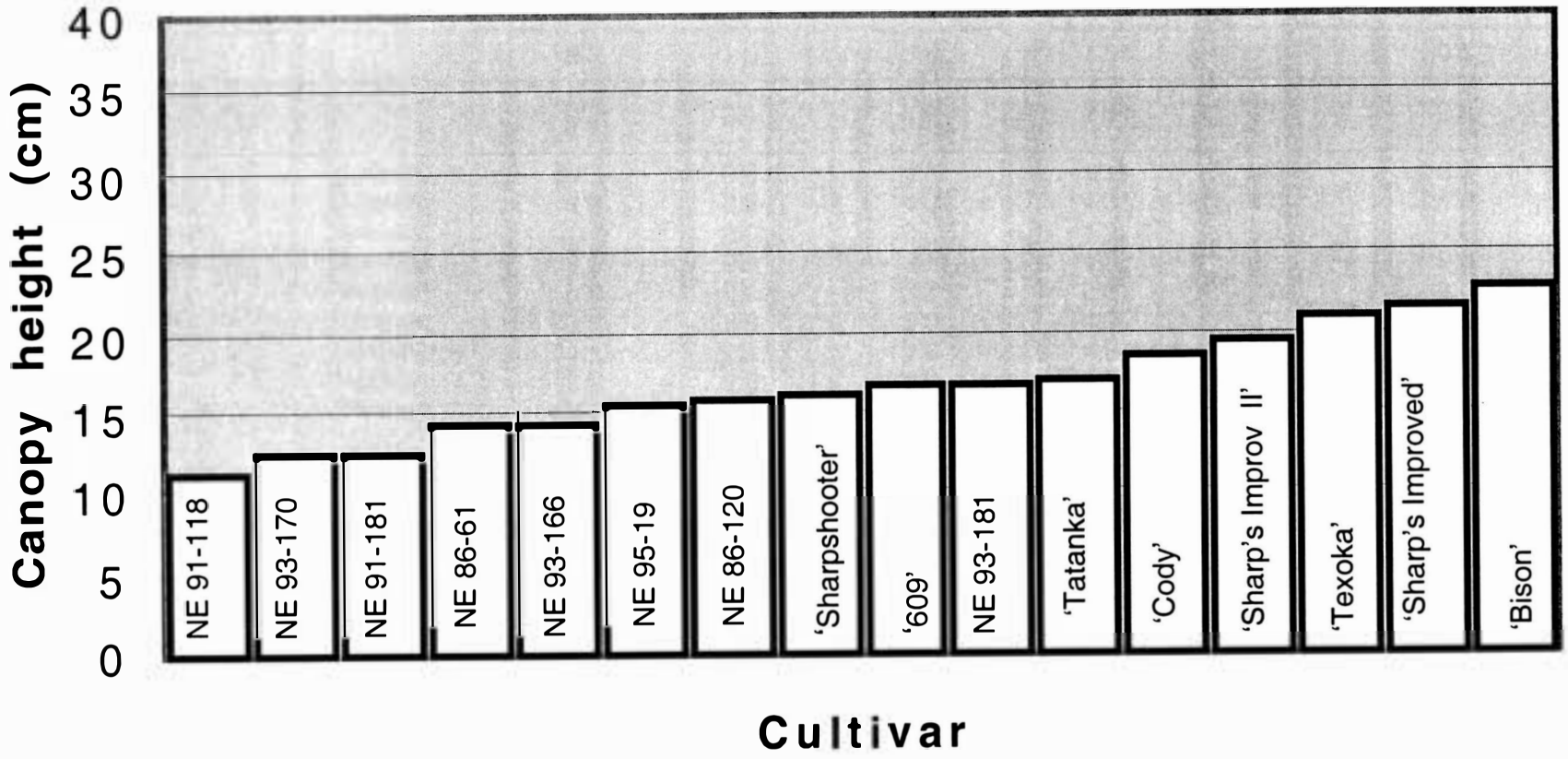


Table 1. Evaluation of seeded and vegetative buffalograss for winter injury, color, fall dormancy, and turfgrass quality at the N.E. Hansen Research Center, Brookings, S.D., in 1999.

Cultivar	Type	Winter Injury[1]	Genetic Color[2]	Fall Dormancy[3]	Turfgrass Quality[4]		
					May 28	Jun 29	Mean
NE 93-166	vegetative	0.0	4.3	2.0	7.0	8.7	7.8
NE 86-61	vegetative	0.0	4.0	2.0	6.3	8.0	7.2
NE 86-120	vegetative	3.3	4.3	2.3	5.7	8.0	6.8
NE 91-181	vegetative	0.0	4.0	2.0	6.3	7.0	6.7
NE 93-170	vegetative	0.0	4.0	2.0	6.0	7.3	6.7
NE 95-19	vegetative	0.0	5.0	2.3	5.3	7.7	6.5
'Sharpshooter'	seeded	1.7	5.7	3.3	5.7	7.0	6.3
'Tatanka'	seeded	0.0	6.3	3.0	5.3	6.7	6.0
NE 91-118	vegetative	8.3	6.3	2.3	4.3	7.3	5.8
NE 93-181	vegetative	1.7	5.7	4.0	4.3	7.0	5.7
'Cody'	seeded	3.3	5.3	3.0	4.3	6.7	5.5
'Texoka'	seeded	0.0	5.7	3.7	5.0	5.0	5.0
'Sharps Improved II'	seeded	8.3	5.7	3.7	4.3	5.7	5.0
'Sharps Improved'	seeded	10.0	5.0	3.7	4.3	4.7	4.5
'Bison'	seeded	6.3	5.3	4.0	4.0	4.0	4.0
'609'	vegetative	61.7	5.0	4.0	1.7	8.0	3.8
Mean		6.5	5.1	2.6	5.0	6.7	5.8
LSD (0.05)		8.6	1.0	0.8	1.2	0.7	0.7

[1] Percent of plot injured; 0 = no injury, 100 = entire plot killed
[2] Genetic color 1–9; 1 = bluish/gray, 9 = dark green
[3] Dormancy 1–4; 1 = total plot dormant, 2 = plot nearly dormant, 3 = plot beginning dormancy, 4 = no sign of dormancy
[4] Visual quality, 1–9; 1 = dead turf, 5 = acceptable, 9 = excellent

1998 Fairway/Tee Bentgrass Cultivar Trial

Leo C. Schleicher

INTRODUCTION

The first full growing season of this 27 bentgrass cultivar trial was in 1999 following establishment the previous fall. Although only a few golf courses have bentgrass fairways or tees in South Dakota, the quality of a well-managed and highly adapted bentgrass cultivar can provide premium golf course turf.

This study is supported by funds from the National Turfgrass Evaluation Program. SDSU is one of 26 official testing sites for this trial.

MATERIALS AND METHODS

Cultivars were seeded 24 Sep 1998 at the N.E. Hansen Research Center near Brookings, S.D., into 1.5 m x 1.5 m plots arranged in a randomized complete block design with three replications. Plots were mowed at 1.6 cm three times per week, irrigated to prevent drought stress, and fertilized each month during the growing season with a total of 220 kg N ha^{-1} yr^{-1}.

Cultivars were rated for turfgrass quality, genetic color, spring greenup, seedling vigor, and turfgrass density.

