1996 TURFGRASS RESEARCH

Report of Progress 765

Agricultural Experiment Station, Kansas State University, Marc A. Johnson, Director

FOREWORD

Results of the 1994 Kansas Turfgrass Survey were released in 1995 and documented the importance of this industry to the state's economy. Some survey highlights:

- ➡ Kansas has 1,149,400 acres of turfgrass, sixth behind wheat, sorghum, hay, corn, and soybeans.
- ➡ The turf industry spent $77 million on payroll and benefits to 11,270 employees.
- ➡ Golf courses accounted for 28% of payroll and benefits in the turf industry.
- ➡ Total turf maintenance expenditures were $311 million, 64% of which was spent on home lawns.
- ➡ The value of all equipment used for turf maintenance totaled $585 million.

This information will be valuable as we promote the turfgrass industry and discuss the importance of research to improve the quality of turfgrass in Kansas. If you did not receive a copy of the 1994 Turfgrass Survey and would like one, please contact Christy Nagel at (913) 532-6173.

Professor Larry Leuthold has announced that he will retire as State Extension Turfgrass Specialist as of July 1, 1996. Larry has been on staff at K-State since 1966 and has dedicated 30 years of his career to serving the turfgrass industry in the state of Kansas. He is recognized throughout the Midwest as a true leader in the horticulture industry. Larry will be missed in the day-to-day operations of the turf program, and we wish him well in his retirement.

As this report is being prepared, we look forward to several personnel changes in the turfgrass program at K-State. **Dr. Steven Keeley** recently accepted the position as Extension Turfgrass Specialist. Steve recently completed a Ph.D. at Colorado State University, and will join our program in August. In addition to his strong academic background, Steve has work experience in the lawn care and golf course industries, and we look forward to his arrival.

Also joining the program this summer will be **Dr. Bingru Huang.** Bingru is doing postdoctoral research at the University of Georgia in Griffin. She is a turfgrass stress physiologist and will complement our applied field work with some much-needed basic research information.

This research summary presents results that address common problems associated with turfgrass management in Kansas. These projects are conducted using a team approach, which includes the K-State faculty and the Kansas turfgrass industry. As always, we appreciate your input and suggestions as we prepare research strategies for the coming years.

The K-State Turf Group

Personnel Associated with the K-State Turfgrass Program

Mike Daratt	Farmer II, Horticulture Research Center, Wichita
Jack Fry	Associate Professor of Horticulture, Turfgrass Research & Teaching
Hongfei Jiang	Ph.D. candidate - Horticulture
Larry Leuthold	Professor of Horticulture, Extension Turfgrass Specialist
Christy Nagel	Extension Horticulture Secretary
Kiranmai Nandivada	M.S. Student, Turfgrass
John Pair	Professor of Horticulture, Horticulture Research Center, Wichita
Yaling Qian	Former Ph.D. Student, presently Assistant Research Scientist, Texas A & M University, Dallas
Michael Shelton	Plant Research Technician II, Horticulture Research Center, Wichita
Ned Tisserat	Associate Professor of Plant Pathology, Plant Pathology Extension and Research
Ward Upham	Turfgrass Research Assistant
Tom Warner	Professor and Head, Department of Horticulture, Forestry, and Recreation Resources
Henry Wetzel	Ph.D. Candidate, Plant Pathology
Steve Wiest	Associate Professor of Horticulture, Plant Stress Research

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TITLE: Variability in Turfgrass Evapotranspiration on a Golf Course

OBJECTIVE: To measure the extent of variability in water demand across a golf course

PERSONNEL: Hongfei Jiang, Jack Fry, and Steve Wiest

SPONSORS: Heart of America Golf Course Superintendent's Association, Kansas Golf Course Superintendent's Association, Kansas Golf Association

COOPERATOR: Mr. Cliff Dipman, Golf Course Superintendent, Manhattan Country Club

INTRODUCTION:

Quality of water management on golf courses varies greatly. Some courses have dated irrigation systems (or none at all) that do a poor job of delivering appropriate amounts of water where needed. Courses with relatively new irrigation systems often have a weather station on site that generates data for use in estimating turf evapotranspiration (ET) empirically. Common sense suggests that ET can vary greatly within a geographic region, because environment is the driving force for ET. However, little is known about the extent to which ET can vary on a specific site. Irrigation amounts typically are based upon a model generated from weather station data, but ET could be significantly lower or higher at other locations on the course. Information is needed on how extensive this variability can be.

The black Bellani plate atmometer provides a relatively accurate estimate of turf ET under well-watered conditions. Others have successfully used the Bellani plate to measure variability in a pasture with irregular terrain. Similarly, several plates could be distributed over a golf course to measure variability in water demand and accuracy of empirical models that generate ET information from one particular site where the weather station is located.

MATERIALS AND METHODS:

Five boxes, each holding two Bellani plates and respective water reservoirs, were placed on tees 3, 5, 7, 18, and near the weather station at the Manhattan Country Club in 1995. The locations differed in elevation, wind direction, and other factors. Boxes were mounted on poles so that plate surfaces were supported about 1 meter above the ground. Evaporation from each Bellani plate was measured on 19 precipitation-free days using a mass balance method. Evaporation from plates at the weather station was compared to that from plates at the four tees.

RESULTS:

Evaporation from plates located near the weather station was 8 to 19% higher than that at any other location on the golf course (Table 1). Turf under and surrounding the weather station site is thin and nonirrigated, likely resulting in higher air temperatures. Evaporation from plates on tees 3, 5, and 18 was not significantly different. Evaporation at tee 7 was at least 8% lower than that on any of the other tees. Tee 7 is surrounded by trees and shrubs, which limited wind movement and shaded the area, resulting in lower evaporation. Results confirm that water demand can vary significantly across a golf course. If the area where the weather station is located is not irrigated, ET estimates produced from weather station data can be higher than actual turf ET. Weather data-generated ET information should be used as a guide for irrigation, realizing that various microclimates may require more or less water than predicted. Additional locations will be evaluated in 1996.

Table 1. Bellani plate evaporation at selected locations at the Manhattan Country Club in 1995.

Belani Plate Location	Evaporation (mm/day)*
Weather station	11.3 a**
Tee no. 3	10.0 b
Tee no. 5	10.2 b
Tee no. 7	8.4 c
Tee no. 18	10.0 b

* Mean Bellani plate evaporation from 19 days.

** Means followed by the same letter are not significantly different ($P < 0.05$).

TITLE: Irrigation Practices and Their Effects on Disease and Weed Incidence in a Perennial Ryegrass Fairway

OBJECTIVES: To compare two irrigation regimes on a perennial ryegrass fairway for effects on disease incidence and weed infestation. Secondary objectives are to determine water savings afforded by monitoring water need and evaluate total pesticide requirements using preventive and curative programs within each irrigation regime.

PERSONNEL: Hongfei Jiang, Jack Fry, and Ned Tisserat

SPONSORS: Heart of America Golf Course Superintendent's Association, Kansas Golf Course Superintendent's Association, Kansas Golf Association

INTRODUCTION:

The 1994 Kansas turfgrass survey indicated that water was the greatest concern of golf course superintendents in the state. Golf course managers often face public scrutiny because of high summer water usage during peak demand periods in urban areas and fear of potential health and environmental problems posed by pesticide application. Water officials from Johnson County, Kansas and the Wichita Public Works Department report that golf courses account for 2 to 5% of water used during peak demand periods in summer. Consequently, golf courses have been provided a water budget based upon mean water usage and pay significant fines if total water use exceeds the budgeted allotment. The potential influence of irrigation management on environmental issues related to golf course turf is underestimated. Irrigation influences disease incidence and fungicide requirements; weed encroachment and herbicide requirements; and clipping production and mowing requirements. More data are needed on the influence of irrigation management on turfgrass pest problems.

MATERIALS AND METHODS:

This experiment was conducted at the Rocky Ford KSU Turfgrass Research Center. Two irrigation regimes, three herbicide treatments, and three fungicide treatments were arranged in a split-split plot design. Soil was a silt loam (fine, montmorillonitic, mesic Aquic Arquidolls). Irrigation treatments (whole plots) were i) daily application of 0.3 inches water and ii) irrigation to replace 80 to 100% of atmometer-estimated evapotranspiration (ET) on 3 days weekly. Irrigation whole plots measured 6 X 12 m. Mean weekly irrigation amounts were determined using collection cups to determine irrigation output. Time required to deliver the desired amount of water then was calculated. Irrigation treatments began on 11 July and ended on 11 September. Herbicide treatments (subplots) were i) preventive spring application of dithiopyr at 0.5 lb. a.i./a on 15 April and ii) curative postemergence herbicide application of fenoxaprop-ethyl (Acclaiim) at 0.38 lbs a.i./a plus 2,4-D + MCPP + Dicamba (Trimec Classic) on 20 July. Herbicide subplots measured 2 X 12 m.

Fungicide treatments (sub-subplots) were i) preventive applications of flutolanil (Prostar) at 2 oz product/1,000 sq ft for brown patch suppression on 9 June, 12 July, 3 August, and 27

August and metalaxyl (Subdue) for pythium control at 2 fl oz product/1,000 sq ft on 26 July and 11 August; ii) curative application of aforementioned fungicides when disease was observed as active; and iii) untreated. Fungicide sub-subplots measured 2 X 4 m.

Data collection:

a) Weed infestation: Weed density was determined once weekly (eight dates) by randomly dropping a 30 by 30-cm template at three locations in each sub-subplot. The numbers of grassy and broadleaf weeds in the template area were counted.
b) Disease infestation: Brown patch incidence was rated in each sub-subplot weekly (eight dates) using a visual estimate of percent infestation. Leaf spot also appeared in plots in late summer.
c) Clipping collection: Clippings were collected weekly by making one lengthwise pass in each sub-subplot with a push-type reel mower. Clippings were dried and weighed..
d) Turf quality: Visual turf quality was rated on three occasions during the study period in each sub-subplot.
e) Total water applied. Irrigation treatments were compared to determine water saved by monitoring ET. Depth of water (cm) applied weekly was determined from irrigation run times.
f) Total pesticide applied. Pesticide need as influenced by irrigation treatment was determined. Number of pesticide applications and total amount of active ingredient were determined.

Analysis of variance and single degree of freedom contrasts were used to determine treatment effects.

RESULTS:

A total of 18.6 inches of water was applied to daily irrigated turf, whereas turf irrigated to replace ET received 6.2 inches. Total active ingredient applied in the preventive program was 14.1 lbs a.i./a, whereas 14.0 lbs a.i./a was applied in the curative program. Hence, in this situation, there was no real environmental advantage of applying pesticides curatively vs. preventively (without considering chemical properties of pesticides used). Where the potential for weed or disease infestation is lower, a curative program might have an advantage in this regard. Furthermore, curative applications often are made to localized areas that would reduce the total amount of pesticide required compared to a blanket application that might be used in a preventive program.

Better turf quality and 9% less disease were observed in perennial ryegrass irrigated daily (Table 1). Daily irrigation reduced disease regardless of fungicide treatment (Figs. 1 to 3). Over irrigation usually is related to greater disease. Turf in plots irrigated to replace ET often exhibited some wilt during midday when temperatures were over 80 F. Infected plants in daily irrigated plots seemed less likely to die than those in plots irrigated to replace ET.

Greater disease (primarily leaf spot) was observed in plots that received the curative herbicide treatment (fexoxaprop plus 2,4-D + dicamba + mecoprop). Research in Texas also has suggested that phenoxy herbicides can predispose plants to leaf spot infection.

Fungicides reduced diseased area by about 13% (Table 1). About 3% greater disease occurred where a curative fungicide treatment was used vs. a preventive treatment. This is not unusual, for some degree of infestation must be present before the need for a curative treatment is recognized.

These results suggest that daily irrigation or fungicides can be used to suppress brown patch and leaf spot diseases on perennial ryegrass fairways. Least disease occurred in daily irrigated plots treated preventively with fungicides. In these studies, only excessive irrigation (0.3 inches per day) was evaluated. More work is required to evaluate daily irrigation to replace ET and resulting effects on disease. Daily irrigation has detriments that were not evaluated, including the potential for reduced turfgrass rooting, inability of the plant to effectively acclimate to drought conditions, and greater soil compaction. This work will continue in 1996.

Table 1. Effect of irrigation and curative and preventive herbicide and fungicide treatments on ryegrass turf response and pest incidence.

Contrast	Turf Quality (0 to 9)	Clipping Weight (g/m^2)	Disease (% of Plot Area)	Broadleaf Weeds (no./m^2)	Crabgrass (no./ m^2)
Daily irrigation vs.	8.3	1.6	11.7	3.8	3.7
Irrigation to replace ET	7.5*	1.1	20.9*	3.0	5.6
Nontreated vs.	8.0	1.6	14.3	6.1	11.6
Herbicide - treated	7.8	1.2	17.3	2.1*	1.2
Herbicide curative vs.	7.5	1.0	20.6	1.3	1.0
Herbicide preventive	8.1**	1.5	14.0**	2.8	1.4
Nontreated vs.	7.6	1.2	25.0	2.7	4.4
Fungicide-treated	8.0***	1.4	11.9***	3.7	4.7
Fungicide curative vs.	8.0	1.3	13.7	2.9	4.9
Fungicide preventive	8.0	1.6	10.2*	4.6**	4.6

*, **, *** Treatments significantly different at $P < 0.10$, 0.05, and 0.01, respectively.

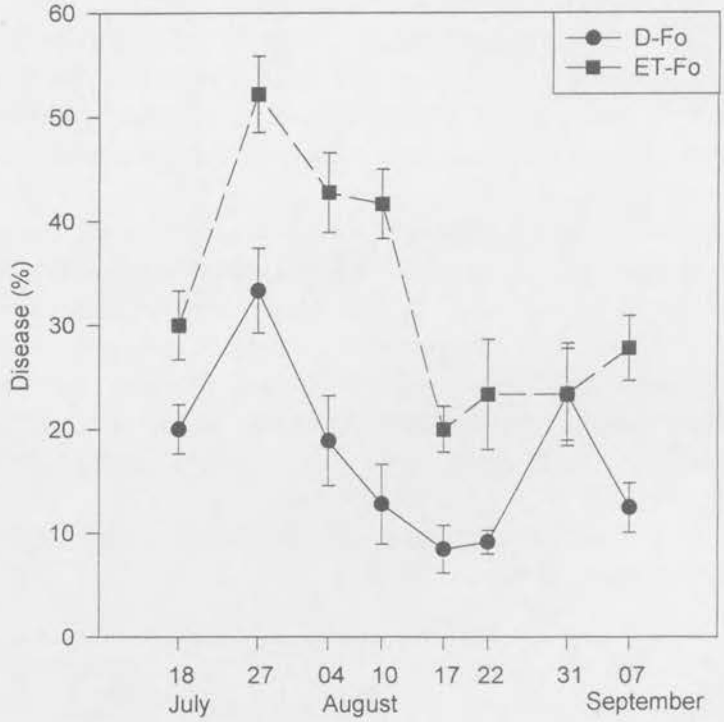


Figure 1. Influence of daily irrigation (0.3 inches) and irrigation to replace ET on disease incidence in a perennial ryegrass fairway receiving no fungicides.

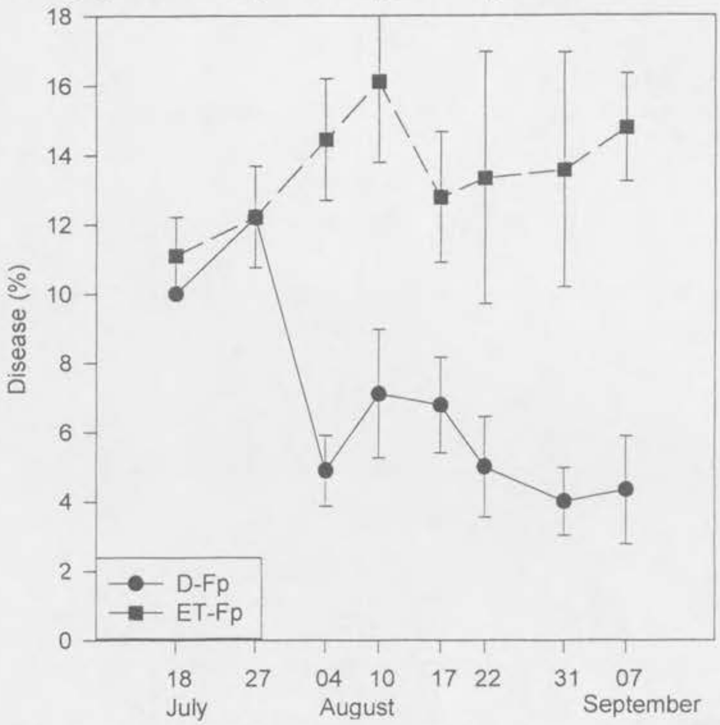


Figure 2. Influence of daily irrigation (0.3 inches) and irrigation to replace ET on disease incidence in a perennial ryegrass fairway receiving preventive fungicide treatments.