RESULTS AND DISCUSSION

Extreme cold temperatures several weeks after emergence in fall 1998 injured all cultivars and stunted fall growth. Additional injury was caused by frost heaving of the soil.

All cultivars recovered during spring 1999 and plots were 100% established by mid-summer. Turfgrass quality ratings, averaged over all cultivars, increased each month from April through September as cultivars recovered from the injury following establishment (Table 1). Another indication of the recovery is the difference between spring (5.7) and summer (7.5) density ratings (Table 2).

'Penncross' had the highest mean rating value for turfgrass quality, although it was not significantly different from seven other cultivars. No differences among cultivars were observed in spring greenup.

Table 1. Visual ratings for turfgrass quality of cultivars in the 1998 NTEP Bentgrass (Fairway/Tee) Cultivar Trial at the N.E. Hansen Research Center, Brookings, S.D., in 1999.

	Turfgrass Quality[1]						
Cultivar	Apr	May	Jun	Jul	Aug	Sep	Mean
PENNCROSS	5.0	5.3	6.7	7.7	7.3	8.3	6.7
L-93	4.7	5.3	6.0	7.0	8.0	8.0	6.5
GRAND PRIX	4.3	4.7	5.7	7.3	7.7	7.3	6.2
TRUELINE	4.7	5.7	6.0	6.7	7.3	7.0	6.2
BACKSPIN	4.7	6.3	6.0	6.7	6.7	6.3	6.1
CENTURY	4.0	5.3	7.0	6.7	6.7	6.7	6.1
PST-OVN	3.7	5.0	6.0	6.7	7.7	7.7	6.1
SR 1119	3.7	5.7	5.7	6.7	7.0	7.7	6.1
IMPERIAL	4.0	5.0	6.3	6.0	6.7	7.3	5.9
SR 7100	5.0	6.3	5.0	5.7	6.0	7.3	5.9
ISI AT-5	3.3	5.3	5.3	6.3	6.3	8.3	5.8
PENN G-6	3.7	4.7	6.0	6.7	6.7	7.3	5.8
PRINCEVILLE	5.0	5.0	5.3	5.7	7.0	7.0	5.8
SRX 1120	3.0	4.7	5.7	6.3	7.7	7.7	5.8
PENNEAGLE	4.0	4.7	5.0	5.7	7.0	7.0	5.6
PROVIDENCE	4.0	5.3	5.7	6.3	6.0	6.0	5.6
SRX 7MOBB	4.0	5.7	5.0	5.3	6.7	7.0	5.6
SRX 7MODD	3.7	5.0	4.7	5.0	6.3	7.7	5.4
ABT-COL-2	3.7	5.3	4.7	5.0	5.7	7.3	5.3
PST-9HG	4.0	4.7	4.3	4.7	5.7	7.7	5.2
SEASIDE II	4.0	5.0	5.3	5.3	5.7	6.0	5.2
SRX 1BPAA	3.7	4.7	5.0	5.3	6.0	6.3	5.2
GOLFSTAR	3.7	5.0	5.0	4.7	6.0	6.0	5.1
TIGER	3.7	5.0	4.7	5.7	6.0	5.7	5.1
PST-9PM	2.7	4.0	4.7	4.7	6.0	6.7	4.8
SEASIDE	4.3	4.0	4.7	4.3	4.3	4.7	4.4
MEAN	4.0	5.1	5.4	5.9	6.5	7.0	5.7
LSD (0.05)	1.9	2.3	1.1	1.1	1.3	1.7	0.8

[1] Visual quality, 1 = dead turf, 5 = acceptable, 9 = excellent

Table 2. Visual ratings for genetic color, spring greenup, seedling vigor and turfgrass density of cultivars in the 1998 NTEP Bentgrass (Fairway/Tee) Cultivar Trial at the N.E. Hansen Research Center, Brookings, S.D., in 1999.

Cultivar	Genetic Color[1]	Spring Greenup[2]	Seedling Vigor[3]	Spring Density[4]	Summer Density
PENNCROSS	4.7	6.0	7.3	5.0	8.3
L-93	5.3	6.0	7.0	5.3	7.3
GRAND PRIX	5.3	5.0	7.0	5.7	7.3
TRUELINE	4.3	5.7	7.7	6.0	7.3
BACKSPIN	4.3	6.0	7.7	6.0	7.7
CENTURY	4.7	5.3	6.0	6.0	8.7
PST-OVN	4.3	4.7	6.0	5.0	7.3
SR 1119	4.7	4.3	5.7	6.0	8.0
IMPERIAL	5.0	5.0	5.7	6.0	8.3
SR 7100	6.3	6.3	6.0	6.7	8.0
ISI AT-5	6.3	5.0	5.3	6.0	8.0
PENN G-6	4.3	4.0	5.7	5.3	8.0
PRINCEVILLE	4.7	6.3	7.7	5.3	7.3
SRX 1120	4.7	4.3	5.3	5.0	7.7
PENNEAGLE	4.3	4.7	6.0	5.0	6.7
PROVIDENCE	4.7	5.7	6.3	6.0	7.7
SRX 7MOBB	7.0	5.7	5.7	6.7	8.3
SRX 7MODD	6.3	5.3	6.0	6.0	7.7
ABT-COL-2	6.0	4.7	6.3	6.0	7.7
PST-9HG	6.7	6.3	5.3	6.7	7.7
SEASIDE II	3.7	4.7	6.3	5.3	6.7
SRX 1BPAA	5.3	5.0	5.3	5.3	7.0
GOLFSTAR	6.0	5.7	5.7	5.3	7.0
TIGER	6.7	5.7	5.7	6.3	7.3
PST-9PM	6.7	5.0	5.0	6.0	7.0
SEASIDE	4.0	5.3	6.0	4.7	5.3
MEAN	5.2	5.3	6.1	5.7	7.5
LSD (0.05)	1.3	NS[5]	1.5	1.6	1.7

[1] Genetic color, 1 to 9, where 9 = darkest green
[2] Spring greenup, 1 to 9, where 1 = dormant and 9 = complete greenup
[3] Seedling vigor, 1 to 9, where 1 = no establishment and 9 = excellent
[4] Density, 1 to 9, where 9 = highest density
[5] Means not significantly different at the 0.05 level

1998 Fineleaf Fescue Cultivar Trial

Leo C. Schleicher

INTRODUCTION

The first, full growing season of this 79 cultivar trial was in 1999 following establishment the previous fall. This trial will test the ability of fineleaf fescues, which include hard fescue, sheep fescue, creeping red fescue, and chewings fescue, to tolerate mowing heights well below their normal range.

The bristle-like leaf texture of these turfgrasses may not provide the strength and density required under golf course fairway conditions. Additionally, the ability to recover from traffic and divot injury may be questionable.

This study is supported by funds from the National Turfgrass Evaluation Program. SDSU is one of 30 official testing sites for this trial.

MATERIALS AND METHODS

Cultivars were seeded 3 Sep 1998 at the N.E. Hansen Research Center near Brookings, S.D., into 1.5 m x 1.5 m plots arranged in a randomized complete block design with three replications. Plots were mowed at 1.6 cm three times per week, irrigated to prevent drought stress, and fertilized each month during the growing season with a total of 146 kg N ha^{-1} yr^{-1}. Cultivars were rated for turfgrass quality, genetic color, spring greenup, seedling vigor, and turfgrass density.

RESULTS AND DISCUSSION

Mean turfgrass quality ratings exceeded 5.0, the minimum acceptable value, for 14 of 79 cultivars (Table 1). Hard fescues and chewings fescues accounted for all 14 cultivars.

The highest rated cultivar value, 5.6, indicates that the quality of fineleaf fescues is poor under fairway conditions, at least in the first year. Strong creeping red fescues accounted for 8 of the 10 poorest rated cultivars when rated for turfgrass quality. September quality ratings, averaged over all cultivars, were higher than other months.

'Salsa', a strong creeping red fescue, was significantly faster in spring greenup than all cultivars except 'PST-EFL' (Table 2). 'SR 6000' rated poorest in spring greenup. 'ASC 172' had extremely poor seedling vigor.

Table 1. Visual ratings for turfgrass quality of cultivars in the 1998 NTEP Fineleaf Fescue Cultivar Trial at the N.E. Hansen Research Center, Brookings, S.D., in 1999.

	Turfgrass Quality[1]						
Cultivar	Apr	May	Jun	Jul	Aug	Sep	Mean
ABT-CHW-2	4.0	5.3	5.3	5.7	6.3	7.0	5.6
ABT-CHW-3	4.7	5.0	5.3	6.0	6.0	6.3	5.6
ABT-HF-4	4.7	5.0	4.0	5.7	6.0	6.3	5.3
AMBASSADOR	4.0	5.3	5.0	5.0	6.0	6.3	5.3
HERON	4.7	4.7	4.0	6.0	6.3	6.0	5.3
OXFORD	5.3	4.0	3.3	5.3	6.3	7.3	5.3
RELIANT II	4.3	4.3	4.0	6.0	6.3	7.0	5.3
SRX 3961	4.7	4.3	3.7	5.7	6.3	7.0	5.3
ABT-CHW-1	4.3	4.7	5.3	4.7	5.7	6.3	5.2
PICK FRC 1-93	4.3	5.0	5.7	4.7	5.3	6.3	5.2
ABT-HF1	4.3	4.3	4.0	5.0	6.0	7.0	5.1
LONGFELLOW II	4.7	4.0	5.0	5.0	6.0	5.7	5.1
PST-4HM	4.7	4.0	4.3	5.0	6.0	6.3	5.1
SHADOW II	4.3	4.3	5.0	5.3	5.0	6.3	5.1
4001	4.0	5.0	4.0	4.7	6.0	6.3	5.0
ASR 049	5.0	4.0	5.3	4.3	5.0	6.3	5.0
BAR SCF 8 FUS3	3.7	4.3	5.0	4.7	5.7	6.7	5.0
BRIDGEPORT	4.3	4.3	5.0	4.7	5.7	6.0	5.0
SCALDIS	5.3	4.7	3.7	5.3	5.3	5.7	5.0
ABT-HF-3	4.3	5.0	4.3	5.0	5.3	5.7	4.9
JAMESTOWN II	4.7	4.3	4.7	4.3	5.3	6.0	4.9
SANDPIPER	4.3	4.0	4.7	5.0	5.7	6.0	4.9
ABT-HF-2	4.7	4.7	4.0	4.7	5.3	5.7	4.8
ACF 092	4.0	4.3	5.0	4.0	5.3	6.0	4.8
BAR HF 8 FUS	4.3	5.3	4.0	4.7	5.0	5.7	4.8
CULOMBRA	4.0	4.3	5.0	4.7	5.0	5.7	4.8
ISI FL 11	4.3	4.3	4.0	5.0	5.3	6.0	4.8
MB-82	4.3	4.7	4.0	4.7	5.3	5.7	4.8
PATHFINDER	5.0	3.0	4.7	5.0	5.3	6.0	4.8
PICK FRC 4-92	5.0	4.0	4.0	5.0	5.0	6.0	4.8
QUATRO	4.3	4.7	3.7	5.0	5.3	5.7	4.8
SR 5100	4.3	4.3	4.7	4.7	5.3	5.7	4.8
ATTILA E	5.0	3.7	3.7	4.7	5.0	6.0	4.7
DAWSON E+	4.3	4.0	4.7	4.0	5.0	6.3	4.7
DEFIANT	4.7	3.7	3.7	5.0	5.0	6.0	4.7
ISI FRR 5	4.7	4.7	4.3	4.0	5.0	5.3	4.7
MINOTAUR	4.0	4.7	4.0	5.3	5.0	5.0	4.7
NORDIC (E)	4.3	3.7	3.7	5.0	5.7	6.0	4.7
SALSA	5.0	3.7	4.3	4.7	5.0	5.3	4.7
SEABREEZE	4.3	3.3	4.3	4.3	5.7	6.3	4.7
ABT-CR-3	4.3	4.3	4.3	4.3	5.0	5.0	4.6
BANNER III	4.0	4.0	5.0	4.3	4.7	5.7	4.6
BRITTANY	4.7	3.3	4.0	4.3	5.3	5.7	4.6

Table 1. (Continued)

	Turfgrass Quality[1]						
Cultivar	Apr	May	Jun	Jul	Aug	Sep	Mean
DISCOVERY	4.0	4.3	3.7	4.3	5.0	6.0	4.6
INTRIGUE	3.3	4.0	4.7	4.3	5.0	6.3	4.6
ISI FL 12	4.0	4.0	4.0	5.0	5.0	5.7	4.6
JASPER II	4.3	4.3	4.7	4.3	5.0	4.7	4.6
MB-63	4.3	4.0	4.0	5.0	4.7	5.3	4.6
PICK FF A-97	4.0	4.0	4.0	5.0	5.0	5.3	4.6
RESCUE 911	4.0	5.0	4.0	4.7	4.7	5.3	4.6
SHADEMASTER II	4.0	4.7	4.3	4.0	5.3	5.3	4.6
AHF 008	4.3	4.7	3.7	4.3	4.7	5.3	4.5
BAR CHF 8 FUS2	4.0	4.7	4.7	4.3	4.7	4.7	4.5
FLORENTINE	4.0	3.7	4.7	4.0	5.3	5.3	4.5
OSPREY	4.3	4.3	3.3	4.7	5.3	5.0	4.5
PST-4MB	4.0	4.3	4.0	5.0	4.7	5.0	4.5
PST-EFL	5.3	3.0	4.3	4.3	5.0	5.0	4.5
SRX 52961	4.7	3.7	4.7	4.3	4.7	5.0	4.5
ABT-CR-2	4.7	4.0	4.7	4.0	4.3	4.7	4.4
BIGHORN	4.0	4.7	3.7	5.0	4.3	5.0	4.4
ISI FRR 7	5.0	3.3	4.3	4.3	4.7	5.0	4.4
MAGIC	4.0	4.7	4.7	4.3	4.0	5.0	4.4
PST-4FR	4.3	4.3	4.0	4.0	4.7	5.0	4.4
TIFFANY	3.7	4.0	4.3	4.0	5.0	5.3	4.4
TREAZURE (E)	3.3	4.7	5.0	3.7	4.7	5.3	4.4
ACF 083	4.3	4.0	4.0	4.3	4.3	5.0	4.3
AHF 009	4.3	4.0	3.3	4.0	5.0	5.0	4.3
BAR CF 8 FUS1	4.0	3.7	4.0	4.3	5.0	4.7	4.3
DGSC 84	5.0	3.3	3.7	4.3	4.7	4.7	4.3
PST-47TCR	4.0	3.3	4.0	3.7	5.0	4.7	4.1
SHADEMARK	5.0	3.0	4.0	3.7	4.3	4.7	4.1
SR 3200	4.0	4.7	3.3	4.0	4.0	4.7	4.1
ASC 087	4.3	3.7	4.3	3.3	4.0	4.3	4.0
COM CREEP RED	5.7	3.0	4.0	2.7	3.7	4.3	3.9
ASC 082	4.3	3.3	3.7	3.7	4.0	4.0	3.8
SRX 52LAV	4.7	3.0	3.3	3.0	4.3	4.0	3.7
BOREAL	4.0	3.7	3.0	2.7	3.7	4.0	3.5
SR 6000	3.3	5.7	4.0	2.7	2.3	3.0	3.5
ASC 172	3.0	2.7	3.7	3.O	3.3	4.0	3.3
MEAN	4.4	4.2	4.2	4.5	5.1	5.5	4.6
LSD (0.05)	1.1	1.2	1.0	1.6	1.6	`1.8	0.9