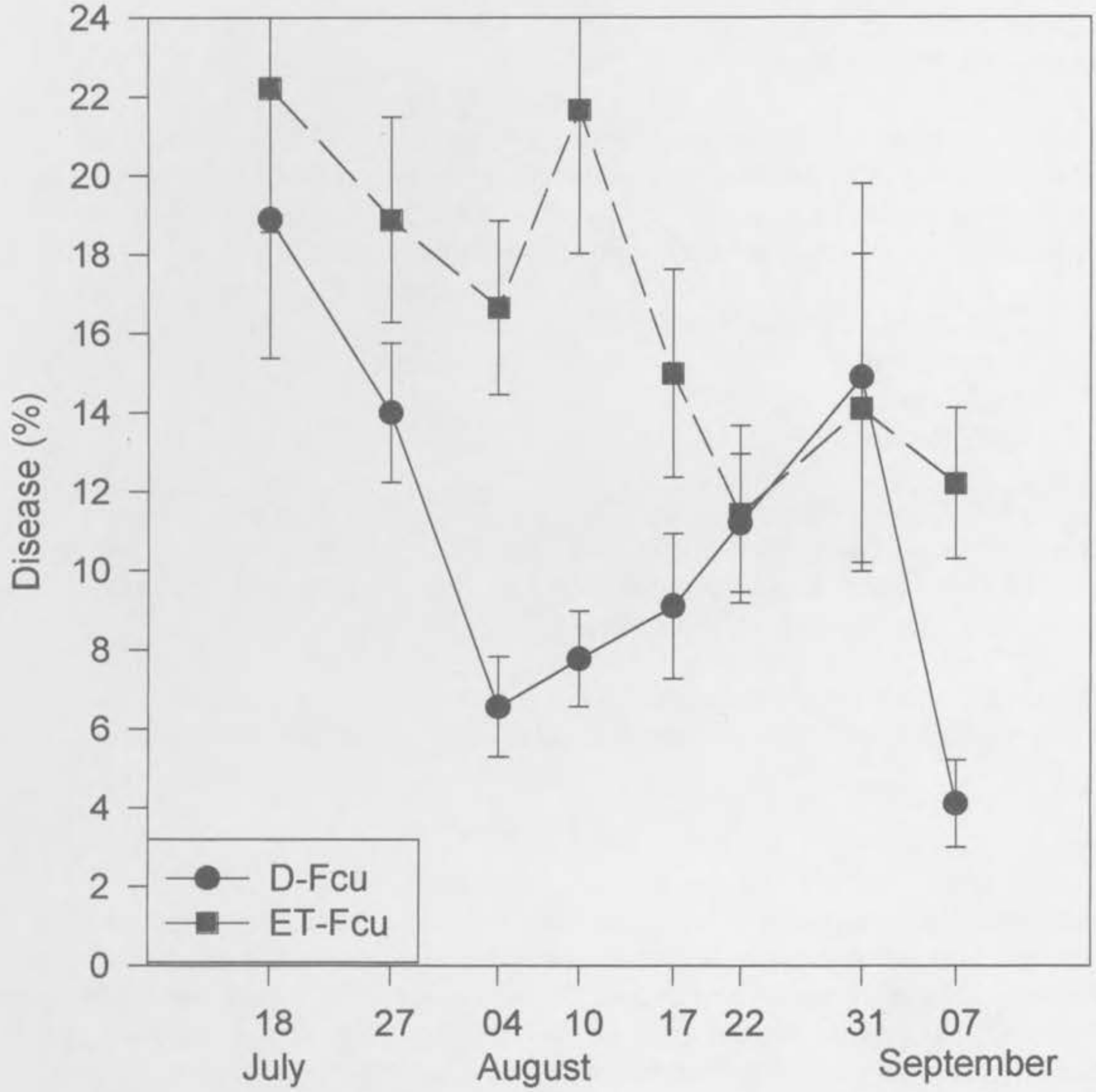


Figure 3. Influence of daily irrigation (0.3 inches) and irrigation to replace ET on disease incidence in a perennial ryegrass fairway receiving curative fungicide treatments.

TITLE: Comparison of Various Fertilizers on Turf Type Tall Fescue

OBJECTIVE: To compare AgricoTurf plus AgrotaiN fertilizer with other conventional turf formulations on tall fescue

PERSONNEL: John C. Pair

SPONSOR: IMC Fertilizer, Inc.

MATERIALS AND METHODS:

Turf type Marksman tall fescue was established in the fall of 1993. A conventional program of 4 lbs N/1,000 sq ft per season was initiated with applications of 1 lb N/1,000 sq ft applied four times per year: 1) September, 2) November, 3) late April, and 4) mid June. The applications made on June 6 consisted of the following treatments (all at 1 lb actual N/1,000):

1) AgricoTurf + AgrotaiN (46-0-0)
2) Nutralene (40-0-0)
3) Sulfur-coated urea (39-0-0)
4) urea (46-0-0)

Treatments began in 1994 and continued through 1995. AgricoTurf plus AgrotaiN was substituted in 1995 for the AgricoTurf used in 1994. Ratings were taken on color, overall turf quality and incidence of Rhizoctonia brown patch disease. Ratings were based on a scale of 0 to 9 with 9 = best color, visual quality and least disease.

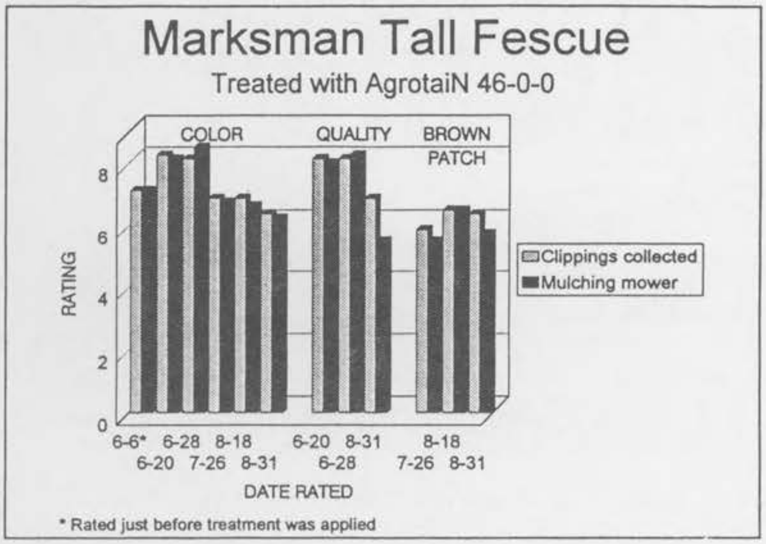
The treatments were arranged in a split plot arrangement with four replications each under two mowing regimes: 1) clippings collected and 2) clippings returned via a mulching mower.

RESULTS:

Initial responses to AgricoTurf plus AgrotaiN in terms of color and visual quality were similar to those to urea and more immediate than those to the slower release forms Nutralene and sulfur-coated urea. In early summer through June 28, there was a slight improvement in plots of every treatment where clippings were returned, which was attributed to some residual nitrogen returned compared to plots where clippings were collected. Although not consistent with every observation, that trend generally continued through August. By the end of August, color was slightly better in plots with Nutralene and sulfur-coated urea (both slow-release forms), but plots with AgricoTurf plus AgrotaiN had slightly better color than urea plots (Figures 1 and 2).

Brown patch appeared in late June and continued to affect turf quality throughout the entire summer because of unusually high humidity through July and August. Where clippings were collected, the plots treated with AgricoTurf plus AgrotaiN and sulfur-coated urea had less brown patch by the end of August. However, where clippings were returned, the plots treated with urea were best.

Turf quality was affected noteceably by the incidence of brown patch (more so than in 1994), but nevertheless most plots recovered satisfactorily by cooler weather in September. Although color is considered a component of quality, it was rated separately as a single, distinguishable trait affected primarily by nitrogen release. By the end of the season, color was better in Nutralene- and sulfur-coated urea-treated plots, but actual turf quality, where clippings were collected on August 31, was highest in AgricoTurf plus AgrotaiN- and sulfur-coated urea-treated plots. With clippings returned, brown patch actually was worse where the slower release forms Nutralene and sulfur-coated urea were applied versus the more soluble forms AgricoTurf plus AgrotaiN and urea, but the differences were not large. This may be attributed partially to a continual release of nitrogen during hot weather, but brown patch invaded virtually every plot to a considerable extent. Perhaps rate and timing of these products should be examined in the future.



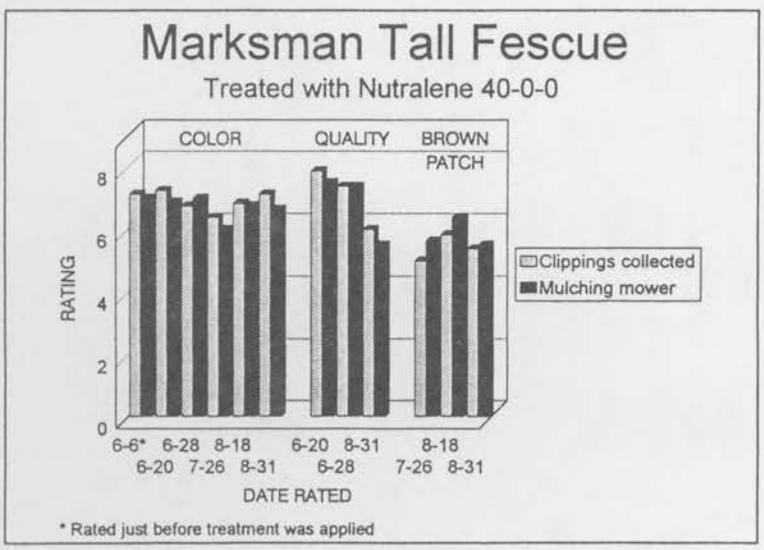
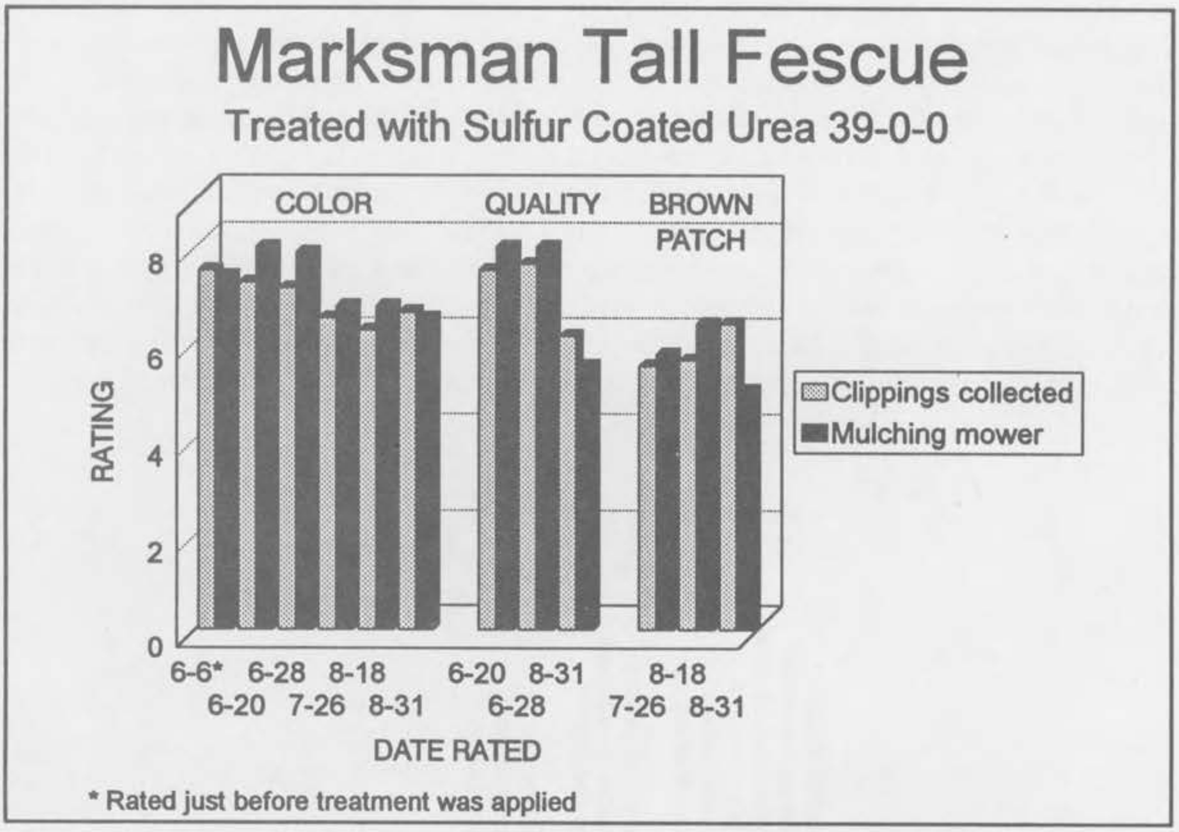


Figure 1. Response of tall fecue to AgrotaiN and Nutralene fertilizers.



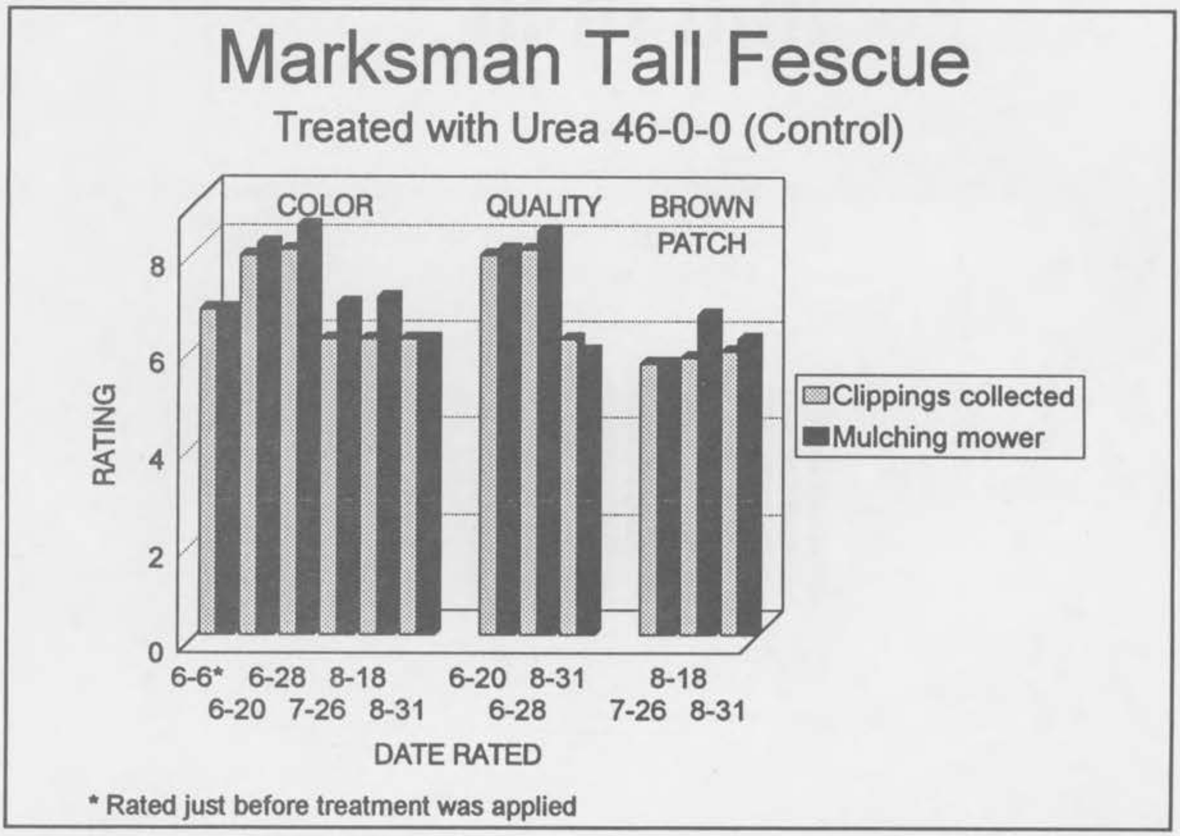


Figure 2. Response of tall fescue to sulfur-coated urea and urea fertilizers.

TITLE: Genetic Diversity in *Ophiosphaerella herpotricha*, a Cause of Spring Dead Spot of Bermudagrass

OBJECTIVE: To assess the genetic diversity of this fungus through the use of the molecular biology techniques.

PERSONNEL: H.C. Wetzel and N.A. Tisserat

INTRODUCTION:

Spring dead spot (SDS) of bermudagrass is caused by the fungus *Ophiosphaerella herpotricha*. Classical microbiological methods have failed to reveal the reproductive biology of this organism. This study is using molecular biology techniques to determine whether or not populations of this fungus are clonal (i.e., identical) or variable on a spatial scale such as from fairway to fairway on the same golf course or from golf course to golf course within a region.

MATERIALS AND METHODS:

Numerous turfgrass samples were collected from three golf courses: Independence G.C. in Southeast Kansas and South Lakes G.C. and Shangri-La G.C. in Northeast Oklahoma. Bermudagrass roots exhibiting the presence of darkly pigmented ectotrophic runner hyphae were washed, surface sterilized, and plated on a selective medium. Cultures exhibiting *O. herpotricha* colony morphology then were transferred to liquid media in preparation for the isolation of the genetic information (DNA) from the isolate. The DNA then was extracted, and isolate identity was confirmed with specific polymerase chain reaction (PCR) primers for *O. herpotricha* and *O. korrae*. *Ophiosphaerella korrae* is the primary agent of SDS in the eastern United States, and we are also interested in documenting whether it occurs with *O. herpotricha*. Once isolates are identified through PCR, an additional set of PCR primers developed from a DNA library of *O. herpotricha* then will be implemented to assess the similarities and differences among the *O. herpotricha* isolates.

RESULTS:

Isolates from South Lakes G.C. and Shangri-La G.C. have been processed thus far. All isolates from South Lakes G.C. appear to be *O. herpotricha*. The majority of the isolates from Shangri-La G.C. are *O. herpotricha*; however, five isolates of *O. korrae* and one isolate of *Leptosphaeria narmari* have been recovered from this course. *Leptosphaeria narmari* is reported as the primary agent of SDS in Australia. Our finding is the first report of this species in North America. We plan on intensively resampling Shangri-La G.C. this spring to see if we can detect any shifts in the populations from one species to another.

Currently, data are being assessed for genetic diversity among the Shangri-La G.C. isolates.

TITLE: Effects of Summer Aerification, Verticutting, and Sod Stripping on Severity of Spring Dead Spot of Bermudagrass

OBJECTIVE: To determine whether spring dead spot of bermudagrass can be controlled or reduced in severity by verticutting, slicing, or stripping in midsummer

PERSONNEL: Ned Tisserat and Jack Fry

INTRODUCTION:

Spring dead spot (SDS), caused by the root-infecting fungus *Ophiospharella herpotricha*, is a debilitating disease of bermudagrass that reduces turf quality. We evaluated summer vertical mowing, aerification, aerfication plus vertical mowing, and sod stripping for effects on suppressing SDS.

MATERIALS AND METHODS:

Treatments were imposed on Midlawn bermudagrass during the summers of 1993, 1994, and 1995. Treatments included: 1) aerification in two directions (hollow tines 2 inches deep) with a Ryan Greensaire; 2) vertislicing in two directions with a standard vertical mower (blades to penetrate turf about 1 inch deep); 3) aerification and verticutting; 4) stripping the plots; and 5) untreated. Treatments were arranged in a randomized complete block design and were applied in June, 1993 and June and August 1994 and 1995.