[1] Visual quality, 1 = dead turf, 5 = acceptable, 9 = excellent

Table 2. Visual ratings for genetic color, spring greenup, seedling vigor and turfgrass density of cultivars in the 1998 NTEP Fineleaf Fescue Cultivar Trial at the N.E. Hansen Research Center, Brookings, S.D., in 1999.

Cultivar	Genetic Color[1]	Spring Greenup[2]	Seedling Vigor[3]	Spring Density[4]	Summer Density
ABT-CHW-2	7.0	5.3	6.3	6.3	6.7
ABT-CHW-3	5.7	6.0	7.7	7.0	6.3
ABT-HF-4	6.0	5.3	8.0	6.3	5.7
AMBASSADOR	6.0	5.0	5.7	6.7	6.3
HERON	5.0	5.3	7.3	7.0	6.0
OXFORD	5.7	6.0	8.0	6.7	5.7
RELIANT II	5.3	5.7	7.3	6.3	5.7
SRX 3961	5.3	5.3	6.7	6.3	5.7
ABT-CHW-1	6.3	5.3	7.3	6.3	6.7
PICK FRC A-93	5.7	6.0	8.0	6.7	6.0
ABT-HF1	5.7	5.7	8.0	6.7	6.3
LONGFELLOW II	6.0	6.7	7.7	6.3	6.3
PST-4HM	5.7	5.3	7.3	6.3	5.7
SHADOW II	5.0	6.3	7.7	5.7	6.0
4001	6.0	5.0	6.0	6.7	6.3
ASR 049	5.7	6.0	8.0	5.7	6.3
BAR SCF 8 FUS3	6.0	5.3	4.3	6.0	5.7
BRIDGEPORT	5.0	6.0	6.7	6.0	5.3
SCALDIS	4.7	5.7	8.7	6.3	5.0
ABT-HF-3	6.3	5.3	6.7	6.0	5.3
JAMESTOWN II	4.7	6.3	8.3	5.3	5.3
SANDPIPER	5.0	5.7	8.0	6.0	6.3
ABT-HF-2	5.3	5.3	6.0	7.0	5.0
ACF 092	5.7	5.0	5.0	6.3	5.3
BAR HF 8 FUS	4.7	5.3	5.0	6.3	5.0
CULOMBRA	6.0	5.3	5.3	5.7	5.3
ISI FL 11	6.7	5.0	6.0	6.3	5.0
MB-82	6.3	5.0	6.7	5.0	5.0
PATHFINDER	5.0	7.0	7.3	4.3	4.7
PICK FRC 4-92	5.3	6.7	8.3	6.7	5.7
QUATRO	4.7	5.7	8.0	7.0	5.3
SR 5100	5.7	5.3	6.3	6.0	5.7
ATTILA E	5.0	5.3	8.0	4.7	5.3
DAWSON E+	5.3	5.7	5.7	5.0	5.3
DEFIANT	5.0	5.7	6.7	6.0	5.0
ISI FRR 5	7.0	6.7	7.3	4.0	4.3
MINOTAUR	5.7	5.0	5.7	5.3	5.0
NORDIC (E)	4.7	6.0	7.7	6.0	5.3
SALSA	4.3	8.0	6.7	4.7	5.3
SEABREEZE	5.3	6.3	7.7	5.0	4.3
ABT-CR-3	6.3	6.7	7.0	5.0	4.7
Banner III	5.3	5.7	6.0	5.7	5.0
BRITTANY	5.3	6.7	8.0	5.7	4.7
DISCOVERY	4.7	5.3	6.3	6.3	4.7

Table 2. (Continued)

Cultivar	Genetic Color[1]	Spring Greenup[2]	Seedling Vigor[3]	Spring Density[4]	Summer Density
INTRIGUE	6.7	4.7	4.0	5.7	5.3
ISI FL 12	5.3	5.0	4.7	6.0	4.7
JASPER II	6.3	6.3	6.3	4.7	5.3
MB-63	5.7	6.7	7.7	5.3	5.0
PICK FF A-97	5.0	5.0	5.0	5.3	5.3
RESCUE 911	6.7	4.7	6.0	6.3	5.7
SHADEMASTER II	6.0	6.0	6.0	4.3	4.3
AHF 008	5.7	5.0	7.3	5.3	4.7
BAR CHF 8 FUS2	6.3	5.7	7.0	6.3	5.0
FLORENTINE	6.0	5.7	6.0	4.3	4.7
OSPREY	5.0	5.3	7.3	6.0	5.0
PST-4MB	5.3	4.7	5.0	5.7	4.3
PST-EFL	6.0	7.3	8.3	4.7	5.0
SRX 52961	5.7	6.3	7.0	4.7	4.7
ABT-CR-2	6.0	6.0	6.7	5.3	4.3
BIGHORN	5.7	5.0	6.3	5.3	5.0
ISI FRR 7	5.7	6.7	9.0	4.3	4.3
MAGIC	6.0	5.3	6.7	6.3	4.7
PST-4FR	7.0	6.3	6.3	4.7	4.7
TIFFANY	5.7	6.0	5.7	6.0	4.7
TREAZURE (E)	5.3	5.0	4.0	6.7	4.7
ACF 083	4.7	5.3	6.3	5.7	5.0
AHF 009	5.7	5.0	6.0	6.0	4.7
BAR CF 8 FUS1	6.7	5.7	5.7	4.7	5.0
DGSC 94	5.0	7.0	8.0	4.0	4.7
PST-47TCR	6.3	6.3	4.7	4.7	4.0
SHADEMARK	5.3	7.0	8.0	4.0	4.0
SR 3200	5.0	5.0	5.7	6.7	4.0
ASC 087	6.3	6.0	5.3	5.0	4.3
COM CREEP RED	3.7	6.3	9.0	4.3	3.7
ASC 082	6.0	5.7	7.0	4.0	4.0
SRX 52LAV	6.0	6.7	6.7	4.0	3.3
BOREAL	5.0	6.7	6.7	4.7	3.7
SR 6000	7.7	3.7	5.7	6.7	3.0
ASC 172	6.3	4.3	2.0	3.7	3.7
MEAN	5.6	5.7	6.6	5.6	5.1
LSD (0.05)	1.3	1.0	2.4	1.1	1.5

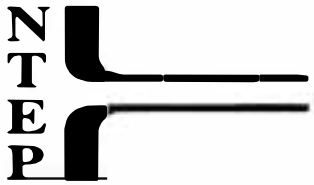
[1] Genetic color, 1 to 9, where 9 = darkest green
[2] Spring greenup, 1 to 9, where 1 = dormant and 9 = complete greenup
[3] Seedling vigor, 1 to 9, where 1 = no establishment and 9 = excellent
[4] Density, 1 to 9, where 9 = highest density

1999 Perennial Ryegrass Cultivar Trial

Leo C. Schleicher

INTRODUCTION

Perennial ryegrass is an excellent turfgrass for use on golf course fairways. Multiple cultivars are oftentimes blended to increase genetic diversity on a site. Use of perennial ryegrass in South Dakota has generally been limited to a small component in mixtures with Kentucky bluegrass and/or fineleaf fescues.