RESULTS:

Spring dead spot severity has declined steadily in all treatements since the first year. This indicates that the pathogen is less aggressive and/or the environmental conditions suitable for the disease were optimum in the first year. Stripping (harvesting) sod and allowing regrowth reduced plot damage by 15% in 1994 and eliminated symptoms in 1995. This is not a practical solution to reducing disease severity, but indicates that new bermudagrass arising from in-ground rhizomes does not exhibit SDS symptoms in the first year. Aerification plus vertical mowing reduced plot damage by SDS by 14% and improved turf quality in spring, 1995. Aerification and vertical mowing alone had little effect on SDS symptoms. Intensive aerification and vertical mowing are recommended to suppress SDS.

TITLE: Preventive Fall Fungicide Applications for Control of Rhizoctonia Large Patch Disease of Zoysiagrass

OBJECTIVE: To determine whether fall fungicide applications help suppress development of large patch of zoysiagrass caused by *Rhizoctonia solani*

PERSONNEL: Ned Tisserat

SPONSORS: Ciba, PBI Gordon, Rhone Poulenc, AgrEvo, Bayer, Rhom & Hass, Sandoz, Zeneca, Heart of America Golf Course Superintedent's Association, Kansas Golf Course Superintendent's Association, and the Kansas Turfgrass Foundation.

MATERIALS AND METHODS:

A section of zoysiagrass 'Meyer' at the Highlands Golf Course in Hutchinson, KS was used for the experiment. Fungicides were applied on 27 September 1995. Plots were placed in a fairway with a history of large patch, although no symptoms of the disease were apparent at the time of fungicide application. Individual plots were 10 X 12 feet and replicated three times. Fungicides were applied in 2 liters of water/120 sq ft at 30 psi with 8003 flat-fan nozzles using a CO_2 backpack sprayer. Plots were not watered immediately after fungicide application.

RESULTS:

The fall of 1995 was very dry, and large patch was not evident before the zoysiagrass went dormant. The winter also was very dry and cold. As a result, the turfgrass was slow to break winter dormancy (approximately 2 weeks later than normal). Large patch severity at the time of rating (1 May 1996) was considered to be moderate to light. Nevertheless, nontreated plots averaged 28% of the plot area damaged. No evidence was seen of active colonization of the turfgrass by the fungus, suggesting that most turf damage was a result of late fall infection.

Several fungicides significantly reduced severity of large patch (Table 1). Plots treated with Prostar, Lynx, Heritage, Sentinel, Bayleton, Penstar, or Banner plus Medallion had little or no large patch. Plots treated with Sentinel appeared to be slower to break winter dormancy and were slightly off-color (lighter green). Results for the past several years indicate that a preventive fungicide treatment in the fall is effective in suppressing both fall and early spring symptoms of patch.

Table 1. Preventive fungicide applications for control of large patch of zoysiagrass, 1995-1996.

Treatment*	Rate	% Plot Area Damaged**
Prostar 50WP	3 oz	0.0 a
Lynx 25DF	1 oz	0.0 a
Heritage 50WP	0.4 oz	0.0 a
Sentinel 40WG	0.25 oz	0.0 a
Bayleton 25 DF	2 oz	1.0 ab
Penstar 75 WP	8 oz	1.0 ab
Banner 1.2MC plus Medallion 75WG	2 fl oz + 0.5 oz	3.3 abc
Medallion 75WG	0.5 oz	6.0 abcd
Eagle 40W + Fore 80WP	0.6 oz + 6 oz	6.3 bcde
Banner 1.2MC	2 fl oz	11.7 def
Chipco 26019 50DG	4 oz	13.3 cdef
Polyoxorim 2.2WP	4 oz	21.7 efg
Polyoxorim 11.25DF	0.8 oz	26.7 fg
No fungicide		28.3 g

* Fungicide application on 6 Nov 95

** Ratings taken on 14 Mar 96. Percentage data were given an arcsine square root tranformation for analysis and backtransformed for presentation. Means not followed by the same letter are significantly different ($\underline{P}$= 0.05)

TITLE: Preventive Fall Fungicide Applications for Control of Yellow Patch of Bentgrass

OBJECTIVE: To determine whether fall fungicide applications help suppress development of yellow patch of bentgrass caused by *Rhizoctonia cerealis*

PERSONNEL: Ned Tisserat

SPONSORS: Ciba, PBI Gordon, Rhone Poulenc, AgrEvo, Bayer, Rhom & Hass, Zeneca, Heart of America Golf Course Superintedent's Association, Kansas Golf Course Superintendent's Association, and the Kansas Turfgrass Foundation.

MATERIALS AND METHODS:

A section of Cohansey bentgrass at the Orchards Golf Course in Lawrence, KS was used for the experiment. Fungicides were applied on 6 Nov 95. Symptoms of yellow patch were just beginning to appear on the golf course at the time of fungicide application. Individual plots were 5 X 6 feet and replicated four times. Fungicides were applied in 2 liters of water/120 sq ft at 30 psi with 8003 flat-fan nozzles using a CO_2 backpack sprayer. Plots were not watered in after fungicide application.

RESULTS:

The fall of 1995 was very mild and dry. Yellow patch severity at the time of fungicide applications was minimal. Winter conditions following fungicide applications were relatively cold and extremely dry. Nevertheless, a moderate amount of yellow patch was present in early March. Symptoms continued through March.

All fungicide applications significantly reduced the % area of turf in each plot damaged by the yellow patch fungus. No phytotoxicity was noted on any of the fungicide-treated plots.

Table 1. Preventive fungicide applications for control of yellow patch on bentgrass, 1995-1996.

Treatment*	Rate	% Plot Area Damaged**
No fungicide		31.3 e
Banner 1.2MC	2 fl oz	13.3 d
Medallion 75WG	0.5 oz	1.3 ab
Banner plus Medallion	2 fl oz + 0.5 oz	5.6 bcd
Polyoxorim 2.2WP	4 oz	0.0 a
Polyoxorim 11.25DF	0.8 oz	0.0 a
Chipco 26019 50DG	4 oz	0.0 a
Prostar 50WP	3 oz	0.8 ab
Lynx 25DF	1 oz	3.3 abc
Bayleton 25DF	2 oz	3.8 abc
Eagle 40W + Fore 80WP	0.6 oz + 6 oz	10.0 cd
RH 0611 62WP	6 oz	2.5 ab
Heritage 50WP	0.4 oz	1.3 ab

* Fungicide application on 6 Nov 95
** Ratings taken on 14 Mar 96

TITLE: Flowering Ornamentals as Indicators for Crabgrass Germination

OBJECTIVE: To compare flowering dates of woody and herbaceous ornamentals to crabgrass germination dates in Kansas and Nebraska

PERSONNEL: Jack Fry, Ward Upham, and Steve Wiest, Kansas State University
Roch Gaussoin and Amy Greving, University of Nebraska

INTRODUCTION:

Timing of preemergence herbicide application for smooth crabgrass control can be important to maximize duration of herbicidal activity. Recommendations for application time traditionally have been by calendar date. For example, in northeast Kansas, April 15 often is targeted as a reliable date to avoid missing the optimum application window, and to maximize crabgrass control. No spring is the same, however, so April 15 may be too early in some years, and too late in others. Some have suggested using ornamentals, such as forsythia, for determining optimum preemergence herbicide application time. The theory is that a biological indicator may be a better predictor of crabgrass germination than a calendar date. However, no research has been done to compare crabgrass germination dates to ornamental flowering times.

MATERIALS AND METHODS:

Spring flowering times of woody and herbaceous ornamentals in Manhattan, Kansas and Lincoln, Nebraska were monitored in spring, 1995 and compared with dates of smooth crabgrass germination. We recorded the average date when blooms were first evident and the last average date when blooms were present. Weather and soil temperature data also were collected and will be used to develop weather-based models for predicting germination times.

RESULTS:

This is the first year of a multi-year study, so results should be regarded as preliminary. Crabgrass germination did not occur in bare ground until April 15 in Kansas and early June in Nebraska. In turf, crabgrass seedlings were not observed until May 22 in Kansas and 16 June in Nebraska. Several ornamentals started and ended bloom well before crabgrass had germinated. Ideally, we are looking for a species that begins, or ends, bloom 2 to 3 weeks before crabgrass germinates. Some species have a relatively long bloom period, whereas others exhibit a short bloom time. Hence, just the fact that a species is in bloom may not be useful information if it is in bloom for an extended period of time. Species that started or ended bloom 2 to 3 weeks prior to crabgrass germination at both locations included lilac and Vanhoutte spirea. Additionally, in Kansas, lantana viburnum, and tatarian honeysuckle ended bloom 2 to 3 weeks prior to crabgrass germination in thin turf. In Nebraska, black locust and sweet mockorange started bloom 2 to 3 weeks prior to crabgrass germination, whereas Burkwood viburnum ended bloom within the same time frame. This study will continue in 1996 and 1997.

Table 1. Dates of crabgrass germination and flowering of ornamentals, 1995.

Species	Bloom/crabgrass germination times Manhattan, KS	Lincoln, NE
Crabgrass germination-bare soil	April 15	7 - 12 June
Crabgrass germination - thin turf	May 22	16 June
Black locust	May 19 - 22	May 26 - June 9*
Bridal wreath spirea	March 24 - April 10	April 12 - May 2
Burkwood virburnum	April 4 -14	April 24 - May 27*
Callery pear	March 20 - April 6	April 3 - May 1
Daffodil	March 20 - April 6	March 26 -April 30
Downy hawthorne	April 9 -April 24	Not evaluated
Flowering quince	March 30 - April 30	April 4 - May 8
Forsythia	March 20 -April 6	March 20 - April 26
Iris	April 17 - May 22	May 16 - June 14
Lantana viburnum	April 9 - May 4*	Not evaluated
Leatherleaf viburnum	Not evaluated	April 7 - May 25
Lilac	April 6 - May 4*	April 22 - May 31*
Redbud	March 27 - April 30	April 7 - May 12
Sand plum	April 1 -12	Not evaluated
Saucer magnolia	April 1 -12	April 2 - 21
Sweet mockorange	Not evaluated	May 24 - June 19*
Tatarian honeysuckle	April 10 - May 4*	Not evaluated
Tulip	April 1 -18	April 6 - May 9
Vanhoutte spirea	April 14 - May 19*	May 11 - June 1*
Washington hawthorne	Not evaluated	May 12 - 31
Winter honeysuckle	March 20 -April 7	Not evaluated

*Started or ended bloom 2 to 3 weeks before crabgrass germination in thin turf

TITLE: Suppression of Bermudagrass in Cool-Season Turf with Turflon Ester and Acclaim

OBJECTIVE: To determine the efficacy of Turflon Ester and Acclaim for the suppression of bermudagrass in a perennial ryegrass turf

PERSONNEL: Ward Upham and Jack Fry

MATERIALS AND METHODS:

A perennial ryegrass turf, located at the KSU Rocky Ford Turfgrass Research Center near Manhattan, KS, was used for this study. Two 'Midfield' bermudagrass plugs were placed in each 1 by 2 meter ryegrass plot on 5/31/95. Plugs were 4 inches in diameter and were taken by using a cup cutter.

Treatments were started 4 weeks after plug insertion and repeated every 4 weeks until a total of four treatments had been applied. Treatment dates were 6/27, 7/25, 8/22, and 9/19. Applications were made with a backpack CO_2 sprayer equipped with 8004 flat-fan nozzles and calibrated to deliver 60 GPA (1.4 gal/1000 ft^2) at 35 psi.

Plot size was 1 x 2 meters, and the experimental design was a randomized complete block with four replications. Data were collected on an area determined by measuring the maximum north-south and east-west coverage of each plug. Areas of the two plugs in each plot then were averaged, and this average was compared to the initial average size of the same two plugs. Initial size measurements were taken on 6/27 immediatly before the first treatment. Subsequent ratings were taken at 2, 4, 6, 8, 10, 12, and 14 WAT (weeks after treatment). Phytotoxicity ratings of the bermudagrass plugs also were taken on these same rating dates, if any differences were discernible among treatments.

Data were subjected to analysis of variance, and means were separated using the Waller-Duncan Bayesian k ratio t test (k = 100, P = 0.05).

RESULTS:

Phytotoxicity: Treatments were applied every 4 wks starting on 6/7. Ratings taken 2 wks after a treatment showed more damage than those ratings taken 4 wks after a treatment (Table 1). The first group will be called the 2WAT group, and the second, the 4WAT group.

All ratings taken for the 2WAT group showed that every chemical treatment caused significant damage to the bermudagrass. The Acclaim + Turflon Ester treatment caused significantly more damage than any other treatment at the 2, 6, and 14 WAT rating periods.

Ratings taken for the dates in the 4WAT group showed significant recovery of color from each treatment date.

Area: The Acclaim + Turflon Ester treatment resulted in a decrease in area for every rating date except for 4 WAT. Both the Acclaim and the Turflon Ester treatments caused significant reductions in the spread of the bermudagrass as compared to the control plot but did not actually reduce the size of the area infested as compared to the size of the initial infestation.

Obviously, repeat treatments are needed to suppress bermuda. The Acclaim + Turflon Ester treatment caused such extensive damage that the bermudagrass appeared close to death by the end of September.

Table 1. Phytotoxicity* on bermudagrass with Turflon Ester and Acclaim at Manhattan, KS - 1994.

Treatment	Rate (lbs ai/a)	July 11 2 WAT**	July 25 4 WAT	August 8 6 WAT	Aug 22 8 WAT	Sept 5 10 WAT	Oct 3 14 WAT
Untreated	-----	9.0	9.0	9.0	9.0	9.0	9.0
Turflon Ester	1.00	6.8	9.0	7.8	9.0	5.6	5.0
Acclaim	0.38	4.5	9.0	5.3	9.0	4.8	4.9
Turflon Ester + Acclaim	0.38 1.00	2.8	9.0	2.8	9.0	2.0	1.4
MSD***	-----	1.7	NS****	1.8	NS	1.1	1.0

* Phytotoxicity ratings on a 0 to 9 scale with 9 = no damage and 0 =completely brown.
** WAT = Weeks After Treatment
*** MSD = Minimum Significant Difference
**** NS = Nonsignificant

Table 2. Percent increase in area covered by bermudagrass plugs treated with Turflon Ester and Acclaim at Manhattan, KS - 1994 .

Treatment	Rate (lbs ai/a)	July 11 2 WAT*	July 25 4 WAT	Aug 8 6 WAT	Aug 22 8 WAT	Sept 5 10 WAT	Sept 19 12 WAT
Untreated	-----	137	232	335	249	488	559
Turflon Ester	1.00	100	178	218	231	221	244
Acclaim	0.38	76	176	138	51	21	21
Turflon Ester + Acclaim	0.38 1.00	69	202	120	30	-29**	-57
MSD***	-----	20.7	NS****	78.2	157.0	149.5	263.7

* WAT = Weeks After Treatment
**Negative numbers indicate a decrease in the size of the area covered by bermudagrass.
*** MSD = Minimum Significant Difference
**** NS = Nonsignificant differences.

TITLE: Control of Crabgrass in Cool-Season Turf with Barricade Applied at Nontraditional Times

OBJECTIVE: To determine the efficacy of Barricade preemergence herbicide applied at nontraditional times in a perennial ryegrass turf.

PERSONNEL: Ward Upham and Jack Fry

SPONSOR: Sandoz

MATERIALS AND METHODS:

A perennial ryegrass turf, located at the KSU Rocky Ford Turfgrass Research Center near Manhattan, KS, was used for this study. Herbicides, treatment dates, and application rates are given in Table 1.

Treatments were applied with a backpack CO_2 sprayer equipped with 8004 flat-fan nozzles and calibrated to deliver 60 GPA (1.4 gal/1000 ft^2) at 35 psi. Plot size was 1 x 2 meters, and the experimental design was a randomized complete block with three replications.

Plots were examined for crabgrass starting in May of 1995, but it did not begin to invade until August. Plots were rated on 8/9 and 8/18 by a visual estimation of the percent of plot covered with crabgrass. Percent control was determined by normalizing each treatment to the untreated plot of that replication. The following equation was used:

$$\left(\frac{Untreated\ Rating - Treatment\ Rating}{Untreated\ Rating}\right) X\ 100$$

Ninety percent control was considered "good".

Data were subjected to analysis of variance, and means were separated using the Waller-Duncan Bayesian $\underline{k}$ ratio $\underline{t}$ test ($\underline{k}$ = 100, P = 0.05).

RESULTS:

Barricade was the only preemergence herbicide that provided season-long control and then only if used at the higher rates. The 0.49 lb rate of Barricade did not provide adequate control for the October 14, November 1, or March 14 application dates but did for the April 14 date. Barricade applied at the 0.65 and 0.75 lb rates during the fall of 1994 gave good control through 1995, except for the 0.75 rate applied on October 14.

Pre-M has a relatively short period of activity and failed at the 1.5 lb rate even when applied in April. Normally, if a single application of Pre-M is used, it is at the 3 lb rate.

Dimension did not show consistently good control through August, regardless of application date. However, it was applied at 0.38 lbs ai/a rather than the more traditional 0.5.

Table 1. Percent crabgrass control with Barricade applied at nontraditional times at Manhattan, KS - 1995.

Treatment	Rate (lbs ai/a)	Date of Application	Crabgrass			
			% of Plot Covered*		% Control**	
			Aug. 9	Aug. 18	Aug. 9	Aug. 18
Check	----	----	23.3	30.0	0.0	0.0
Barricade	0.49	October 14	6.7	18.3	73.3	46.7
Barricade	0.65	October 14	1.0	1.0	96.0	96.0
Barricade	0.75	October 14	2.0	2.7	91.0	89.3
Pre-M	1.5	October 14	10.0	13.3	56.7	46.7
Dimension	0.38	October 14	7.7	6.7	67.7	73.3
Barricade	0.49	November 1	16.7	30.0	23.3	-12.5
Barricade	0.65	November 1	0.0	1.3	100.0	94.7
Barricade	0.75	November 1	0.0	1.0	100.0	97.5
Barricade	0.49	March 14	2.0	4.3	91.0	85.2
Barricade	0.65	March 14	1.0	0.0	96.0	100.0
Pre-M	1.5	March 14	3.7	5.0	84.3	82.5
Dimension	0.38	March 14	2.7	2.3	87.7	90.7
Barricade	0.49	April 14	2.0	2.0	91.0	92.0
Barricade	0.65	April 14	2.0	2.3	92.0	92.2
Pre-M	1.5	April 14	11.0	9.3	51.0	72.7
Dimension	0.38	April 14	1.7	3.3	93.3	86.7
MSD***			9.7	15.3	43.3	50.8

* Rating a visual estimate of the percent of plot covered with crabgrass.
** Percent control determined by normalizing each treatment to the untreated plot of that rep.
*** MSD = minimum significant difference

TITLE: Control of Crabgrass in Cool-Season Turf with Various Preemergence Herbicides

OBJECTIVE: To compare the efficacy of various preemergence herbicides on the control of crabgrass.

PERSONNEL: Ward Upham and Jack Fry

SPONSOR: Rhone-Poulenc

MATERIALS AND METHODS:

A perennial ryegrass turf, located at the KSU Rocky Ford Turfgrass Research Center near Manhattan, KS, was used for this study.

Plot size was 1 x 2 meters, and the experimental design was a randomized complete block with three replications. All treatments but two were applied on April 19, 1995. Weather conditions were 12 mph wind, sunny, and a temperature of 52°. Treatments 9 and 10 were applied as tank mixes of Barricade + Acclaim on June 13, 1995. Liquid treatments were applied with a backpack CO_2 sprayer equipped with 8004 flat-fan nozzles and calibrated to deliver 60 GPA (1.4 gal/1000 ft^2) at 35 psi. Granular treatments were applied by using a shaker bottle. Treatments were watered in immediately with 1/4 inch of water.

Data were collected on quality at 3 WAT (weeks after treatment). Quality ratings were not taken at 6, 9, 12, or 20 WAT because no discernible differences were observed among treatments. A quality rating of 10 meant perfect turf and a rating of 0 signified that the turf was completely brown.

Not enough crabgrass was present to rate until 12 WAT (July 12). Crabgrass was rated as the percent of the plot covered. Percent crabgrass control was calculated from these data by normalizing each chemical treatment to the untreated plot of that replication. The following equation was used:

$$\left[\frac{(Untreated-Treatment)}{Untreated}\right] x\ 100$$

Data were subjected to analysis of variance, and means were separated using the Waller-Duncan Bayesian k ratio t test (k = 100, P = 0.05).

RESULTS:

Quality: No discernible differences in quality occurred among treatments.

Efficacy: Only two treatments (Dimension and Barricade) provided greater than 90% control of crabgrass season-long. Control by Ronstar and Pendimethalin dropped below acceptable levels between 12 and 16 WAT.

Table 1. Efficacy of Ronstar and other preemergence herbicides on the control of crabgrass in Manhattan, KS, 1995.

Treatment	Rate (lbs ai/a)	Quality* (3 WAT**)	% Plot Covered with Crabgrass			% Control of Crabgrass***		
			July 12	Aug. 9	Sept. 7	July 12	Aug. 9	Sept. 7
Untreated Check	-----	8.5	6.0	27.5	37.5	0.0	0.0	0.0
Ronstar 2G	4.0	8.5	0.0	0.8	17.5	100.0	85.0	63.3
Pendimethalin 1.21G	3.0	9.0	0.0	1.2	8.8	100.0	75.0	56.3
Dimension 1EC	0.5	8.5	0.0	2.3	1.3	100.0	90.3	98.3
Barricade 65WG	1.0	8.2	0.2	1.2	2.5	98.3	98.3	96.7
MSD****	-----	NS*****	4.4	25.9	31.1	2.1	41.4	79.5

* A phytotoxicity rating of 10 = perfect turf and a rating of 0 = brown turf.
** WAT = weeks after treatment
*** Percent crabgrass control was calculated by normalizing each chemical treatment to the untreated plot of that replication
**** MSD = Minimum Significant Difference
***** NS = Nonsignificant differences

TITLE: Effects of Plant Growth Regulators on Perennial Ryegrass Growth and Drought Resistance

OBJECTIVE: To determine the effects of four PGRs on perennial ryegrass growth, quality, and drought resistance under golf course fairway conditions.

PERSONNEL: Hongfei Jiang and Jack Fry

INTRODUCTION:

Plant growth regulators (PGRs) traditionally have been used to suppress turfgrass vegetative or reproductive growth on sites where high turf quality was not required. Increased use of trinexapac ethyl (Primo) on golf course turf in the southern U.S. has led to questions regarding the feasibility of using PGRs on golf course fairways in Kansas. Some studies have suggested that PGRs may be effective in enhancing turfgrass drought resistance by reducing evapotranspiration or enhancing rooting.

MATERIALS AND METHODS:

This study was conducted on a blend of perennial ryegrass at the Rocky Ford Turfgrass Research Center in Manhattan. Turf was mowed three times weekly at 0.75 inches, recieved 3 lbs. N/1,000 sq ft/yr, and was irrigated to prevent stress prior to PGR application. PGRs and application rates are presented in Table 1. PGRs were applied initially on 2 June, and turf response without irrigation was evaluated until 11 July. For 1 week, turf was watered well, a second PGR application was made on 18 July, and irrigation ceased. PGRs were applied using a CO^{2}-pressurized backpack sprayer equipped with 8004 flat-fan nozzles and calibrated to deliver 60 GPA (1.4 gal/1000 ft^2) at 35 psi. Plots measured 2 by 3 meters and were arranged in a randomized complete block with four replications.

Data were collected on turf quality, clipping dry weight, canopy height (3 days after mowing), canopy minus air temperature, relative water content leaf osmotic adjustment, and soil moisture extraction between 0 and 15 inches. Turf quality was rated visually in 13 separate weeks using a 0 to 9 scale, where 0 = dead turf; 7= acceptable quality for a golf course fairway; and 9 = optimum color, density, and uniformity. Clipping dry weight was determined in 12 separate weeks by making one lengthwise pass over each plot with a push-type reel mower and collecting clippings, drying, and weighing. Canopy height was measured at three locations in each plot prior to clipping collection by dropping a small cardboard disc over a ruler standing on the soil surface perpendicular to the turf canopy. Canopy minus air temperature was measured at three locations per plot using a hand-held infrared thermometer in 6 separate weeks. Leaf relative water content and osmotic potential were measured in 4 separate weeks using standard methods. Soil moisture extraction was determined gravimetrically in 4 separate weeks by removing two 1-inch-diam by 15-inch-deep cores from each plot. Data were subjected to analysis of variance, and means were separated using the least significant difference T test with P=0.05.

RESULTS:

Turf Quality: Mean perennial ryegrass quality was acceptable for all PGRs except mefluidide. Mefluidide-treated turf commonly was chlorotic within several days after treatment, and significant turf loss occurred during dry down.

Clipping Weight and Canopy Height: Mean clipping weights and canopy heights of perennial ryegrass treated with mefluidide and trinexapac-ethyl were lower than those of untreated turf.

Canopy minus Air Temperature: A higher canopy minus air temperature generally is observed if the turf is under stress and unable to cool itself effectively by transpiration. Paclobutrazol- and trinexapac-ethyl-treated ryegrass had mean canopy temperatures equal to or lower than that of untreated turf.

PGRs did not significantly affect relative water content and osmotic adjustment of grass leaves or soil water extraction.

SUMMARY:

Of the PGRs evaluated, only trinexapac-ethyl significantly suppressed perennial ryegrass shoot growth, resulted in mean acceptable turf quality, and did not increase canopy minus air temperature over that of untreated turf. Greenhouse and field studies will continue in 1996.

Table 1. Effect of PGRs on perennial ryegrass quality, growth, and canopy temperature.

PGR	Application Rate (lbs. a.i/A)	Turf Quality	Clipping Weight (g/m^2)	Canopy Height (cm)	Canopy Minus Air Temp. (C)
Untreated	----------	7.7 ab*	0.52 a	3.2 ab	3.1 c
Ethephon	3.0	7.6 bc	0.49 a	3.2 a	3.6 b
Mefluidide	0.12	4.9 d	0.28 b	2.9 d	5.5 a
Paclo-butrazol	0.50	7.8 a	0.48 a	3.1 bc	2.7 d
Trinexapac-ethyl	0.17	7.5 c	0.33 b	3.0 c	2.9 cd

*Means followed by the same letter in a column are not significantly different ($P < 0.05$).

TITLE: Effect of Primo plus Various Adjuvants on Density, Quality, and Clipping Yields of 'Glade' Kentucky Bluegrass and 'Amigo' Tall Fescue

OBJECTIVE: To compare the efficacy of Primo using several adjuvants on tall fescue and Kentucky bluegrass.

PERSONNEL: Ward Upham and Jack Fry

SPONSOR: Ciba

MATERIALS AND METHODS:

The KSU Rocky Ford Turfgrass Research Center near Manhattan, KS, was used for this study. The same protocol was used for two species of turfgrass: 'Amigo' tall fescue and 'Glade' Kentucky bluegrass. Turf was well watered and maintained at a height of 3 inches, and no fertilizer was applied during the course of the study.

Plot size was 6 x 6 feet, and the experimental design was a randomized complete block with three replications. All treatments were applied on August 17, 1995. Conditions at the time of application were 83°F, wind at 4 mph, and a relative humidity of 25%.

Treatments 2 through 7 were applied with a backpack CO_2 sprayer equipped with 8004VS flat-fan nozzles and calibrated to deliver 60 GPA (1.4 gal/1000 sq ft) at 35 psi. Treatments 8 and 9 involved the use of Thinvert and a low volume nozzle calibrated to deliver 2.8 gal/a. The low volume nozzle was used much like a 'Chemlawn' gun with the nozzle being about 3 ft above ground level during application.

Treatments calling for a 1X rate received Primo at 0.75 oz of product per 1000 sq ft. The 0.5 rate was half of that amount. Adjuvants were mixed at the rate of 0.5% v/v.

Density was rated visually on a 0 to 9 scale, with 9 being the most dense. Quality was also rated on the same scale, with 9 being the best and 0 equaling totally brown turfgrass. Clipping weight was determined by cutting one swath across each plot with a Toro 21 in. walk-behind mower and collecting the clippings. The clippings were weighed after being dried thoroughly.

Density was rated at the time of application and at 5 WAT (weeks after treatment). Quality ratings and clipping yields were taken weekly for 5 weeks. Quality ratings were taken immediately after mowing.

RESULTS:

Tall Fescue

Density: No differences occurred among treatments for either of the rating periods (initial and 5 WAT).

Quality: No significant differences occured among treatments for either the first or fifth WAT rating periods. The Primo treatments without adjuvants (Treatments 6 and 7) were consistently rated lower than all other treatments for the remaining weeks (Table 1). Thinvert by itself (Treatment 8) showed no significant differences when compared to the Check plots. Thinvert + Primo (Treatment 9) was significantly lower in quality than the Check at weeks 2 and 3 but not at weeks 1, 4, and 5. All treatments provided acceptable quality (rating $\geq$ 6.0) except for Treatment 6 at week 4.

Clipping Yield: No significant differences occurred among treatments for every week except week 5. Though Treatment 7 (Primo @ 1X) was consistently at the lower end of clipping yields, no significant differences occurred among treatments 2 through 7 on any rating date. However, Treatment 9 (Primo + Thinvert) consistently produced more clippings than treatments 2 through 7 but less than treatments 1 and 8 (Check and Thinvert plots, respectively). Treatments 1 and 8 consistently produced more clippings than treatments 2 through 7 for every week except week 5.

Kentucky Bluegrass

Density: No differences occurred among treatments for either of the rating periods (initial and 5 WAT).

Quality: No significant differences occurred among treatments for either the first, fourth, or fifth WAT rating periods (Table 2). Treatment 9 (Thinvert + Primo) showed the lowest quality ratings for weeks 2 through 4, with weeks 3 and 4 being of less than acceptable quality (a rating of < 6 was deemed unacceptable). The only other treatment to be rated less than acceptable was Treatment 7 (Primo @ 1X) at week 3. On weeks 2 and 3, all treatments were of significantly lower qualtiy than treatments 1 and 8 (Check and Thinvert, respectively) except Treatment 3 (Adjuvant 2 + Primo) at week 3.

Clipping Yield: No significant differences occurred among treatments for every week except week 5. Treatments 7 and 9 (Primo @ 1X and Thinvert + Primo, respectively) tended to produce the least clippings with significantly less than the Check for weeks 1 through 4. Treatments 2 through 7 and treatment 9 produced significantly fewer clippings than the Check at weeks 2 and 3. Results from weeks 1 and 4 were more mixed.

Table 1. Quality and clipping yields of 'Amigo' tall fescue under various treatments containing Primo at Manhattan, KS, 1995.

Treatment	Adjuvant	Rate of Primo	Quality*					Clippings Yields **				
			Weeks after Treatment					Weeks after Treatment				
			1	2	3	4	5	1	2	3	4	5
1(Check)	----	----	7.7	8.7	7.7	8.0	8.0	17.2	13.6	19.3	19.1	14.1
2	1	0.5X	8.0	7.3	7.0	7.3	7.3	7.9	7.0	4.5	10.6	12.1
3	2	0.5X	7.3	7.7	6.7	7.7	7.7	10.7	7.2	6.6	12.1	11.5
4	3	0.5X	7.7	8.0	6.3	7.3	7.3	10.8	5.6	5.5	11.7	11.2
5	4	0.5X	7.7	8.0	7.0	8.0	8.0	9.9	5.7	6.2	12.5	10.4
6	----	0.5X	7.7	7.0	6.0	5.3	7.0	10.0	5.7	4.8	8.1	10.7
7	----	1X	7.0	7.0	6.0	6.7	7.7	6.9	5.5	3.9	8.5	10.2
8	Thinvert	----	8.0	9.0	8.0	8.0	8.0	16.0	14.8	20.8	19.5	11.9
9	Thinvert	1X	7.7	8.0	7.0	7.3	7.3	12.1	10.6	12.3	15.0	12.1
MSD	----	----	NS***	0.7	0.7	1.0	NS	4.0	4.1	7.5	6.5	NS

* Quality was rated visually on a 0 to 9 scale with 9 = best and 0 = completely brown. A rating of 6 or above represented acceptable quality.

** Grams dry weight

** NS = Nonsignificant

Table 2. Quality and clipping yields of 'Glade' Kentucky bluegrass under various treatments containing Primo at Manhattan, KS, 1995.

Treatment	Adjuvant	Rate of Primo	Quality* Weeks after Treatment					Clippings Yields ** Weeks after Treatment				
			1	2	3	4	5	1	2	3	4	5
1(Check)	----	----	8.0	9.0	8.0	6.7	8.0	10.7	17.2	13.5	16.4	16.2
2	1	0.5X	7.3	7.3	6.7	7.0	7.3	7.2	7.9	2.9	11.5	12.3
3	2	0.5X	7.7	7.7	7.3	7.3	8.0	9.3	10.7	4.3	13.9	17.6
4	3	0.5X	7.3	7.3	7.0	6.3	7.7	9.8	10.8	3.9	11.5	16.9
5	4	0.5X	7.7	7.3	6.7	7.3	7.7	8.6	9.9	3.6	11.3	14.8
6	----	0.5X	7.7	7.3	6.3	7.3	7.3	9.4	10.0	3.8	7.2	11.8
7	----	1X	7.0	7.3	5.7	7.0	7.3	7.0	6.9	2.2	6.3	11.9
8	Thinvert	----	8.0	8.7	8.0	6.7	8.0	13.8	16.0	15.3	17.5	17.2
9	Thinvert	1X	7.0	6.7	5.3	5.7	7.3	5.7	12.1	2.9	7.0	9.7
MSD	----	----	NS***	1.3	0.7	1.8	NS	2.9	4.2	4.7	7.8	NS

* Quality was rated visually on a 0 to 9 scale with 9 = best and 0 = completely brown. A rating of 6 or above represented acceptable quality.

** Grams dry weight

*** NS = Nonsignificant

TITLE: National Tall Fescue Cultivar Trial

OBJECTIVE: To evaluate tall fescue genotypes for adaptability and performance under Kansas conditions

PERSONNEL: John Pair, Ward Upham, and Ned Tisserat

SPONSOR: National Turfgrass Evaluation Program

INTRODUCTION:

Tall fescue is the best adapted, cool-season turfgrass for use in the transition zone because of its greater drought and heat tolerance. Although tall fescue has few serious insect and disease problems, it possesses a rather coarse leaf texture because it lacks stolons and has only very short rhizomes. Efforts to improve tall fescue cultivars include selection for finer leaf texture, good mowing quality, a rich green color, and better sward density, while maintaining good stress tolerance characteristics.

MATERIALS AND METHODS:

Manhattan

A trial of 103 cultivars was established at the Rocky Ford Turfgrass Research Center on Sept 8, 1994. The turf was maintained at 3.5 in. No fungicides were applied so that natural disease resistance could be rated. Turf quality was rated visually, with 0 = dead turf; 6 = acceptable quality; and 9 = optimum color, density, and uniformity.

Wichita

A trial of 65 cultivars and experimental numbers was established at the Horticulture Research Center on Sept 10, 1987. Plots were maintained at 4 lbs N/1000 sq ft per year and mowed at 2 ½ in. with clippings removed. This trial was terminated after 4 years, and a summary was published in 1994. A new national trial was initiated on Sept. 24, 1992 containing 95 cultivars and experimental numbers and was given the same management.

RESULTS:

Manhattan

Cultivars that had average quality ratings above 7.0 for 1995 were Lexus, ATF-007, Genesis, Pick 90-10, PST-5VC, Shortstop II, Vegas, Houndog V, Finelawn, Finelawn Petite, Micro DD, Gazelle, Palisades, and FA-19. As usual, K-31 rated lowest.

Improvements in color are becoming more pronounced with the best color shown by Rebel-3D, Lexus, Finelawn Petite, Duke, Safari, ITR-90-2, ATF-007, and ISI-AFE.

Significant damage was caused by Rhizoctonia brown patch during 1995. Though there was some variability in the data, results were still statistically significant. The cultivars most resistant to brown patch were Cafa 101, Bonanza, FA-19, Phoenix, BAR Fa2AB, PST-5DX, and SR 8300.

Wichita

Initial seedling vigor was rated to determine the dwarfness or tallness of the various selections, which is obscured by mowing. Results indicated that this trial includes a number of new dwarf types. Performance in the third season was rated highest for Apache; GEN-91; Lexus; Jaguar; Twilight; Coyote; Ninja; Coronado; Starlet; and experimental Nos. ISI-AFE, ISI-AFA, MB21-92, ATF-007, PST-5LX, and Pick 90-10. Other high rated selections were Gazelle, Empress, Crossfire II, Shortstop II, PST-5PM, Lancer, Marksman, and Southern Choice (Table 2). Poorest performers were PRO-9178, Evergreen, Arid, Anthem, and K-31.