Perennial ryegrass has poor low temperature tolerance compared to most cool-season turfgrass species. Additionally, gray leaf spot disease in perennial ryegrass has reached epidemic proportions in the last few years, mostly in the Midwest and Atlantic States.

This study, consisting of 137 cultivars (Table 1), is supported by funds from the National Turfgrass Evaluation Program. SDSU is one of 30 official testing sites for this trial.

MATERIALS AND METHODS

Cultivars were seeded 15 Sep 1999 at the N.E. Hansen Research Center near Brookings, S.D., into 1.5 m x 1.5 m plots arranged in a randomized complete block design with three replications.

A 18-22-6 starter fertilizer was applied at 49 kg N ha^{-1} at seeding. Plots are mowed at 1.6 cm three times per week, irrigated to prevent drought stress, and fertilized with 25 kg N ha^{-1} each month during the growing season.

Cultivars will be evaluated over a 4-year period for establishment, winter injury, snow mold injury, spring greenup, genetic color, density, and turfgrass quality.

RESULTS AND DISCUSSION

Results of the 2000 growing season will be presented in next year's annual turfgrass research summary.

Table 1. Entries in the 1999 Perennial Ryegrass Cultivar Trial at the N.E. Hansen Research Center near Brookings, SD.

	Entry name	Sponsor		Entry name	Sponsor
1	Calypso II	Roberts Seed Company	29	LTP 98-501	Lebanon Seaboard Corporation
2	Racer	Roberts Seed Company	30	Pennington-11301	Pennington Seed Company
3	Fiesta III	Pickseed West, Inc	31	CIS-PR-69	Cebeco International Seeds
4	Linn	Standard Entry	32	CIS-PR-75	Cebeco International Seeds
5	Buccaneer	Standard Entry	33	CIS-PR-78	Cebeco International Seeds
6	Pick PR 1-94	Pickseed West, Inc	34	CIS-PR-80	Cebeco International Seeds
7	Passport	Roberts Seed Company	35	CIS-PR-84	Cebeco International Seeds
8	Headstart	Roberts Seed Company	36	CIS-PR-85	Cebeco International Seeds
9	LPR 98-143	Deutsche Saatverdelung	37	R8000	The Scotts Company
10	LPR 98-144	Deutsche Saatverdelung	38	Majesty	The Scotts Company
11	YatsuGreen	Nichino Ryokka Co. Ltd	39	Divine	The Scotts Company
12	Secretariat	Grassland West Company	40	Ascend	The Scotts Company
13	Pizzazz	Turf Merchants, Inc	41	Pleasure XL	Ampac Seed Company
14	Promise	Turf Merchants, Inc	42	B1	Ampac Seed Company
15	Paragon	Turf Merchants, Inc	43	APR 1235	Advanta Seeds Pacific, Inc
16	Pick RC2	Pickseed West, Inc	44	APR 1237	Advanta Seeds Pacific, Inc
17	Pick EX2	Pickseed West, Inc	45	Churchill	Lebanon Seaboard Corporation
18	Affinity	Standard Entry	46	Exacta	Lebanon Seaboard Corporation
19	APR 1234	Advanta Seeds Pacific, Inc	47	Affirmed	Lebanon Seaboard Corporation
20	APR 1233	Advanta Seeds Pacific, Inc	48	LTP-ME	Lebanon Seaboard Corporation
21	Koos R-71	Willamette Valley Plant Breeders	49	Barlennium	Barenbrug USA
22	WVPB-R-82	Willamette Valley Plant Breeders	50	BAR 9 B2	Barenbrug USA
23	WVPB-R-84	Willamette Valley Plant Breeders	51	Premier II	Barenbrug USA
24	APR 1236	Smith Seed Services	52	Premier	Standard Entry
25	Nexus	Smith Seed Services	53	JR-187	Simplot Turf and Horticulture
26	DFL-LDD	DLF-Trifolium	54	JR-128	Simplot Turf and Horticulture
27	NJ-6401	Rutgers University	55	JR-317	Simplot Turf and Horticulture
28	Roberts-627	Roberts Seed Company	56	JR-151	Simplot Turf and Horticulture

Entry name	Sponsor	Entry name	Sponsor
57 Edge	Pickseed West, Inc	85 Panther	Independent Seeds
58 Pick PR QH-97	Pickseed West, Inc	86 Seville II	Independent Seeds
59 Pick MDR	Pickseed West, Inc	87 Pennant II	Independent Seeds
60 Pick PRNGS	Pickseed West, Inc	88 DP 17-9496	DLF-Trifolium
61 Pick PR B-97	Pickseed West, Inc	89 DP LP-1	DLF-Trifolium
62 PST-2RT	Pure-Seed Testing, Inc	90 DP 17-9069	DLF-Trifolium
63 PST-2A6B	Pure-Seed Testing, Inc	91 DP 17-9391	DLF-Trifolium
64 PST-2SBE	Pure-Seed Testing, Inc	92 Allsport	LESCO, INC
65 PST-2CRR	Pure-Seed Testing, Inc	93 Line Drive	LESCO, INC
66 PST-2M4	Pure-Seed Testing, Inc	94 Wilmington	LESCO, INC
67 PST-2SLX	Pure-Seed Testing, Inc	95 6011	LESCO, INC
68 PST-2BR	Pure-Seed Testing, Inc	96 AG-P981	LESCO, INC
69 PST-CATS	Pure-Seed Testing, Inc	97 APR 777	Advanta Seeds Pacific, Inc
70 PST-2CRL	Pure-Seed Testing, Inc	98 APR 776	Advanta Seeds Pacific, Inc
71 PST-2LA	Pure-Seed Testing, Inc	99 APR 1231	Advanta Seeds Pacific, Inc
72 Brightstar II	Turf-Seed, Inc	100 APR 1232	Advanta Seeds Pacific, Inc
73 Catalina	Turf-Seed, Inc	101 SRX 4801	Seed Research of Oregon, Inc
74 Manhattan 3	Turf-Seed, Inc	102 SR 4500	Seed Research of Oregon, Inc
75 Charger II	Turf-Seed, Inc	103 SRX 4120	Seed Research of Oregon, Inc
76 Palmer III	Standard Entry	104 SRX 4RHT	Seed Research of Oregon, Inc
77 Phantom	AgriBioTech, Inc	105 Elfkin	Jenks Seed Connection
78 ABT-99-4.339	AgriBioTech, Inc	106 CAS-LP84	ProSeeds, Inc
79 ABT-99-4.464	AgriBioTech, Inc	107 MDP	ProSeeds, Inc
80 ABT-99-4.600	AgriBioTech, Inc	108 EPD	Mountain View Seeds, Ltd
81 ABT-99-4.721	AgriBioTech, Inc	109 EP53	Grassland West Company
82 ABT-99-4.815	AgriBioTech, Inc	110 EP57	Mountain View Seeds, Ltd
83 ABT-99-4.834	AgriBioTech, Inc	111 Skyhawk	Forbes Seed and Grain
84 Cathedral II	Independent Seeds	112 MP58	Jenks Seed Connection