Best color was recorded for Lexus, GEN-91, Bonsai, Coyote, PST-5LX, Coronado, Pick 90-10, Gazelle, and ITR-90-2. Finest texture was noted with Ninja, ATF-007, Gazelle, Shortstop II, Micro DD, M-2, Lexus, MB-21-92, Pic 90-10, Starlet, Lancer, Bonsai, Rebel, Jr., and SR 8010.

Rhizoctonia brown patch caused severe injury to plots in 1995. Slight differences were apparent in tolerance, although most plots sustained some injury. Cultivars showing the least borwn patch in 1995 included Austin, Twilight, K-31, MB-22-92, MG-21-92, Rebel-3D, Apache, PST-5VC, and Duke. Mot susceptible were cultivars Debutante, Montauk, Pyramid, ATF-007, Gazelle, Crossfire II, Bonsai Plus, and Ninja.

Table 1. Performance of tall fescue cultivars at Manhattan, KS, 1995.[1]

Cultivar[2]	Color	Texture	Brown Patch	Visual Quality March	July	September	Average[3]
Lexus*	8.0	8.0	5.7	6.0	7.7	7.7	7.5
ATF-007	8.0	7.3	5.3	6.0	8.0	7.7	7.3
Genesis*	6.7	6.0	6.0	6.7	7.0	7.3	7.3
Pick 90-10	7.7	7.7	5.7	6.3	7.7	7.7	7.3
PST-5VC	7.7	7.0	5.0	6.7	8.0	6.7	7.2
Shortstop II*	6.7	6.7	6.0	6.3	7.0	7.3	7.2
Vegas*	7.0	6.7	5.7	6.3	7.0	7.0	7.2
Houndog V*	8.0	7.0	5.3	7.0	7.7	7.0	7.2
Finelawn Petite*	8.0	7.0	6.3	6.3	7.3	6.7	7.2
Micro DD*	7.3	7.3	4.7	6.3	7.3	6.7	7.1
Gazelle*	6.7	7.3	6.0	6.7	6.7	6.7	7.1
Palisades*	7.3	6.7	6.0	6.7	7.7	7.0	7.1
FA-19	7.0	6.7	7.3	6.3	7.0	7.7	7.1
Virtue*	7.3	6.0	5.0	6.3	7.0	7.0	7.0
Coyote*	7.7	7.3	4.7	6.0	7.3	7.0	7.0
Emperor*	6.7	7.3	4.7	6.7	7.0	6.3	7.0
Bonanza*	6.3	6.0	7.3	7.0	6.7	6.7	7.0
Tomahawk*	6.3	6.3	5.0	7.0	7.0	6.7	7.0
Apache II*	7.3	6.3	6.0	6.0	7.0	7.0	7.0
Rebel-3D*	8.3	6.3	5.0	6.3	8.0	6.0	7.0
ISI-AFA	6.7	6.3	6.0	6.7	7.0	7.7	7.0
Kittyhawk*	7.3	6.0	5.0	6.3	7.0	6.7	7.0
Rebel, Jr.*	6.7	6.0	5.7	6.7	6.7	6.3	7.0
Alamo*	6.7	6.7	5.7	7.0	6.7	6.3	7.0
Duke*	8.0	7.0	5.7	6.0	7.0	7.3	7.0
Pixie*	7.0	7.3	6.0	6.0	7.3	6.0	6.9
Trailblazer II*	6.7	5.7	6.0	6.3	6.3	7.3	6.9
BAR Fa 2AB	7.3	6.7	7.0	6.3	7.3	7.0	6.9

(continued)

Table 1. Performance of tall fescue cultivars at Manhattan, KS, 1995.[1]

Cultivar[2]	Color	Texture	Brown Patch	Visual Quality March	July	September	Average[3]
Starlet*	6.7	7.0	4.7	6.3	7.0	7.0	6.9
Duster*	8.0	7.0	4.7	6.0	7.3	6.3	6.9
Ninja*	7.3	7.3	4.7	6.0	7.3	6.7	6.9
Avanti*	7.7	6.7	5.7	6.3	6.7	7.3	6.9
Jaguar 3*	7.3	7.7	4.3	7.0	7.3	7.0	6.9
ISI-CRC	7.0	7.0	5.3	6.3	7.0	6.7	6.8
MED 10-3-3	7.3	6.7	4.3	6.0	7.0	7.3	6.8
Chieftan I*I	6.7	6.3	6.7	6.3	6.7	6.7	6.8
PST-5LX	7.3	6.7	5.0	6.0	7.0	6.7	6.8
Montank*	7.3	6.3	5.3	6.0	7.0	7.3	6.8
Crossfile II*	6.3	6.3	6.3	7.0	6.7	6.3	6.8
PST-5DX w/endophytes	6.3	6.3	7.0	6.3	6.7	6.7	6.8
Aztec*	7.0	5.7	5.3	6.0	6.7	6.7	6.8
Renegade*	7.0	7.0	4.7	6.3	6.7	7.3	6.8
PST-5PM	6.3	6.0	4.7	6.0	7.3	6.3	6.8
SFL	7.0	6.7	3.7	6.0	7.0	7.3	6.8
Austin*	7.3	7.0	5.0	6.3	7.0	6.7	6.8
MED 2-3-19	7.3	6.0	6.0	6.0	6.7	6.7	6.7
BAR Fa 214	7.0	7.7	4.7	6.3	7.0	6.7	6.7
Eldorado*	7.3	6.3	5.3	6.0	6.7	6.7	6.7
Cochise*	6.0	5.7	5.7	6.7	6.0	6.0	6.7
PST-5STB	7.3	6.7	6.0	6.0	6.7	6.0	6.7
Pyramid*	6.7	5.3	5.3	6.3	5.7	7.0	6.7
Shenandoah*	6.7	5.7	6.3	7.0	6.7	6.3	6.7
Falcon II*	7.0	6.7	6.0	6.0	6.3	7.0	6.6
Silverado*	6.0	5.7	5.0	6.0	6.3	6.3	6.6
PSTF-401	6.7	6.0	6.0	6.3	6.7	6.3	6.6
Safari*	8.0	6.3	6.3	6.3	7.0	6.3	6.6
SR 8200	7.0	6.3	6.0	6.7	6.7	6.7	6.6
Southern Choice*	7.0	6.3	5.7	6.0	6.3	6.0	6.6
Debutante*	6.3	6.3	6.7	6.0	6.0	6.7	6.6
M-2	7.0	6.3	4.7	6.0	7.0	6.3	6.6
MED 2-1-25	7.0	6.7	5.0	5.7	6.7	7.0	6.6
FA-22	6.3	6.3	6.3	6.0	6.3	7.3	6.6
Lancer*	7.7	7.3	5.3	6.3	6.7	6.3	6.6
MED 10-5-4	7.3	6.0	4.3	6.3	7.0	6.7	6.6
CAS-MA21	7.0	6.7	5.0	6.0	6.3	6.3	6.6
PRO-9178	7.0	6.0	5.0	6.3	6.0	7.3	6.6
Mirage*	6.3	6.3	5.0	6.0	6.7	7.3	6.6

(continued)

Table 1. Performance of tall fescue cultivars at Manhattan, KS, 1995.[1]

Cultivar[2]	Color	Texture	Brown Patch	Visual Quality			
				March	July	September	Average[3]
Titan 2*	6.3	6.7	6.3	6.0	6.3	6.7	6.5
MED 2-8-12	6.0	6.3	5.3	6.0	6.0	6.3	6.5
MED 2-9-3	6.3	6.7	5.0	6.0	6.3	6.7	6.5
OFI-ATK	6.7	6.3	6.7	6.3	6.7	6.7	6.5
BAR Fa 0855	7.7	6.7	6.7	6.3	7.0	6.3	6.5
Coronado*	6.3	6.0	5.3	6.7	6.3	6.3	6.5
Guardian*	6.3	6.3	4.7	6.3	6.0	5.7	6.5
403	6.0	6.0	6.0	6.3	6.0	6.0	6.5
CAS-LA20	7.3	6.0	5.0	6.0	6.7	6.7	6.4
MED 10-6-8F	7.0	6.7	5.3	6.0	7.0	7.0	6.4
MED 10-7-2	6.3	6.3	5.3	6.0	6.0	6.7	6.4
Grande*	6.3	6.0	6.7	6.0	6.7	6.7	6.4
Aquara*	6.0	6.0	5.0	6.0	6.3	6.3	6.4
MED 10-4-3	6.3	6.3	5.0	6.3	5.7	6.0	6.4
Twilight*	7.7	7.0	4.0	6.0	7.7	6.0	6.4
Bonsai Plus*	7.0	6.3	5.7	6.0	6.0	6.3	6.4
Bonanza II*	5.3	6.0	5.7	6.0	5.7	6.0	6.4
Bonsai*	7.0	7.7	3.7	6.0	7.0	6.0	6.3
Marksman*	6.7	5.7	5.0	5.7	6.7	6.0	6.3
PSTF-200	6.0	5.3	6.0	6.0	5.3	6.7	6.3
Monarch*	7.0	6.0	5.7	6.0	6.3	6.3	6.3
Falcon*	6.3	6.0	5.3	6.3	6.0	6.0	6.3
Finelawn 88*	6.0	5.3	5.0	6.3	5.7	5.7	6.3
SR 8210	6.0	5.7	5.3	6.3	6.0	6.3	6.3
PSTF-LF	7.0	6.3	5.3	6.0	6.3	6.3	6.3
SR 8300	6.7	5.7	7.0	6.0	5.7	5.7	6.3
Olympic II*	6.3	6.3	6.7	6.0	6.3	6.3	6.2
Phoenix*	6.7	6.0	7.0	5.7	6.7	5.7	6.2
Arid*	6.3	5.3	5.7	6.0	5.3	5.7	6.1
Astro 2000*	6.3	6.0	6.3	6.0	6.0	6.7	6.1
Leprechaun*	6.0	5.7	4.3	6.3	6.0	5.7	6.0
Anthem*	7.0	6.0	5.3	6.0	6.3	5.7	6.0
Generic*	5.0	4.7	7.7	5.7	5.0	5.0	5.4
K-31 w/endophytes*	5.0	5.0	6.0	5.7	4.7	4.7	5.2
K-31 no endophytes*	5.0	4.3	5.3	5.0	4.3	4.0	4.5

[1] Established Sept. 8, 1992. Ratings based on a scale of 0 - 9 w/9 = darkest green, finest texture, least disease damage, and highest quality.

[2] Cultivar names followed by an asterisk are commercially available in the USA.

[3] Average of monthly ratings taken from March through October.

Table 2. Performance of tall fescue cultivars at Wichita, KS, 1995

Cultivar or Accession No.	Visual Quality (O-9 w/9 = best) 4-25-95	5-29-95	6-28-95	7-26-95	8-15-95	9-8-95	10-20-95	Avg.	Gen. Color 5-17	Texture 5-31	Brown Patch 9-8
Apache II (PST-59D)	8.0 DG	7.8 DG	8.0 DG	8.5 DG	7.3	6.0	8.0 DG	7.7.	7.3	5.8	6.2
GEN-91	8.2 DG	8.0 DG	8.5 DG	8.7 DG	7.5	5.2	7.7	7.7	7.8	5.7	5.0
Lexus	8.3 DG	8.3 DG	8.5 DG	8.2 DG	7.3	5.0	7.8 DG	7.6	8.0	6.5	5.3
Jaguar 3 (ZPS-J3)	8.2 DG	7.5	8.0	8.5 DG	7.8	5.2	7.8 DG	7.6	7.2	5.5	4.7
Twilight	7.7 W	7.7DG	8.0 DG	8.2 DG	7.3	7.0 DG	7.3	7.6	7.5	5.7	6.7
ISI-AFE	8.0 DG	7.5	8.3 DG	8.5 DG	7.7	5.3	7.7 DG	7.6	7.2	5.7	5.0
ISI-AFA	8.2 DG	7.7DG	8.2 DG	8.3 DG	7.3	5.7	8.0	7.6	7.0	5.3	4.8
Coyote (ZPS-ML)	8.3 DG	7.8 DG	8.3 DG	8.0 DG	7.2	6.0	7.5 DG	7.6	7.7	6.0	5.3
Falcon II (MB-21-92)	7.8 DG	7.5	8.2 DG	8.3 DG	7.7	6.2	7.3	7.6	7.2	6.5	6.3
Ninja (ATF-006)	8.2 DG,F	8.3 DG	8.2 DG	8.3 DG	7.3	5.0	7.0	7.5	7.2	7.0	4.5
PST-5LX	8.0 DG	7.5	8.0	8.3	6.3	6.3 DG	8.0 DG	7.5	7.7	4.3	6.3
Coronado (PST-RDG)	8.2 DG	7.7 DG	8.2	8.3 DG	7.0	5.5	7.7	7.5	7.7	5.8	5.3
ATF-007	8.0 DG	7.5	8.5 DG	8.5 DG	7.3	4.8	7.7	7.5	6.8	7.0	4.3
Pick 90-10	7.8 DG,F	8.2 DG	8.3 DG	8.2 DG	7.5	5.3	7.2	7.5	7.7	6.5	5.5
Starlet(MB-24-92)	8.2 DG	7.7	8.2 DG	8.7 DG	7.0	4.7	7.8 DG	7.5	7.5	6.5	4.8
Gazelle (ZPS-VL)	8.3 DG	8.0 DG	8.2 DG	8.3 DG	6.7	4.8	7.2 DG	7.4	7.7	6.7	4.3
Empress(ZPS-E2)	7.7	7.7	8.3	8.2 DG	6.5	5.5	7.8 DG	7.4	7.3	6.2	5.0
Crossfire II (Pick 90-12)	7.7	7.7	8.0	7.8 DG	7.7	4.7	8.0 DG	7.4	7.2	5.7	4.3
Shortstop II (Pick 90-6)	7.7 DG	7.7	8.0	8.5 DG	7.2	5.3	7.3	7.4	7.2	6.7	5.0
PST-5PM	7.7	7.7	8.0 DG	8.2 DG	7.2	5.3	7.8 DG	7.4	7.2	5.7	5.2
Lancer	8.2 DG	7.8	8.0 DG	8.0	6.8	5.7	7.5	7.4	6.5	6.5	5.3
Marksman (MB-23-92)	7.7 DG	7.2	8.2 DG	8.3 DG	7.2	5.3	7.8 DG	7.4	7.2	5.5	5.3
Southern Choice (MB-25-92)	8.0 DG	8.0 DG	7.8 DG	8.3 DG	7.5	4.7	7.7	7.4	7.3	5.8	5.0
BAR Fa 2AB	7.5	7.2	7.8	8.3 DG	7.3	6.0	7.0	7.3	7.3	5.5	6.0
Rebel-3D	7.3	7.3 DG	7.8	8.2 DG	6.8	6.5	7.3	7.3	7.2	4.8	6.2
Finelawn Petite	7.5 DG	7.8 DG	7.8 DG	7.8 DG	6.5	5.7	8.0 DG	7.3	7.3	5.0	5.8
Micro DD	8.2 DG	8.0	8.0	7.8	6.7	4.8	7.3	7.3	6.7	6.7	4.8
Cochise	7.7	7.3	8.0	8.3	7.3	5.0	7.2	7.3	7.2	5.5	4.8
Pixie	7.8 DG	7.5	8.3 DG	8.2 DG	6.2	5.3	7.8 DG	7.3	7.2	6.0	5.2
Bonsai Plus	7.7	7.7	8.2 DG	8.3 DG	6.8	4.5	6.8	7.2	7.3	6.3	4.3
Bonsai	8.5 DG,F	7.7 DG	8.2	8.0 DG	5.0	5.0	8.0 F	7.2	7.8	6.5	4.7
Mirage (KWS-DSL)	8.2	7.5	7.8	7.5	6.8	5.5	7.3	7.2	7.0	6.2	5.2
Falcon	5.0 LG,C	5.3 LG	6.0 LG	5.7 LG,C	5.0	5.0 LG	5.8 LG	7.2	5.3	3.7	5.7
MB-22-92	7.7	7.2	7.8	7.8 DG	6.5	6.0	7.0	7.2	7.3	6.2	6.5
Vegas	7.7	7.2	7.8	8.2	6.7	5.3	7.3	7.2	7.0	5.0	5.2
PST-5DX(w/endo.)	7.2	7.2	7.5	8.2	7.0	5.3	8.0	7.2	6.7	5.8	5.3
Tomahawk	7.0 DG	7.5	8.0 DG	7.8	6.3	5.7	7.7 DG	7.2	7.0	6.2	5.2
PST-5VC	7.3	7.2	7.3	7.3	7.0	6.2	7.7	7.2	6.7	6.2	6.0
Duke	7.2	7.3	8.0	7.8	6.8	6.2	7.3	7.2	6.7	5.7	6.0
J-1048	7.7	7.3	7.3	7.8	7.0	5.7	7.2	7.2	6.5	5.2	5.7

(continued)

Table 2. Performance of tall fescue cultivars at Wichita, KS, 1995.

Cultivar or Accession No.	Visual Quality (O-9 w/9 = best) 4-25-95	5-29-95	6-28-95	7-26-95	8-15-95	9-8-95	10-20-95	Avg.	Gen. Color 5-17	Texture 5-31	Brown Patch 9-8
Trailblazer II	7.7 C	7.0	8.2 DG	7.3	6.5	5.7	7.7	7.2	6.7	4.8	5.5
SR 8400	7.0	7.2	7.8	7.8	7.0	5.2	7.7	7.1	6.3	5.5	5.3
Pick CII	7.3	7.2	8.0	7.8 DG	6.5	5.5	7.0	7.1	7.0	4.7	5.5
ITR-90-2	7.3	7.7	7.5	8.5 DG	6.7	4.7	7.3 DG	7.1	7.7	6.2	4.7
Virtue	7.5 C	7.3	7.8	7.7 DG	6.8	5.5	7.2	7.1	7.2	5.3	5.0
OFI-TF-601	6.7	7.2	7.7	8.0	6.8	5.8	7.7	7.1	6.2	5.5	5.8
Silverado	7.2	7.3	8.0	8.0 DG	6.7	5.0	7.7	7.1	7.2	5.8	5.0
Excaliber	7.5	7.5	7.7	7.8	6.8	5.0	7.2	7.1	7.0	5.7	5.2
Adobe (SFL)	8.0 DG	7.2	8.0	7.7	6.5	5.2	7.3	7.1	6.8	6.0	5.0
ISI-ATK	6.7	6.8	7.5	8.0 DG	7.3	5.7	7.7 DG	7.1	6.3	5.5	5.8
FA-19	7.7	7.0	7.5	7.5	6.8	5.5	7.5	7.1	6.0	6.3	5.0
J-1047	7.0	7.3	7.8	8.0 DG	6.3	6.2	7.2	7.1	7.3	5.3	6.5
Rebel Jr.	7.8 DG	7.8	7.8	7.2 DG	6.5	5.0	7.2	7.1	7.3	6.5	5.3
Debutante (WXI-208-2)	7.3	7.3	8.0	8.0 DG	6.5	4.0	7.5	7.0	6.3	6.0	3.7
M-2	7.3	7.2	7.3 C	8.0	6.7	5.7	6.7	7.0	6.8	6.7	5.7
Montauk	7.0	7.0	7.7	7.7	6.3	6.0	7.0	7.0	6.5	5.5	6.0
Pyramid (SIU-1)	6.8 C	7.0	7.5	8.0	7.0	5.0	7.8	7.0	6.2	5.7	4.3
SR 8210	7.7	7.2	7.5	7.8	6.5	4.7	7.8	7.0	6.8	5.7	4.3
Eldorado	6.7 C	6.8 C	7.5	7.3	6.7	6.2	7.3	6.9	6.5	5.3	5.8
BAR Fa 0855	6.3 LG	7.2	7.5	8.0	6.5	5.7	7.3	6.9	6.7	5.0	5.7
Safari	6.3 LG,C	6.7	7.5	7.7	7.3	5.0	7.5	6.9	5.8	6.2	5.3
CAS-LA20	6.5	7.2	7.7	7.5	6.2	5.7	7.3	6.9	6.7	6.3	5.3
ISI-CRC	7.7	6.8	7.3	7.3	6.7	5.0	7.3	6.9	6.5	5.8	5.3
PSTF-LF	7.2	6.3	7.2	7.7	7.3	5.5	7.0	6.9	6.5	4.7	5.7
Guardian	7.3	7.0	7.7	7.7	6.0	5.2	7.5	6.9	6.3	4.5	5.5
Leprechaun	7.3	7.3	7.7	8.0	7.5	4.7	7.5	6.9	6.8	6.0	4.8
Kittyhawk	7.0	7.0	7.2	7.5	6.7	5.3	7.3	6.8	6.2	5.0	5.5
FA-22	7.0 LG	7.0	7.2	7.5	6.5	5.2	7.0	6.8	6.3	6.5	4.8
CAS-MA21	6.8 C	7.3	6.8	7.3 C	6.5	5.2	7.3	6.8	6.8	5.0	5.5
Avanti	7.0 LG	6.7	7.5	7.3	6.7	5.5	7.0	6.8	6.2	5.3	5.7
Finelawn 88	6.5	6.7	7.0	7.8	7.0	5.5	6.8	6.8	6.3	5.0	5.3
Aztec	7.0	7.2	7.3	7.5	6.8	4.5	7.3	6.8	6.5	4.7	5.0
Monarch	7.0	6.7	7.3	8.0 DG	6.3	4.7	7.5	6.8	6.7	5.0	4.8
403	6.8	7.3	7.0	7.5	6.3	5.2	7.2	6.8	6.3	5.2	5.0
SR 8200	7.0	6.8	7.3	7.8 DG	6.2	5.3	7.2	6.8	6.2	4.7	4.8
SR 8300	6.3 C	7.2	7.2	7.3	6.5	6.0 LG	7.2	6.8	6.3	5.2	6.2
SR 8010	6.8 LG	6.7 LG	7.2	7.2	6.5	5.7	7.3	6.8	5.5	6.5	5.3
PST-5STB	7.2 C	7.3	7.8	7.2	5.0	4.7	7.5 DG	6.7	7.0	5.2	4.7
Bonanza II	6.8 C	6.8	7.3	7.7	6.0	5.0	7.2	6.7	6.5	5.2	5.0
Bonanza	6.8 LG	6.7 LG	6.7 C	7.5 DG	6.3	5.5	6.8 C	6.6	6.2	4.0	5.3
Austin	6.7 LG	6.3	6.8 C	6.8	6.0	6.5	6.8	6.6	5.8	5.0	6.7
Cafa101	6.5 C	6.8 LG	6.3	7.3	6.5	6.0	6.2	6.5	6.2	5.0	6.0
BAR Fa 214	6.8 LG	6.5	7.0	6.8	6.5	5.0	7.0	6.5	5.3	5.7	4.7
Astro 2000	6.0 LG	6.8	6.0 LG	6.8 C	6.7	6.0 LG	6.8	6.5	5.7	4.3	6.5
PSTF-200	6.3 LG	6.0	6.5 C	7.8	6.0	5.8 LG	7.0	6.5	5.0	4.3	5.8
PSTF-401	5.5 C	6.3	7.0 C	7.0	6.7	5.3	7.0	6.4	5.8	4.7	5.7
Phoenix	6.0 LG	5.7 LG,C	6.8 C	6.8 LG	6.7	5.7 LG	7.3	6.4	5.7	4.3	6.2

(continued)

Table 2. Performance of tall fescue cultivars at Wichita, KS, 1995.

Cultivar or	Visual Quality (O-9 w/9 = best)								Gen. color	Texture	Brown Patch
Accession No.	4-25-95	5-29-95	6-28-95	7-26-95	8-15-95	9-8-95	10-20-95	Avg.	5-17	5-31	9-8
Shenandoah	6.2 LG	5.7 LG,C	7.0	7.5	6.5	5.0	6.5 C	6.4	6.0	4.7	5.0
Olympic II	5.7 LG,C	6.0 LG	6.5 LG	7.5 V	6.2	4.3 LG	6.7	6.1	5.8	4.0	5.8
PRO-9178	7.5	6.7	7.3	7.7	6.2	5.0	7.7 DG	5.9	6.5	4.7	4.7
Evergreen	6.5 LG	6.3 C	6.3 C	6.3 LG	4.3	4.7 LG	6.7 C	5.9	5.8	4.7	5.5
Arid	4.7 LG,C	5.3 LG,C	6.0 LG,C	6.7 LG	5.8	5.3 LG	6.8 LG	5.8	4.3	4.3	5.5
Anthem	4.7 LG,C	5.3 LG	5.3 LG,C	5.3 LG	5.0	5.3 LG	6.5 LG	5.4	4.3	3.3	5.5
Ky-31 no endo.	3.7 LG,C	4.0 LG,C	4.0 LG,C	4.3 LG	4.7	5.0 LG	5.7 LG,C	4.5	3.3	3.0	6.5
Ky-31 w/endo.	3.7 LG,C	4.0 LG,C	4.0 LG,C	4.3 LG	4.3	4.7 LG	5.0 LG,C	4.3	4.0	2.0	6.7

Fertilizer incorporated @1 lb. N-P-K per 1,000 sq. ft. as 13-13-13. Seeded Sept. 24, 1992. Plot size 4' x 6'. Seeding rate 50 gms/plot (equivalent to 4.6 lbs/1,000 sq ft). F=fine texture, C=coarse, DG=dark green,LG=lt. green, V=vigorous (rated unmowed so differences in height evident).

TITLE: Creeping Bentgrass Cultivar Evaluation

OBJECTIVE: To evaluate the performance of standard and experimental creeping bentgrass cultivars in the Kansas climate

PERSONNEL: Jack Fry, Ward Upham, and John Pair

SPONSOR: National Turfgrass Evaluation Program

MATERIALS AND METHODS:

Wichita

Twenty-one cultivars and experimental numbers were established at the Horticulture Research Center in the fall of 1993. Fertility level was at 4 lbs N/1,000 sq ft per season. Mowing was at a fairway height of 1 inch with clippings removed. Fungicides Daconil at 3 o./1,000 sq ft and Fungoflo at 2 oz/1,000 sq ft were alternated for disease control.

Manhattan

Cultivars were seeded in fall 1993 on a putting green constructed to USGA specficiations at the Rocky Ford Turfgrass Research Center. Turf was mowed six days weekly at 5/32 in. A total of 5 lbs. N/1,000 sq. Ft. Was applied in 1995. Irrigation was applied to prevent stress. No fungicides were applied so that differences among cultivars in disease susceptibility could be evaluated. Turf quality was rated visually, where 0 = dead turf; 7 = acceptable quality for a putting green; and 9 = optimum color, density, and uniformity. Other parameters were rated on a 0 to 9 scale where 0 = worst and 9 = best.

RESULTS:

Wichita

Best seedling vigor was apparent for Exeter and Seaside, followed by Providence, PRO/CUP, and Penncross. Best winter color was seen on BAR AS 493 and Exeter. Genetic color (darkest green) was rated highest on 18th Green and BAR Ws 42102 (Table 1). Visual quality was rated highest on Cato, G-2, Providence, G-6, 18th Green, Crenshaw, DF-1, PRO/CUP, Penneagle, and BAR Ws 42102. Following closely with excellent quality in mid-summer were Lopez, Penncross, and Trueline.

Manhattan

A severe dollar spot infestation occurred, which greatly reduced turf quality throughout the growing season. Brown patch also was observed.

Genetic color. Best color ratings were given to G-2, A-4, L-93, A-1, Providence, Cato, Crenshaw, and 18th Green.

Green-up. Only minor differences were observed in creeping bentgrass green up when rated in April.

Leaf texture. Finest leaf texture ratings were given to L-93, Cato, A-4, G-6, and Syn 92-1.

Dollar spot. Dollar spot was most severe between June and September. Greatest resistance to dollar spot was observed with L-93, Pennlinks, MSUEB, Penncross, ISI-AP-89150, BAR AS 492, and Seaside. Greatest dollar spot infection was observed on A-4, Syn 92-2, Syn 92-5, SR 1020, Syn 92-1, Crenshaw, and 18th Green.

Brown patch. A lot of variability was observed in brown patch infection. Least infection was observed on MSUEB, Penncross, and Syn 92-1. Greatest infection was observed on Tendenz and A-1.

Turf quality. Only L-93, an experimental cultivar, exhibited acceptable mean (May to September) quality. Severe dollar spot infection resulted in only L-93 having acceptable quality in August, and none of the cultivars exhibiting acceptable quality in September.

Table 1. Performance of bentgrass cultivars and experimental accessions at Wichita, KS 1995 [1/].

Cultivar or	Visual Quality								Color	Texture
Exp. No.	4-25-95	5-31-95	6-29-95	7-28-95	8-18-95	9-4-95	10-20-95	Avg.	6-29-95	6-9-95
Cato	8.0	8.0 DG	8.0	8.7	7.8	8.7 DG	8.5	8.3	7.3	8.4
G-2	8.5 DG	8.3	8.5	7.8	7.7	8.2	8.3	8.2	7.3	8.3
Providence	8.2	7.7	8.7	8.3	6.7	8.2 W,DG	8.0	8.0	8.0	8.0
G-6	7.7	8.2 DG	8.5	7.7	6.5	7.8	8.0	7.8	7.3	8.7
18th Green	8.3 DG	7.8 DG	8.0 DG	8.5	7.0	7.7 DG,W	7.3	7.8	8.0	7.3
Crenshaw	7.3	7.5	8.3	8.2	7.0	7.8	8.3	7.8	8.0	8.3
Southshore	7.7	7.5	8.3	7.8	6.5	7.2	7.5	7.5	7.0	8.7
PRO/CUP	6.8	6.8	8.3	7.8	7.3	7.2	7.7	7.4	7.8	7.0
Penneagle	7.2	6.5	8.0	7.8	6.7	7.8	7.5	7.4	7.0	8.7
BAR Ws 42102	7.8	8.0	8.5	7.5	6.0	6.7	7.3	7.4	7.7	9.0
DF-1	6.7	6.8	7.8	8.0	6.7	7.8	7.8	7.4	7.2	8.3
Trueline	7.3	7.0	8.3 DG	7.8	6.0	6.7	7.0	7.2	8.2	7.0
Penncross	6.3	7.5	8.2	7.2 C	6.8	7.2	7.2	7.2	6.7	6.3
Lopez	7.0	6.8	7.7	7.2	6.0	6.3 W	7.0	6.9	7.0	7.2
BAR As 493	6.2	6.7 LG	6.5	7.0 LG	5.7	6.2	5.7	6.3	5.3	5.7
SR 7100	5.3	5.8 LG	6.5	5.3 LG	4.7 LG	6.0 LG,W	5.7	5.6	6.0	5.7
Exeter	5.0	4.7 T	5.0 W	6.0 W	5.8 W	5.3 W	5.7	5.4	7.3	4.7
ISI-At-90162	3.7	5.0 T	6.0 W	5.3 W	5.7 LG	5.0 W	5.3	5.2	7.3	5.3
OM-At-90163	4.7	5.8	6.0 W	5.0	4.7 LG,W	4.7 W	5.0	5.1	6.7	4.7
Seaside	4.0	4.7 C	5.7 C	5.0	5.0 W	4.7 W	5.7	5.0	6.3	3.7
Tendez	3.7	5.0 T	5.0 W	5.3 W	5.3 W	5.0 W	5.7	5.0	7.3	4.3

[1/] Quality rated on a scale of 0-9 w/9 best. C = Coarse texture; T = Thin, patchy, DG = Dark green, W = weedy.

Table 2 . Performance of creeping bentgrass cultivars at Manhattan, KS in 1995.

Cultivar	Color*	Greenup	Leaf Texture	Dollar Spot	Brown Patch	Turf Quality May	June	July	Aug	Sept	Mean
L-93	7.7	6.3	8.7	8.0	8.3	7.7	7.7	7.0	7.0	6.3	7.1
A-1	7.7	6.3	8.3	7.3	5.3	7.3	7.0	6.0	6.0	6.0	6.5
Providence	7.7	6.0	7.3	7.3	8.0	7.7	6.3	6.0	5.7	5.7	6.3
Pennlinks	6.7	5.3	6.0	8.7	8.3	6.7	6.7	6.3	5.3	6.0	6.2
Msueb	6.7	4.7	6.3	7.7	9.0	6.0	6.0	6.3	6.3	6.0	6.1
Cato	7.7	6.0	8.7	7.3	8.3	7.3	6.7	6.0	5.0	5.0	6.0
Penncross	7.0	5.0	5.7	8.0	9.0	6.0	6.3	5.7	6.0	6.0	6.0
Southshore	7.3	6.3	8.0	6.0	7.7	7.7	6.0	5.7	5.3	5.3	6.0
A-4	8.0	7.0	9.0	5.3	6.0	7.7	6.0	5.3	5.3	5.3	5.9
G-6	7.3	5.7	8.7	6.7	8.3	6.7	5.3	5.7	6.0	6.0	5.9
ISI-AP-89150	7.0	5.7	6.7	7.7	6.3	6.7	6.7	5.7	5.0	5.7	5.9
BAR AS 492	7.0	6.0	7.3	7.7	8.7	6.7	6.7	5.7	5.0	5.0	5.8
Regent	7.0	5.7	7.0	7.3	7.3	6.7	6.0	5.7	5.0	5.7	5.8
G2	8.0	6.0	7.3	6.7	8.0	6.3	5.3	5.7	6.0	5.3	5.7
Pro/Cup	7.0	5.7	7.0	7.0	8.3	7.0	6.0	5.3	5.0	5.0	5.7
DG-OP	7.3	4.7	6.3	7.3	8.0	6.0	5.7	5.7	5.0	5.7	5.6
BAR WS 42102	7.0	6.3	8.3	6.0	8.3	7.0	5.7	5.3	4.3	5.0	5.5
Trueline	7.3	6.0	7.0	6.3	8.0	6.3	5.0	5.7	4.7	5.3	5.4
Lopez	6.3	5.0	6.3	6.7	8.0	6.0	5.0	5.0	5.0	5.0	5.2
Seaside	7.3	4.0	5.7	7.7	7.3	4.3	5.0	5.7	5.3	5.3	5.1
SYN-1-88	7.0	5.0	6.3	6.3	4.0	6.3	5.0	4.3	4.7	5.0	5.1
Tendenz	6.3	5.0	5.0	7.0	7.7	5.7	5.7	4.7	4.7	5.0	5.1
SYN 92-2	6.3	6.3	8.0	5.3	8.3	7.3	5.3	4.7	3.3	3.7	4.9
SYN 92-5	7.0	5.7	8.0	5.0	7.0	6.0	5.0	4.7	3.7	4.3	4.7
SR 1020	7.0	6.0	8.0	4.7	7.0	6.7	5.3	4.0	3.0	3.7	4.5
SYN 92-1	6.7	6.3	9.0	3.7	8.7	6.0	4.7	4.0	3.7	3.3	4.3
Crenshaw	7.7	6.0	8.3	4.0	8.3	7.0	4.3	4.0	2.7	3.0	4.2
18th Green	7.7	6.0	7.3	5.0	8.0	5.0	4.3	4.3	3.7	3.3	4.1
LSD Value	1.4	1.5	0.9	1.3	2.6	1.1	1.0	1.2	0.9	0.9	0.5

All parameters were rated on a 0 to 9 scale, where 9 = best. A quality rating of 7 was considered acceptable for a putting green.

TITLE: National Perennial Ryegrass Cultivar Trial

OBJECTIVE: To evaluate perennial ryegrass genotypes for adaptability and performance under Kansas conditions

PERSONNEL: Ward Upham

SPONSOR: National Turfgrass Evaluation Program

INTRODUCTION:

Perennial ryegrasses are used widely in most areas of the United States because they germinate quickly, cover rapidly, and possess good wear tolerance and a rich green color. Recent efforts to improve perennial ryegrasses include selecting for better mowing quality, disease resistance, and stress tolerance.

MATERIALS AND METHODS:

A trial of 96 cultivars was established at the Rocky Ford Turfgrass Research Center during the fall of 1994. The turf was maintained at 3/4 inch. No fungicides were applied so that natural disease resistance could be rated. Turf quality was rated visually, with 0 = dead turf; 6 = acceptable quality; and 9 = optimum color, density, and uniformity.

RESULTS:

Cultivars were evaluated monthly during the growing season for quality. Those that had as average rating of 6.5 or greater included Imagine, Divine, Nine-O-One, Calypso II, Prizm, Laredo, Achiever, and Brightstar. Five cultivars had average ratings of 5.5 or less (Navajo, Pegasus, Pennfine, Figaro, and Linn). Note that no fungicides were used.