	Entry name	Sponsor		Entry name	Sponsor
113	MP107	Cascade International Seed Company	126	SRX 4820	Seed Research of Oregon, Inc
114	MP103	Cascade International Seed Company	127	ABT-99-4.461	AgriBioTech, Inc
115	MEPY	Jenks Seed Connection	128	ABT-99-4.629	AgriBioTech, Inc
116	ABT-99-4.115	AgriBioTech, Inc	129	ABT-99-4.633	AgriBioTech, Inc
117	ABT-99-4.560	AgriBioTech, Inc	130	ABT-99-4.753	AgriBioTech, Inc
118	ABT-99-4.625	AgriBioTech, Inc	131	ABT-99-4.903	AgriBioTech, Inc
119	ABT-99-4.709	AgriBioTech, Inc	132	Radiant	Independent Seeds
120	ABT-99-4.724	AgriBioTech, Inc	133	Jet	Pennington Seed Company
121	ABT-00-4.960	AgriBioTech, Inc	134	BY-100	Brett Young Seeds, Ltd
122	ABT-99-4.965	AgriBioTech, Inc	135	DLF-3	DLF-Trifolium
123	CIS-PR-72	Mountain View Seeds, Ltd	136	Barefoot	DLF-Trifolium
124	PST-2JH	Pure-Seed Testing, Inc	137	Esquire	DLF-Trifolium
125	PST-2L96	Pure-Seed Testing, Inc			

1997 NCR-192 Low Input Sustainable Turf

Leo C. Schleicher

INTRODUCTION

NCR-192 is an association of turfgrass programs at universities in the North Central Region of the United States. South Dakota State University is a member of NCR-192 and participates in cooperative research projects with the other members. Current NCR-192 research is focused on low input sustainable turf to be used for roadsides, airports, rights-of-ways, or other low utility areas.

Previous NCR-192 research indicated that mowing every other week at 9 cm in height produced better low input turf quality with less weed infestation. Tall fescue and sheep fescue rated higher than other turfgrass species under low input conditions.

The current study includes 14 species or combination of species using tall fescue and/or sheep fescue plus legumes or other turfgrasses. The objective of the study is to evaluate establishment, weed infestation, and sustainable quality with low input.

MATERIALS AND METHODS

Treatments were established by seed in 1.5 m x 1.5 m plots with three replicates on 30 Aug 1997 at the N.E. Hansen Research Center near Brookings, S.D. No fertilizers, pesticides, or supplemental irrigation have been applied since establishment. Plots were mowed at 9 cm in height every other week and were rated on 29 April.

RESULTS AND DISCUSSION

Plots in which sheep fescue was the only turfgrass present had higher weed infestations than other plots (Table 1). Addition of Kentucky bluegrass, tall fescue, or perennial ryegrass to sheep fescue reduced weed infestation. Plots containing tall fescue, with or without other components, had little or no weeds.

The quality of four treatments, including sheep fescue + birdsfoot trefoil, sheep fescue + white clover, sheep fescue + red clover, and tall fescue + birdsfoot trefoil, was considered unacceptable (< 5.0) in 1999. Adding a legume to sheep fescue, when sheep fescue was the only turfgrass component, reduced quality compared to sheep fescue as a monostand. All treatments that were considered acceptable (≥ 5.0) contained tall fescue as a component, except the monostand of sheep fescue.

Table 1. Evaluation of NCR-192 Low Input Sustainable Turf plots for weed infestation and quality on 29 April at the N.E. Hansen Research Center, Brookings, S.D.

Species	Rating	
	Weed infestation[1]	Quality[2]
Sheep fescue/birdsfoot trefoil	20.0	3.0
Sheep fescue/tall fescue/Kentucky bluegrass	0.0	5.3
Tall fescue/birdsfoot trefoil	0.0	5.7
Sheep fescue/tall fescue/white clover	0.0	5.0
Sheep fescue/tall fescue/birdsfoot trefoil	1.7	5.7
Tall fescue/white clover	1.7	4.7
Tall fescue	0.0	5.0
Sheep fescue/tall fescue	3.3	5.3
Sheep fescue/tall fescue/red clover	1.7	5.3
Tall fescue/red clover	3.3	5.7
Tall fescue/creeping red fescue/birdsfoot trefoil/ Perennial ryegrass (roadside mix)	1.7	5.0
Sheep fescue/white clover	16.7	4.7
Sheep fescue	18.3	5.3
Sheep fescue/red clover	25.0	4.0
Mean	6.7	5.1
L.S.D. (0.05)	6.8	0.9

[1] Percent of plot infested by weeds
[2] Visual quality, 1=dead turf, 5=acceptable, 9=excellent

Bi-weekly mowing of low input sustainable turf plots at the N.E. Hansen Research Center near Brookings.

South Dakota Regional Turf Species Evaluation

Leo C. Schleicher

INTRODUCTION

Regional differences affecting turfgrass growth and development, environmental response, and management practices are of great importance in a geographically diverse state like South Dakota.

Establishing turfgrass evaluation sites in northern and western regions of the state is not only important to communities in these areas but it also provides a unique opportunity to observe turfgrass response to different soil types, climates, and environments.

The initial phase of this research will be to evaluate species and cultivars for establishment, winter injury, disease, turfgrass density, and turfgrass quality across three regions: North (Aberdeen), West (Rapid City), and East (Brookings).

Arrowhead CC in Rapid City and Moccasin Creek CC in Aberdeen were selected as evaluation sites for comparing species/cultivars previously established at the N.E. Hansen Research Center near Brookings.

MATERIALS AND METHODS

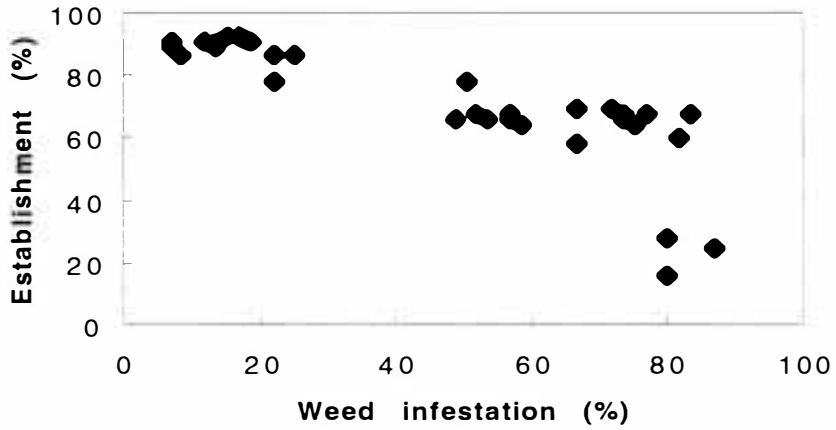
Thirty-three turfgrasses were seeded into 1.5 m x 1.5 m plots with three replicates on 19 April in Aberdeen and 18 May in Rapid City. Turfgrasses included 18 fineleaf fescues, 12 perennial ryegrasses, and 3 Kentucky bluegrasses. A 18-22-6 starter fertilizer was incorporated at 49 kg N ha^{-1} just prior to seeding. Plots were mowed at 1.3-1.9 cm fairway height and irrigated to prevent drought stress. Fertilization consists of a complete fertilizer applied at 49 kg N ha^{-1} in May, late Aug and late Sep.