Table 1. Performance of perennial ryegrass cultivars at Manhattan, KS, 1995.[1]

Cultivar[2]	Seedling Vigor	Genetic Color	Texture	Visual Quality March	July	September	Average[3]
Brightstar II*	6.7	8.3	6.0	6.7	7.7	7.0	7.4
MB 44	6.3	8.0	6.7	7.3	8.0	6.7	7.4
LRF-94-C7	5.3	7.7	6.0	7.0	7.3	6.7	7.2
LRF-94-C8	6.0	7.7	6.0	7.7	7.0	6.7	7.1
MB 46	6.7	7.7	6.0	7.3	8.0	4.7	7.1
Pick Lp 102-92	6.3	7.0	6.3	6.7	6.7	6.3	7.0
LRF-94-B6	5.3	8.0	7.0	6.3	7.7	5.7	6.9
Divine	6.0	6.3	6.0	6.7	7.0	6.3	6.9
Imagine	6.3	7.0	6.0	6.3	7.0	5.3	6.9
Pick PR 84-91	5.7	6.3	6.3	7.3	7.0	6.0	6.9
BAR USA 94-11	6.3	7.3	6.7	7.0	7.0	6.0	6.9
Nine-O-One	5.3	7.7	6.3	6.7	7.7	6.3	6.9
ZPS-PR1	6.3	7.3	6.7	7.0	8.0	6.7	6.9
Calypso II	7.3	6.7	6.7	6.7	7.3	7.3	6.8

(continued)

Table 1. Performance of perennial ryegrass cultivars at Manhattan, KS, 1995.[1]

Cultivar[2]	Seedling Vigor	Genetic Color	Texture	Visual Quality			
				March	July	September	Average[3]
MB 1-5	6.0	7.3	6.7	7.0	7.3	5.0	6.8
PST-GH-94	6.3	7.0	6.7	6.7	7.0	6.3	6.8
LRF-94-MPRH	6.7	7.3	6.3	6.3	7.3	6.7	6.7
ISI-MHB	6.7	6.0	6.3	7.0	7.0	7.0	6.7
ZPS-2ST	7.3	7.0	6.0	6.3	6.7	7.7	6.7
Laredo*	6.3	7.3	6.3	7.0	6.7	7.0	6.7
Prizm*	6.7	6.3	6.3	7.3	7.0	5.7	6.7
RPBD	6.3	6.7	6.0	6.7	6.7	6.3	6.6
PST-2DGR	6.3	7.0	6.7	6.7	7.0	5.7	6.6
Pennant II*	6.0	7.3	6.0	6.3	7.3	5.3	6.6
J-1706	6.7	6.3	6.3	6.3	7.0	6.3	6.5
MB 47	7.0	6.7	6.0	6.3	6.7	6.3	6.5
Acheiver*	6.0	6.7	6.0	6.7	6.7	7.7	6.5
Brightstar*	6.7	7.0	6.3	5.7	6.3	6.3	6.5
MB 43	6.0	7.0	6.0	5.7	7.0	6.0	6.5
PST-2DLM	6.0	7.3	6.0	6.7	6.3	5.0	6.5
MB 45	7.0	6.7	6.3	6.3	6.3	5.0	6.5
BAR Er 5813	6.3	6.3	6.3	7.0	7.0	6.0	6.4
Cutter*	6.7	6.3	6.0	6.3	6.7	7.3	6.4
MED 5071	7.0	6.0	6.0	6.3	6.3	6.3	6.4
Esquire*	6.3	6.3	6.3	7.0	6.7	6.3	6.4
Manhattan III*	7.3	6.7	6.0	6.0	6.7	6.3	6.4
ZPS-2NV	6.0	7.3	6.0	6.3	7.0	5.7	6.4
Roadrunner*	7.0	6.7	6.0	6.3	7.0	5.3	6.4
WX3-93	6.3	6.0	6.0	6.7	6.3	5.7	6.4
PC-93-1	7.0	6.3	6.0	6.3	6.7	7.3	6.4
PST-2FE	6.7	7.0	6.3	6.0	6.7	6.0	6.3
APR 106	6.7	6.0	6.7	6.7	6.3	7.0	6.3
Top Hat*	7.3	6.0	6.0	5.7	6.3	6.7	6.3
MB 41	6.0	6.7	6.0	6.7	6.3	5.3	6.3
APR 124	6.7	6.7	6.3	6.0	6.3	6.7	6.3
Elf*	6.7	6.3	6.0	7.0	6.3	6.0	6.3
Omni*	5.7	6.7	6.3	6.7	6.3	5.7	6.3
ZSI-E-1	7.0	6.3	6.0	6.3	6.3	6.0	6.3
PST-28M	6.3	6.3	6.0	6.3	6.7	6.3	6.3
Advantage*	6.7	7.0	6.0	6.7	7.0	5.0	6.2
Riviera II*	7.0	6.3	6.3	5.7	6.3	6.0	6.2
ISI-R2	6.3	6.3	6.0	6.7	6.0	6.7	6.2
PST-2FF	6.0	7.0	6.3	6.0	6.3	5.7	6.2
Accent*	7.0	6.0	6.0	6.3	6.0	6.0	6.2
J-1703	6.3	5.7	6.0	6.3	6.3	6.0	6.1
Vivid*	7.0	6.0	6.0	7.0	6.0	6.0	6.1
ZPS-2DR-94	7.0	6.0	6.0	7.0	6.3	5.3	6.1
SR 4200*	6.7	6.7	6.0	6.0	6.7	6.0	6.1
TMI-EXFLP94	7.3	6.0	6.0	6.3	6.3	6.0	6.1
PST-2R3	6.3	6.7	6.0	6.3	6.0	5.7	6.1
Night Hawk*	7.3	6.3	6.7	6.3	6.3	6.0	6.1
CAS-LP23	6.7	6.0	6.3	6.7	6.3	5.7	6.1
PST-2CB	6.3	6.3	6.0	6.0	6.3	5.7	6.1
Quickstart*	6.7	6.3	6.0	6.0	6.3	6.0	6.1

(continued)

Table 1. Performance of perennial ryegrass cultivars at Manhattan, KS, 1995.[1]

Cultivar[2]	Seedling Vigor	Genetic Color	Texture	Visual Quality			
				March	July	September	Average[3]
Stallion*	8.0	6.3	5.7	6.0	6.3	6.3	6.0
Pick 928	7.3	6.0	6.0	6.3	6.3	6.0	6.0
Koos 93-3	7.3	6.0	6.0	6.3	5.7	6.0	6.0
SRX 4010	6.3	6.0	6.0	6.3	6.3	6.3	6.0
MVF-4-1	6.0	6.7	6.3	6.3	6.3	6.0	6.0
Nobility*	7.7	6.7	6.0	6.0	6.7	7.3	6.0
Express*	7.3	6.0	6.0	6.0	6.3	6.7	6.0
Assure*	7.7	6.3	6.0	5.7	6.7	6.7	6.0
LESCO-TWF	6.0	6.7	6.0	6.7	6.7	4.7	5.9
Morning Star*	7.3	6.0	5.7	6.0	6.0	6.7	5.9
Edge*	7.3	6.0	6.0	6.0	6.0	6.3	5.9
Precision*	7.0	6.0	6.3	6.0	6.3	5.7	5.9
APR 131	6.7	6.3	6.0	6.0	6.3	7.3	5.9
WX3-91	6.3	6.0	6.0	6.7	5.7	5.3	5.8
WVPB-93-KJK	7.0	6.3	6.3	6.0	6.0	6.3	5.8
Saturn*	7.0	6.0	6.0	6.0	6.0	5.3	5.8
SRX 4400	7.0	6.0	6.0	5.7	6.3	6.0	5.8
PS-D-9	6.7	6.3	6.0	6.0	6.0	5.7	5.7
WVPB 92-4	7.3	6.0	5.7	6.0	6.0	6.3	5.7
WVPT-PR-C-2	7.0	6.3	6.0	5.7	6.0	5.3	5.7
Williamsburg*	7.0	6.0	6.0	6.0	5.7	6.3	5.7
Koos 93-6	6.7	6.7	6.3	6.3	5.7	5.3	5.7
Dancer*	7.7	6.0	6.0	5.7	5.7	5.0	5.7
Navajo*	7.0	6.0	5.7	5.3	5.7	5.0	5.5
APR 066	6.3	6.0	5.7	5.7	5.7	5.7	5.5
DLP 1305	6.3	6.0	6.0	6.0	6.0	5.0	5.4
Pegasus*	7.3	6.3	7.0	6.0	5.7	5.0	5.2
Pennfine*	6.7	6.3	5.7	5.7	5.0	5.3	5.1
Figaro*	8.0	5.7	6.0	5.3	6.0	4.7	5.0
DSV NA 9401	8.7	5.7	6.0	5.3	5.7	5.3	4.8
DSV NA 9402	8.3	6.0	6.0	4.3	5.7	4.7	4.8
Linn*	9.0	4.0	4.0	4.7	3.7	2.3	3.1

[1] Established Sept 26, 1994. Ratings based on a scale of 0 - 9 w/9 = best vigor, darkest green,and highest quality.

[2] Cultivar names followed by an asterisk are commercially available in the USA.

[3] Average of monthly ratings taken from March through October.

TITLE: National Fineleaf Fescue Cultivar Trial

OBJECTIVE: To evaluate fineleaf fescue genotypes for adaptability and performance under Kansas conditions

PERSONNEL: Ward Upham

SPONSOR: National Turfgrass Evaluation Program

INTRODUCTION:

A number of species are designated as fineleaf fescues. Those found in this trial include chewings fescue (26 cultivars), hard fescue (15 cultivars), sheeps fescue (2 cultivars), and creeping fescue (17 cultivars). All fineleaf fescues have a texture that is finer than Kentucky bluegrass and much finer than any of the tall fescues. Though these fescues have good shade tolerance, they are susceptible to summer heat stress and various diseases. They are better adapted to northern climes and often are thinned severely by our hot summers.

MATERIALS AND METHODS:

A trial of 60 cultivars was established at the Rocky Ford Turfgrass Research Center during the fall of 1993. The turf was maintained at 3 inches. No fungicides were applied so that natural disease resistance could be rated. Turf quality was rated visually, with 0 = brown turf; 6 = acceptable quality; and 9 = optimum color, density, and uniformity.

RESULTS:

Cultivars were evaluated monthly during the growing season for quality. Available cultivars that had an average quality rating of 6.0 or higher included Shademaster II, Brittany, Tiffany, Treazure, Flyer II, Bridgeport, Discovery, and Jaspar. Six cultivars had average quality ratings of less than 5.0. They were Medina, Pamela, Rondo, Quatro, Dawson, and Cascade.

Table 1. Performance of fineleaf fescue cultivars at Manhattan, KS, 1995.[1]

Cultivar[2]	Genetic Color	Texture	Leafspot	Visual Quality			
				March	July	September	Average[3]
Shademaster II*	7.3	6.3	5.7	5.7	6.3	5.0	6.8
Brittany*	5.7	7.3	6.3	6.7	6.7	6.0	6.7
MB64-93	7.3	7.7	5.7	6.0	6.3	5.0	6.6
MB63-93	6.7	7.7	6.3	7.3	6.0	6.0	6.6
MB65-93	7.0	7.3	5.0	6.0	6.7	5.3	6.5
WX3-FF54	6.3	7.7	5.7	6.7	5.7	4.7	6.4
MB61-93	7.3	7.0	5.3	6.7	6.7	5.3	6.4
MB82-93	7.3	7.0	5.3	6.3	6.3	5.7	6.3
Pick 4-91W	5.3	7.7	5.7	6.0	6.0	5.0	6.3
BAR Frr 4ZDB	7.7	6.3	5.3	5.3	6.0	5.3	6.3
ISI-FC-62	7.3	7.3	5.0	6.0	6.3	5.0	6.3
TMI-3CE	6.3	7.3	5.3	6.3	6.3	5.0	6.2
Tiffany*	6.3	7.3	5.0	5.3	6.7	4.7	6.2
Treazure*	6.0	7.0	5.7	6.0	6.3	5.0	6.2
PST-44D	6.0	7.7	5.7	6.3	6.0	5.7	6.2
PST 4VB Endo.	7.3	6.7	5.0	6.0	6.7	4.3	6.2

(continued)

Table 1. Performance of fineleaf fescue cultivars at Manhattan, KS, 1995.[1]

Cultivar[2]	Genetic Color	Texture	Leafspot	Visual Quality			
				March	July	September	Average[3]
Flyer II*	7.7	6.7	4.7	5.7	6.7	5.0	6.1
CAS FR13	7.0	6.0	6.0	6.0	6.0	5.3	6.1
Bridgeport*	7.0	7.0	4.7	6.0	5.7	4.7	6.1
Discovery*	7.3	7.3	5.3	5.7	7.0	5.7	6.1
Jasper*	7.7	6.3	4.7	6.3	5.7	4.7	6.0
NJF-93	6.3	7.3	4.7	6.3	6.3	4.3	6.0
Shadow (E)*	7.0	7.7	5.0	5.3	6.3	4.7	5.9
WX3-FFG6	6.0	6.3	5.7	6.0	6.0	5.0	5.9
PST-4DT	6.7	6.3	4.7	5.7	6.0	4.0	5.8
Reliant II*	5.7	6.7	5.3	5.7	6.3	4.7	5.8
Banner II*	6.0	7.0	4.3	5.7	6.7	4.7	5.8
MB66-93	7.0	6.7	4.7	6.0	6.0	4.3	5.8
Jamestown II*	6.0	7.0	4.7	5.7	6.7	4.3	5.8
Ecostar*	7.3	7.3	4.3	5.7	6.7	4.3	5.8
PRO 92/20	6.0	6.7	4.7	6.0	6.3	4.7	5.8
Auroroa/Endophy*	6.3	6.7	4.7	5.7	6.0	4.3	5.8
Jamestown*	7.0	7.0	4.7	6.0	7.0	3.7	5.8
PRO 92/24	6.3	6.7	5.3	6.7	6.7	5.3	5.7
PST-4ST	6.7	6.3	4.3	4.7	6.7	4.3	5.7
Flyer*	5.3	6.3	4.3	5.3	5.3	4.7	5.7
Molinda*	6.3	7.3	5.3	5.7	5.0	4.7	5.7
Victory (E)*	6.0	7.0	3.7	5.7	6.0	5.3	5.6
SR 3100*	6.7	7.0	5.0	5.7	6.7	4.3	5.6
SR 5100*	7.0	7.3	5.7	6.3	5.7	4.3	5.6
MED 32	6.0	6.3	5.3	6.3	5.3	5.0	5.6
Brigade*	6.3	6.7	4.3	6.0	6.7	3.7	5.6
Common Creeping*	6.0	6.7	5.0	5.0	6.0	4.0	5.5
Aruba*	4.3	6.3	6.0	5.7	5.3	5.0	5.5
BAR UR 204	5.3	6.7	4.7	5.7	5.7	4.3	5.5
MB81-93	6.7	7.3	4.3	6.0	5.0	4.3	5.5
Seabreeze*	7.7	7.3	4.3	5.7	6.7	3.7	5.5
Nordic*	7.3	7.0	4.3	6.0	5.3	4.3	5.5
MB83-93	6.3	7.0	4.3	5.3	5.3	4.0	5.3
Darwin*	6.0	7.7	4.0	5.0	5.3	4.0	5.3
Spartan*	6.0	6.7	4.7	5.3	5.0	4.0	5.3
Medina*	5.7	7.7	4.0	5.3	4.7	4.0	5.2
Scaldis*	5.7	7.0	4.7	5.7	5.3	4.0	5.0
Pamela*	7.3	7.0	4.0	5.0	5.0	3.3	4.9
Rondo*	5.3	7.0	4.3	4.7	6.3	3.3	4.9
WVPB-STCR-101	6.3	7.0	5.3	5.0	5.3	4.7	4.8
Quatro*	6.0	6.0	4.0	5.0	5.0	3.0	4.8
Dawson*	6.3	7.0	3.3	4.3	6.0	2.7	4.6
Cascade*	6.3	6.7	2.3	5.3	5.7	2.7	4.6
67135	5.7	6.0	3.0	5.3	2.7	3.3	4.2

[1] Established Sept 9, 1993. Ratings based on a scale of 0 - 9 w/9 = least disease, darkest green and highest quality.

[2] Cultivar names followed by an asterisk are commercially available in the USA.

[3] Average of monthly ratings taken from March through October.

TITLE: National Buffalograss Cultivar Trial

OBJECTIVE: To evaluate the performance of 22 buffalograss cultivars and experimental selections under Kansas conditions

PERSONNEL: John C. Pair, Yaling Qian, and Ned Tisserat

SPONSOR: National Turfgrass Evaluation Program

INTRODUCTION:

Buffalograss is the only native species used for turfgrass in Kansas. Its heat and drought tolerance and the introduction of many new selections have aroused considerable interest in growing buffalograss in low maintenance turf situations. In addition, both seeded and vegetative types are now available but not yet fully evaluated. Evaluation was done in Wichita and Manhattan.

MATERIALS AND METHODS:

Wichita

As part of the National Turf Evaluation Program sponsored by USDA, 22 selections were established at the Horticulture Research Center on July 1, 1991. All entries, even seeded types previously sown in the greenhouse, were plugged on 1-ft centers. Fertilizer was incorporated lightly at a rate of 1 lb of N/1000 sq ft as 13-13-13 prior to planting. A preemergent herbicide, XL granules containing Surflan and Balan, was applied at 100 lbs/a (2.12 lbs/1000 sq ft) on July 2 after planting. In 1994 and 1995, the preemergent Dimension was applied. Plots were maintained under a low fertility regime of 2 lbs N /1000 sq ft per season and moderate drought stress with only occasional irrigation. Plots were split with mowing heights of 1½ and 3 in with clippings returned for 1992-94. In 1995, a mowing height of 3 in was resumed for all plots.

Manhattan

Cultivars were plugged in June 1991 at the Rocky Ford Turfgrass Research Center. In 1994, fertilizer was applied in July to provide 1 lb of N/1000 sq ft. Turf was mowed weekly at 2.5 in. No irrigation was applied. Turf quality was rated on a 0 to 9 scale based on overall appearance, where 9 = optimum quality. Quality components were color, density, sex expression, plot coverage, and turf vigor. Grass green up was rated in May on a 0 to 9 scale, with 9 = best. Wilt was rated in September on a 0 to 9 scale, where 0 = brown and 9 = wilt.

RESULTS:

Wichita

Data were taken on genetic color, density and visual turf quality. Selections rated superior in density included AZ143, Buffalawn, NE84-315, NE84-436, NE85-378, and NTDG-2. NE84-609 was rated highest quality under a mowing height of 1.5 inches. In 1995, cultivars that appeared to have above-average turf quality when mowed at 3 inches were 84-609, Bison, Texoka, NTDG-4, Sharp's Improved, NE85-378, Prairie, NTDG-1, and NTDG-5 (Table 1). Some leafspot was noted in July on NTDG-4, NE85-378, NTDG-5, NTDG-2, NTDG-3, and AZ143.

Some herbicide injury occurred when Trimec was applied on August, 1993. Although the temperature was below 85°F on the day of application, it rose to near 90°F on the following day. The response appeared to be varietal, and NE84-45-3, AZ143, Highlight 25, Prairie, and Plains were most affected, but all recovered from injury in a few days. NE85-378 was largely unaffected.

<u>Manhattan</u>

Several cultivars exhibited slow green-up and/or winter injury (ratings 6/10/95). Plots containing the cultivars NE 84-609, Buffalawn, Highlight, and Rutgers had less than 50% green turf at the time of ratings. In addition, many of the cultivars exhibited circular patches of dead turf ranging in size from 6 inches to 2 feet in diameter. The fungus (*Ophiosphaerella herpotricha*) that causes spring dead spot of bermudagrass was isolated consistently from roots collected in the damaged areas. Spring dead spot areas were noted on the cultivars Buffalawn, Prairie, Sharp's Improved, NTDG 1 through 5, Bison, and Plains. This is the first report of spring dead spot occurrence on buffalograss.

Table 1. Performance of buffalograss cultivars and experimental numbers at Wichita, KS, 1995[1]

Cultivar Name	Green-up 5-4-95	Visual Quality 6-30-95	7-26-95	8-18-95	9-26-95	Avg.
NE 84-609	8.2	8.3 DG	8.3 DG	8.5	8.5	8.4
Bison	7.7	7.3	8.0 DG	8.3 DG	6.7	7.6
TEXOKA	7.5	7.8 SF	7.2	7.8	7.5	7.6
Sharp's Impr.	7.3	7.7	7.3	7.8	6.8	7.4
NTDG-4	7.2	7.3	6.5 LS	8.0	7.8	7.4
NE 85-378	8.7	7.8	6.3 LS	8.3 DG	6.8	7.3
Prairie	6.8	7.3 LG	7.0 LG	7.0 LG	7.7	7.3
NTDG-1	7.3	7.7	6.7	7.8	6.8	7.3
NTDG-5	7.0	7.7	6.0 LS	7.7	7.2	7.2
NTG-2	6.8	7.5	6.0 LS	7.8	6.8	7.0
NTDG-3	7.3	7.5	6.3 LS	7.0	7.0	7.0
Topgun	7.2	7.2	6.5	7.5	6.7 W	7.0
NE 84-436	7.3	7.5	6.0	7.7	6.8	7.0
NE 84-45-3	8.7 W	7.5 SF	7.0	7.2	5.7 W	6.9
Buffalawn	3.3	8.0 LG	5.7 LG	6.5 LG	6.0 LG	6.6
Highlight	3.0 W	6.0	4.7 LG,W	5.3 LG	5.3 LG	6.6
Rutger's	3.7	7.7	5.8 LG	6.2 LG	5.7 LG	6.4
Plains	6.7	6.0	6.0	7.2	6.0 W	6.3
NE 84-315	6.8	6.2	6.0	6.8 W	6.3 W	6.3
AZ143	8.0	6.3 LS	4.3 LS	7.2	6.0	6.0
Highlight 4	3.3	6.8	5.7 LG,W	5.7 LG	5.7 LG	6.0
Highlight 15	3.7	6.8 LG	6.3 LG	4.3 T,LG	5.7 LG	5.8

[1/]Rated on a scale of 0-9 w/9=best. Symbols: DG=dark green, LG=light green, LS=leafspot, and W=weedy.

Table 2: Performance of buffalograss cultivars at Manhattan, KS, 1995.

Cultivar[1]	Green-up[2]	Quality		
		June	July	Avg.
NE 84-378	7.7	7.0	7.5	7.3
NE 84-436	7.7	6.5	6.7	6.6
Texoka*	7.3	6.2	6.8	6.5
AZ 143	7.3	6.5	6.5	6.5
NTDG-3*	6.8	5.3	6.7	6.0
NE 84-315	6.7	5.3	6.5	5.9
NTDG-4*	6.3	5.5	6.3	5.9
Top Gun*	6.8	5.2	6.4	5.8
NTDG-5*	7.0	4.8	6.3	5.6
NTDG-2*	6.7	4.7	6.3	5.5
Sharp's Improved*	6.0	4.2	6.5	5.3
NTDG-1*	6.0	4.2	6.0	5.1
Plains*	6.0	4.3	5.7	5.0
Bison*	5.3	4.0	5.8	4.9
Buffalawn	3.3	2.2	6.0	4.1
Prairie	4.0	3.5	4.7	4.1
NE 84-45-3	5.3	3.3	4.5	3.9
Highlight 25	2.7	1.0	4.7	2.8
609	3.3	2.2	3.3	2.8
Rutgers	3.0	1.2	4.0	2.6
Highlight 15	2.7	1.2	3.8	2.5
Highlight 4	2.3	0.7	2.0	1.3
MSD[3]	1.5	1.3	1.6	1.2

[1]Cultivar names followed by an asterisk are seeded rather than vegetatively propagated.

[2] Green-up and quality were rated visually on a 0 to 9 scale, where 0 = most brown at green-up and low quality and 9 = most green at green-up and best quality.

[3] MSD = If the difference between two cultivar means is larger than the MSD value, they are significantly different.

TITLE: Zoysiagrass Cultivar Performance at Wichita

OBJECTIVE: To evaluate 24 cultivars and experimental numbers under Kansas conditions

PERSONNEL: John C. Pair and Ned Tisserat

SPONSOR: National Turfgrass Evaluation Program

INTRODUCTION:

Zoysiagrass is one of the hardiest warm-season turfgrass species grown in the transition zone. In addition to common Korean zoysiagrass (Zoysia japonica), few cultivars have been introduced that offer advantages of more rapid establishment and higher turf qualities. As water restrictions increase, this drought-resistant species may again become a popular choice, especially if more attractive cultivars are available.

MATERIALS AND METHODS:

Twenty-four selections, including the standard Meyer (Z-52) were provided by USDA-NTEP for evaluation. All were established at the Horticulture Research Center, Wichita from vegetative plugs on June 11, 1991 on 12-inch centers. Fertilizer was incorporated prior to planting at the rate of 1 lb N-P-K/1,000 sq ft as 13-13-13. An additional application of fertilizer containing Atrazine was made later in the summer. Plots were maintained at 2 lbs N per 1,000 sq ft per year for the duration of the trial. Mowing was at 1 inch with clippings returned.

RESULTS:

Preliminary data indicate much more rapid establishment for Korean Common. Atrazine injury occurred on J2-1, Belair, and TGS-B10. Winter injury was apparent on Belair, Emerald, DALZ 8501, DALZ 8502, DALZ 8508, DALZ 8701, and JZ-1, perhaps partially because of the phytotoxicity of Atrazine on certain cultivars. Early spring green-up was particularly good on CD 259-13, DALZ 8508, TC 5018, TC 2033, Meyer, Emerald, Belair, Sunburst, and DALZ 9006 (Table 1).

The most vigorous and quickest to cover was DALZ 8512, which fully covered the plots in 11 months when planted on 12-inch centers. Other vigorous selections were El Toro, DALZ 8514, GT 2057, CD 2013, TC 5018, and TC 2033. Selections with highest quality ratings in 1995 were TC 2033, TC 5018, DALZ 8514, Meyer, Emerald, DALZ 8508, and DALZ 9006.

Table 1. Performance of Zoysia cultivars and experimental numbers at Wichita, KS, 1995 .

Cultivar or	Green-up	Color	Texture	Visual Quality				
Exp. No's.	5-17-95	6-30-95	6-30-95	6-30-95	7-23-95	8-31-95	9-27-95[1/]	Avg.
TC 2033	8.5	7.3	7.3	7.8	7.8	8.0	9.0	8.2
DALZ 8514	8.0	7.0	5.3	7.8	7.5 DG	8.0	7.8 C	7.8
Meyer	8.3	8.3	6.0	7.7	7.3 DG	7.8	8.5	7.8
TC 5018	8.7	7.3	4.7	7.3	7.7 DG,C	8.0 C	8.0	7.8
Emerald	8.3	7.8	8.3	8.0 F	7.5 F	7.2 F	8.2 F	7.7
DALZ 8508	8.8	6.3	8.0	7.2 LG,F	7.2 LG,F	7.7	8.5	7.7
DALZ 9006	8.2	6.0	8.7	7.5 LG,F	7.5 F	7.2 F	8.2	7.6
GT 2013	8.0	6.0	7.3	7.3	7.0 LG	7.3 DG	8.0	7.4
GT 2004	7.7	5.7	7.3	7.0 LG	7.2 F	7.5 F	8.0	7.4
CD 259-13	9.0	7.7	5.7	7.3	6.7	7.7	7.7	7.4
DALZ 8507	7.7	7.7	8.0	7.8 LG,F	6.5 Cg,F	7.3 F	7.7 CG,F	7.3
DALZ 8516	6.8	6.7	6.3	6.8	7.0 DG,Cg	7.2 Cg	8.0 Cg	7.3
Belair	8.3	8.5	5.3	7.2 T	6.5 C	7.2 Cg	7.2 Cg	7.0
*TGS-B10	7.3	8.0	3.7	6.0 C	7.0 DG,C	7.5	7.7	7.1
DALZ 8502	5.7	6.7	9.0	7.0 F,T	6.3 F	7.2 Xf	7.7 Cg,F	7.1
Sunburst	8.3	5.3	5.0	6.8	6.2 LG	7.0	8.3	7.1
El Toro	8.0	6.7	5.3	7.0	7.3 C	8.0 C	8.0 DG,C	7.1
DALZ 8512	7.3	7.0	4.7	6.8 C	6.3 C	7.5 C	7.3 DG,C	7.0
DALZ 8501	5.0	5.7	8.7	6.3 LG,F	6.5 F,LG,Cg	7.0 F	7.3	6.8
GT 2057	7.7	6.7	5.7	7.0	6.2 LG	6.3	7.3	6.7
*TGS-W10	5.7	8.3	4.0	6.0 C	5.7 Cg,DG,C	5.7 Cg	6.7 Cg,C	6.0
*Korean Common	7.7	8.0	2.3	5.0 C,T	5.3 C	6.0 C	6.7 Cg,C	5.8
*JA-1(lot # A89-1)	6.7	7.7	3.0	5.7	5.0 C	5.7 C,Cg	6.0 Cg,C	5.6
DALZ 8701	4.0	5.3	8.3	5.0 Cg	5.0 Cg,$	4.3 Cg	6.0 Cg	5.1

[1/] Frost on Sept. 22 had browned crabgrass but hardly discolored zoysia.

* Seeded variety. Established June 11, 1991 in 8' x 10' plots with plugs 1' on center. Fertilizer incorporated at rate of 1 lb N-P-K per 1,000 sq ft before planting.

LG=light green, DG= dark green; F=fine; C=coarse, T=thin, Cg=crabgrass invasion, D=dense, $=dollar spot, Xf=extra fine.

TITLE: National Bermudagrass Cultivar Trial

OBJECTIVE: To evaluate both seeded and vegetative cultivars and experimental numbers for performance under Kansas conditions

PERSONNEL: John C. Pair and Ned Tisserat

SPONSORS: National Turfgrass Evaluation Program

INTRODUCTION:

Greater hardiness and finer quality of new bermudagrass introductions have once again aroused the interest of turfgrass managers in this wear-resistant and low water-demand turf species. The development of hardy seeded types provides greater winter survival than available with Arizona common. New vegetative cultivars with spring dead spot resistance and greater sod strength offer more choices for both sod growers and consumers.

MATERIALS AND METHODS:

A national turf evaluation program (NTEP) cultivar trial, coordinated by USDA and consisting of 26 selections, was established at the Horticulture Research Center, Wichita on June 23, 1992. Entries included 16 seeded types and 10 vegetative selections. Four miscellaneous KSU clones also were included. Plots were maintained at 4 lb actual N/1,000 sq ft and mowed at 1 in with clippings removed. Characteristics rated included color, texture, and visual quality from May to September and spring green-up in April. In subsequent years, resistance to spring dead spot will be evaluated.

RESULTS:

In preliminary observations during the first season, highest quality ratings were given to vegetative types Midlawn, Midway, and Tifway, although the latter is not expected to be hardy in Kansas. The highest rated seeded types were Sundevil, Sonesta, FMC 1-90, and OKS 91-11, which also exhibited early green-up as did 90173, J-27, and Guymon. Darkest green color occurred on Tifway, FHB-135 and, Texturf 10, followed closely by Midlawn and TDS-BM1. Finest texture was rated on FHB-135 (a very refined Florida introduction of doubtful hardiness). Midiron and Midlawn continued to exhibit excellent hardiness and early green-up (Table 1). Hardiness of bermudagrass following the conditions of the past winter had not been rated when this report was printed. Some injury is expected following the -10°F during early February.

Improved cultivars continue to outperform Arizona Common, with the highest overall quality given to Tifway (tender), Midfield, Midlawn, STF-1 and Midiron, all vegetative types. Highest rated seeded types were OKS 91-11, J-7, Guymon, and 90173. Earliest green-up occurred on 90173, OKS 91-11, and Midiron. Miscellaneous clones A-7 and A-12 also excelled in early spring green-up and overall quality.

Table 1. Performance of bermudagrass cultivars and experimental accessions at Wichita, KS, 1995 [1/].

	Green-up	Unmow.	Color	Texture	Quality					
Name	5-4	Ht.(in.)	8-25	8-25	5-31-95	6-30-95	7-25-95	8-23-95	*9-27-95	Avg.
Seeded Entries										
Sundevil	4.7	9.3	6.5	4.7	4.3 T	7.0	6.0 SH,C	6.5	7.3	7.8
Sonesta	3.3	9.5	6.3	5.3	6.5 C	6.2 W	6.7 SH,DG	5.7 O,W	6.7	7.6
FMC 1-90	4.3	8.8	5.3	5.8	6.3	6.3	6.3 SH	5.7 LG	6.7	7.5
OKS 91-11	7.2	6.4	7.3	5.8	6.3 C	7.7 DG	7.3 FSH	7.7 DG	8.0	7.4
J-27	7.3	7.5	7.0	4.7	4.8 T,W	7.7 DG	7.3 FSH,DH	7.3 DG	7.3 DG	6.9
Guymon	6.7	7.6	7.0	4.3	4.3 T,W	7.8 DG	6.5 SH,C	7.3 DG	7.5 DG	6.7
90173	7.7	7.1	7.0	5.2	3.8 T,W	7.7	6.7 FSH	6.8 DG	7.8	6.6
FMC 6-91	3.0	8.3	6.2	6.2	4.3 T,W	7.2 DG	7.0 SH	6.3 W	7.0	6.4
MC F5-91	3.0	8.2	6.8	5.3	5.7 W,C	6.3	6.7 SH	6.7	6.8	6.4
J-912	3.7	7.1	7.2	6.0	4.2 T,W	7.2	6.7 DH,SH	6.8 DG	7.0	6.4
FMC 2-90	3.3	8.7	6.2	5.7	4.3 T,W	6.5	6.8 SH,DG	6.5	6.8	6.2
Cheyenne	4.3	9.8	6.2	5.8	4.3 T,W	6.2	6.3 FSH,LG	6.3	6.7	6.0
OKS 91-1	3.7	8.3	5.7	5.0	4.5 T,W	6.8	6.0 LG,W	5.7	6.8	6.0
FMC 3-91	3.0	9.5	6.2	5.5	5.7 LG,C	5.8	5.5 SH,LG	6.2	6.8	6.0
Arizona Common	4.0	8.8	5.3	5.8	3.8 T,W	6.0	6.8	5.8 W	6.7	5.8
Sahara	3.0	8.7	5.8	4.7	4.5 T,W	5.5	5.7 LG,SH	5.7 C,W	6.0 C	5.5
Vegetative Entries										
Midfield	6.8	6.1	6.0	5.7	7.8 DG	8.5 DG	8.0	8.2	8.3	8.2
Tifway	5.8	5.7	8.8	8.0	4.3 W,F	8.8 DG	9.0 FSH,DG	8.5 DG	8.7	7.9
A-7	7.2	5.6	6.5	6.8	7.5 DG,F	8.0 DG	8.0	8.0	8.0	7.9
E-7	7.3	6.2	6.7	6.7	7.2 LG	8.3	8.0	7.3	7.7	7.7
STF-1	4.7	5.7	6.8	5.7	5.7 LG,T	8.5 DG	8.0 SH	8.3	8.0	7.7
Midlawn	6.2	5.2	7.8	7.3	3.7 W,C	8.7 DG	8.7	8.0	8.5 DG	7.5
Midiron	7.2	5.8	6.0	6.0	6.5 T	8.2 DG	7.8 SH	7.0	8.2	7.5
TDS-BMI	4.7	2.8	7.8	7.7	6.5 LG	7.5	7.5	7.7	8.0	7.4
A-12	7.3	5.3	6.8	6.7	4.8 T,W	8.0	7.8	7.8	8.0	7.3
Texturf 10	4.3	5.5	8.3	5.3	6.8	7.5 DG	7.8 DG	6.8 DG	7.0	7.2
Tifgreen	5.0	2.8	7.2	7.3	5.0 T,W	7.8	7.2 SH	7.7 SH,F	7.8	7.1
Arizona Common	4.2	8.8	6.2	4.3	7.7	5.3 W	6.5 C,W	6.0 C	6.0 Cg,C	6.3
FHB-135	2.7	0.5	8.8	9.0	6.8 LG	7.0 DG,F	6.3 F,W	7.0 DG,F	4.7 W,T	6.2

[1/]Established on June 23, 1992. Ratings based on a scale of 0 to 9 w/0 = dead and 9 = ideal turf.
Symbols: C= coarse, SH=seed heads prominent, FSH=few seed heads, F = fine, DG = dark green, LG=light green, O=open, W=weedy, kCg=crabgrass, T=thatchy.
*Frost on Sept. 22 had discolored bermuda (but not zoysia). Rated in spite of "ice nucleation" pattern evident on most plots.

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