RESULTS AND DISCUSSION

Establishment of turfgrass in spring is often difficult due to weed competition. Turfgrass species that take longer to germinate and develop a canopy tend to be more susceptible to weed infestation. This was demonstrated at both locations.

In Aberdeen, the slower establishing turfgrass species, Kentucky bluegrass, had significantly higher crabgrass infestation than the faster germinating perennial ryegrass. Establishment rate was negatively correlated with crabrass infestation ($r = 0.80$) (Fig 1). At 37 days after seeding, perennial ryegrasses, fineleaf fescues, and Kentucky bluegrasses averaged 89, 67, and 23% establishment, respectively. Crabgrass infestation averaged 15, 66, and 82% for perennial ryegrasses, fineleaf fescues, and Kentucky bluegrasses, respectively.

Figure 1. Relationship between weed infestation and turfgrass establishment 37 days after seeding on 26 May at Moccasin Creek CC, Aberdeen, S.D.



At Rapid City, the late seeding date (19 May) allowed many different weed species, including highly competitive summer annual weeds, to compete with turfgrass seedlings. As a result, weed pressure was so heavy that ratings were postponed until 2000, when weeds are anticipated to be under control.

Evaluation plots at Moccasin Creek CC in Aberdeen

Table 1. Establishment[1] and crabgrass infestation[2] ratings of 26 May for turfgrasses seeded on 19 April at Moccasin Creek CC, Aberdeen, S.D.

Cultivar	Species	Percent Crabgrass	Establishment
Omni	perennial ryegrass	15.0	93.3
Elka	perennial ryegrass	16.7	93.3
Calypso II	perennial ryegrass	13.3	91.7
Penguin	perennial ryegrass	11.7	91.7
Essence	perennial ryegrass	18.3	91.7
Regal	perennial ryegrass	6.7	91.7
Windstar	perennial ryegrass	6.7	90.0
Sunshine	perennial ryegrass	13.3	90.0
Paragon	perennial ryegrass	21.7	86.7
Laredo	perennial ryegrass	8.3	86.7
LP22	perennial ryegrass	25.0	86.7
Achiever	perennial ryegrass	21.7	78.3
Magic	chewings fescue	50.0	73.3
Dawson E+	slender creeping fineleaf fescue	71.7	70.0
SR 3200	blue fescue	66.7	70.0
Shademaster II	strong creeping fineleaf fescue	56.7	68.3
Discovery	hard fescue	73.3	68.3
ISI Frr 2	chewings fescue	51.7	68.3
ISI Fl 12	hard fescue	73.3	68.3
Seabreeze	slender creeping fineleaf fescue	76.7	68.3
Common Creeping Red	strong creeping fineleaf fescue	73.3	68.3
Boreal	strong creeping fineleaf fescue	83.3	68.3
Jasper II	strong creeping fineleaf fescue	48.3	66.7
ISI Frr 5	strong creeping fineleaf fescue	53.3	66.7
ISI Frr 7	strong creeping fineleaf fescue	56.7	66.7
Quatro	sheep fescue	73.3	66.7
Florentine	strong creeping fineleaf fescue	58.3	65.0
ISI Fl 11	hard fescue	75.0	65.0
Scaldis	hard fescue	81.7	60.0
Bighorn	hard fescue	66.7	58.3
Limousine	Kentucky bluegrass	80.0	28.3
Blacksburg	Kentucky bluegrass	86.7	25.0
Unique	Kentucky bluegrass	80.0	16.7
Mean		48.9	71.2
LSD (0.05)		19.3	10.6

[1] Establishment, 0-100, where 100 = total plot established with desired turfgrass species
[2] Percent crabgrass infestation, 0-100, where 100 = total plot infested with crabgrass

Evaluation of Sun Sedge for Native Landscapes

Martin Maca and Leo Schleicher

INTRODUCTION

Carex inops subsp. *heliophila*, or sun sedge, is an upland perennial sedge with a number of turfgrass-like qualities. Indigenous to South Dakota, sun sedge has a leaf texture similar to turf-type tall fescue, grows to 6-8 inches in height, and is rhizomatous. Additionally, sun sedge has an attractive dark green color. Sun sedge has potential as a mass planting for golf course roughs and for low maintenance areas in native landscapes.

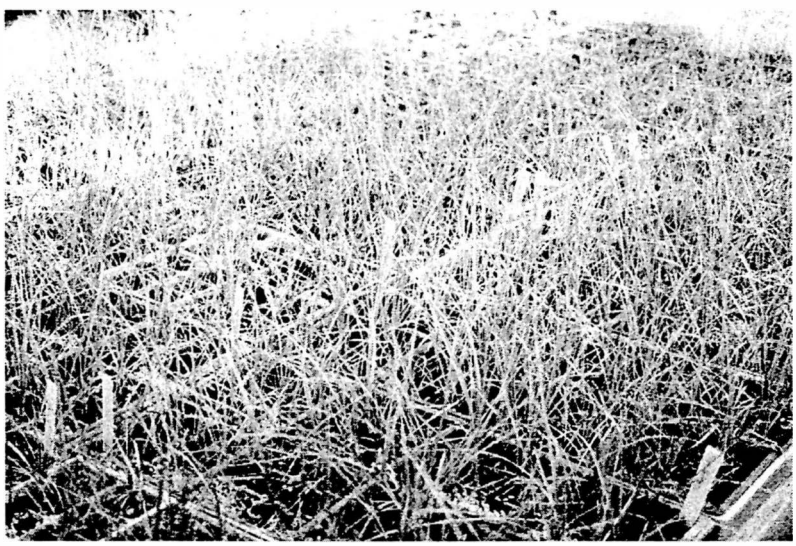
Initial efforts will investigate the ability of sun sedge 1) to form and retain a dense turf following vegetative establishment by plugging, 2) compete with weeds, and 3) survive with little or no maintenance.

MATERIALS AND METHODS

Plant material was collected from an upland site near Wessington, S.D., in 1998, vegetatively propagated in the greenhouse, and observed under greenhouse conditions for one year. The plants were unmowed, received no fertilization, and were watered to prevent drought stress. Clones were propagated in plug flats in fall 1999 for spring field planting in 2000.

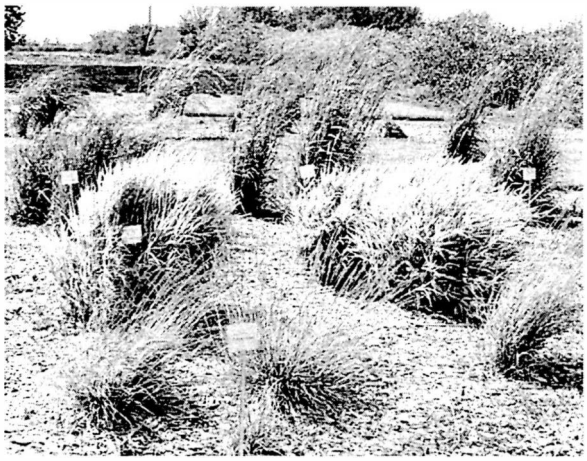
DISCUSSION

Greenhouse results showed that sun sedge formed a dense sward in a favorable greenhouse environment. Canopy density was extremely high under unmowed conditions, and maximum height of the sward was approximately 8 inches. In spring 2000, 1000 sun sedge plants will be plugged on 6-inch centers at the N.E. Hansen Research Center near Brookings, S.D.



Evaluation of Ornamental Grasses for South Dakota

David F. Graper



INTRODUCTION

For living in the middle of the prairie, it makes sense to utilize plants that are best suited to that type of environment – grasses. Ornamental grasses have become much more popular over the last 10 years with many more nurseries carrying them in their inventory. However, many of those that have been introduced into the trade may not be hardy enough to survive our harsh climate

MATERIALS AND METHODS

Thirty-one different species and cultivars were selected from area nurseries for inclusion in an ornamental grass evaluation at the NE Hansen Research Farm. All the selections were established using three plants per bed unless fewer plants were available. Plants will be evaluated for adaptability and ornamental value periodically over the course of the next few years. Plants included in the demonstration were:

Andropogon gerardii	Big Bluestem
Andropogon gerardii 'Pawnee'	Big Bluestem
Bouteloua curtipendula	Sideoats Grama
Bouteloua curtipendula 'Trailway'	Sideoats Grama
Calamagrostis acutiflora 'Overdam'	Feather Reed Grass
Calamagrostis x acutiflora 'Karl Foerster'	Feather Reed Grass
Carex muskingumensis	Sedge Palm
Cortaderia selloana	Pampas Grass pink
Deschampsia caespitosa 'Northern Lights'	Hair Grass
Deschampsia caespitosa viviparia	Tufted Hare Grass
Festuca ovina glauca 'Elijah's Blue'	Blue Fescue
Glyceria maxima 'Variegata'	Variegated Mannagrass
Helictrotrichon sempervirens	Blue Oatgras
Lazula nivea	Snowy Woodrush
Miscanthus sinensis 'Stricta'	Porcupine Grass
Miscanthus sinensis 'Gracillimus'	Maiden Grass
Miscanthus sinensis purpurescns 'Autumn Red'	Maiden Grass
Miscanthus sinensis 'Bluttenwonder'	Japanese Silver Grass
Molinia caerulaea ssp. arundinacea 'Skyracer'	Purple Mooregrass
Panicum virgatum 'Heavy Metal'	Switch Grass
Panicum virgatum 'Prairie Sky'	Switch Grass
Phalaris arundinacea 'Feesey'	Strawberry & Cream
Phalaris arundinacea 'Picta'	Ribbon Grass

Schizachyrium scoparium 'Blaze'	Little Bluestem
Schizachyrium 'The Blues'	Little Bluestem
Sesleria caerulea	Blue Moorgrass
Sorghastrum nutans	Indian Grass
Sorghastrum nutans 'Sioux Blue'	Indian Grass
Spartina pectinata aureo-marginata	Prairie Cordgrass
Sporobolus heterolepis	Prairie Dropseed

DISCUSSION

At this point, only very preliminary data have been collected. In general, most of the grasses have done very well and are now coming into flower. A few that have failed include the *Deschampsia* which seem to be a favorite food of rabbits or some rodent as they are continually chewed off near ground level, the *Lazula* which has died, and the *Cordaderia* and *Carex* which suffered major winter injury.

Recommended Kentucky Bluegrass Cultivars for South Dakota 1999

Leo C. Schleicher

Table 1. Recommended Kentucky bluegrass cultivars for medium to high input in South Dakota that are commercially available in 1999.

Cultivar	Company
Unique	Turf-Seed, Inc.
Blacksburg	Turf-Seed, Inc.
Rambo	Jacklin Seed Company
Allure	International Seeds, Inc.
Limousine	Roberts Seed Company
Seabring	O.M. Scotts & Sons
America	Pickseed West, Inc.
Princeton 105	Loft's Seed, Inc.
SR2000	Seed Research of Oregon, Inc.

Table 2. Recommended Kentucky bluegrass cultivars for low input in South Dakota that are commercially available in 1999.

Cultivar	Company
South Dakota Common	standard cultivar
Baron	standard cultivar
Eagleton	Loft's Seed, Inc.
Caliber	Peterson Seed Company
Baronie	Barenburg USA
Canterbury	Jonathon Green & Sons
Blue Star	Turf Seed & Pennington Seed Co.

Recommended Fineleaf Fescue Cultivars for South Dakota 1999 *

Leo C. Schleicher

Table 1. Recommended Chewings Fescue cultivars for South Dakota that are commercially available in 1999.

Cultivar	Company
Shadow II [2]	Pure Seed Testing, Inc.
Brittany [2]	LESCO, Inc.
Victory II [2]	Pickseed West, Inc.
Tiffany [2]	Turf-Seed, Inc.

Table 2. Recommended Hard Fescue cultivars for South Dakota that are commercially available in 1999.

Cultivar	Company
Discovery [1,2]	Turf-Seed, Inc.
Reliant II [1,2]	Loft's Seed, Inc.
SR3100 [1]	Seed Research of Oregon
Osprey [1,2]	Research Seeds
Defiant [1]	LESCO, Inc.

Table 3. Recommended Strong Creeping Red Fescue cultivars for South Dakota that are commercially available in 1999.

Cultivar	Company
Shademaster II	Turf-Seed, Inc.
Florentine	Pure-Seed Testing, Inc.

Table 4. Recommended Sheep Fescue cultivars for South Dakota that are commercially available in 1999.

Cultivar	Company
Quatro	International Seeds, Inc.

* Based on NTEP Final Report 1994-1997. Cultivars selected by overall performance at 26 sites and performance at Lincoln, Neb., drought tolerance, and shade tolerance.

[1] Superior drought tolerance

[2] Superior shade tolerance

Recommended Perennial Ryegrass Cultivars for South Dakota 1999 *

Leo C. Schleicher

Table 1. Most highly recommended Perennial Ryegrass cultivars for South Dakota that are commercially available in 1999.

Cultivar	Company
Secretariat	Grasslands West
Caddieshack	Medalist America
Prizm	Zajac Performance Seeds
Manhattan 3	Manhattan Rye Growers Assoc.
Catalina	Pure-Seed Testing, Inc.

Table 2. Highly recommended Perennial Ryegrass cultivars for South Dakota that are commercially available in 1999.

Cultivar	Company
Palmer III	Loft's Seed, Inc.
Premier II	Barenbrug USA
Line Drive	LESCO, Inc.

* Based on NTEP Final Report 1995-1998. Cultivars selected by overall performance at 30 sites at Lincoln, Neb., and Madison, Wis., for gray leaf spot, pink snow mold resistance, and winter kill.