4

# 1991 TURFGRASS RESEARCH

## KANSAS TURFGRASS FOUNDATION

REPORT OF PROGRESS 633

**Agricultural Experiment Station • Kansas State University, Manhattan • Walter R. Woods, Director**

## TABLE OF CONTENTS

**Cultivar Evaluations:**



**Pest Control:**



**Cultural Practices:**



Contribution No. 91-519-S from the Kansas Agricultural Experiment Station.

**TITLE:** National Bermudagrass Cultivar Trial

**OBJECTIVE:** To compare hardiness and turf quality of numerous cultivars and experimental numbers of bermudagrass

**PERSONNEL:** John C. Pair and Jeff Nus

**INTRODUCTION:** Much of Kansas is located in the transition zone for turfgrass. Bermudagrass is susceptible to winterkill, and efforts to breed for improved germplasm require evaluation of new cultivars.

**MATERIALS AND METHODS:**

Sprigs were received from the National Turfgrass Evaluation Program in 1986 and planted into flats in the greenhouse. Most were propagated vegetatively, but several were seeded cultivars. All were later sprigged at both Wichita and Manhattan to compare hardiness and turf quality through 5 years of varying weather conditions.

Twenty-eight accessions were established in a randomized complete design with three replications. Mowing was at 1-inch with clippings removed, and nitrogen was applied at 1 pound actual N per 1,000 square feet per growing month, May through August.

**RESULTS:**

Monthly quality ratings indicated highest quality in 1989 at Manhattan for MSB-101, NM 43, Tifway, Tifway II, A-22, Tufcote, Tifgreen, and Texturf 10. However, following record low temperatures in December, 1989, most were winter killed except A-22, a Kansas State University entry in the national trial.

At Wichita, following -18°F on December 22, 1989, significant injury occurred and over half the bermudagrasses in the trial died completely. Hardiest selections surviving included E-29, A-29, A-22, and Midiron, all KSU introductions, plus Guymon, an Oklahoma State University development (Table 1). Highest quality in June and July occurred for E-29, A-29, and A-22. Guymon, a seeded cultivar, is somewhat coarsely textured and open growing but appears very adaptable to athletic field turf.

As shown in Table 1, additional numbered accessions are being maintained because of hardiness and high quality under low maintenance conditions. Examples of those possessing good hardiness include A-7, A-12, and E-7, all superior to Midway, a once popular home lawn type.

Table 1. Performance of Bermudagrass Cultivars at Wichita, KS 1/

| Cultivar Name/No. | Green-up 5-9-90 | Visual Quality (0-9 w/9 = best) 6-15-90 | 7-13-90 | Season Avg. |
|---|---|---|---|---|
| CT-23 | 0 | -- | -- | -- |
| NM 43 | 0.5 | 0.5 | 1.0 | 0.8 |
| NM 72 | 0 | -- | -- | -- |
| NM 375 | 0 | -- | -- | -- |
| NM 471 | 0 | -- | -- | -- |
| NM 507 | 0 | -- | -- | -- |
| Vamont | 0.7 | 2.7 | 3.7 | 2.4 |
| E-29 | 6.0 | 7.5 | 8.0 | 7.2 |
| A-29 | 6.0 | 7.8 | 8.0 | 4.6 |
| RS-1 | 2.3 | 5.3 | 6.3 | 4.6 |
| MSB-10 | 0 | 1.0 | 1.7 | 0.9 |
| MSB-20 | 0 | 0.5 | 0.3 | 0.3 |
| MSB-30 | 0.3 | 2.0 | 2.7 | 1.7 |
| A-22 | 3.7 | 6.3 | 8.5 | 6.2 |
| Texturf 10 | 1.3 | 2.5 | 3.0 | 2.3 |
| Midiron | 3.3 | 7.0 | 7.7 | 6.0 |
| Tufcote | 0 | 1.2 | 1.3 | 0.8 |
| Tifgreen | 0 | 0.7 | 1.0 | 0.6 |
| Tifway | 0 | -- | -- | -- |
| Tifway II | 0 | 1.0 | 1.3 | 0.8 |
| NMS 1 | 0 | -- | -- | -- |
| NMS 2 | 0 | -- | -- | -- |
| NMS 3 | 0 | -- | -- | -- |
| NMS 4 | 0 | -- | -- | -- |
| NMS 14 | 0 | -- | -- | -- |
| Arizona Common | 0 | -- | -- | -- |
| Guymon | 6.3 | 6.0 | 6.3 | 6.2 |
| FB-119 | 0 | -- | -- | -- |
| A-7 | 6.0 | 7.0 | 7.3 | 6.8 |
| A-12 | 7.3 | 7.3 | 7.7 | 7.4 |
| Q-12 | 2.7 | 4.5 | 7.2 | 4.8 |
| P-1 | 3.0 | 4.7 | 8.0 | 5.2 |
| E-7 | 5.3 | 7.0 | 7.5 | 6.6 |
| Sunturf | 0.5 | 1.3 | 1.7 | 1.2 |
| Midway | 3.7 | 5.8 | 7.7 | 5.7 |
| U-3 | 0 | -- | -- | -- |

1/ Rated on a scale of 0-9, with 0 = dead and 9 = most green-up and highest visual quality.

**TITLE:** National Kentucky Bluegrass Cultivar Trial

**OBJECTIVE:** To evaluate commercial and experimental genotypes of Kentucky bluegrass for their adaptability under Kansas conditions

**PERSONNEL:** John C. Pair, Roch Gaussoin, and Jeff Nus

**INTRODUCTION:**

Kentucky bluegrass is one of the most widely used turfgrass species in the United States. It forms a dense, high quality sward of rich green color. Under Kansas conditions, however, it often does not perform well during mid-summer, because it lacks a high degree of heat and drought tolerance. Trials were initiated in both Manhattan and Wichita to test Kentucky bluegrass genotypes from the National Turfgrass Evaluation Program for their adaptability to Kansas conditions.

**MATERIALS AND METHODS:**

Manhattan

Seventy-two Kentucky bluegrass cultivars were planted in Section II of the Rocky Ford Turfgrass Research Plots during the first week of March, 1986. The planting utilized a completely randomized block design with 72 cultivars replicated three times each into individual 1 X 2 meter plots. A complete (20-20-20) fertilizer was applied immediately after seeding at 1 lb. N per 1000 sq. ft. Plots received 4 lbs. of nitrogen per 1000 sq. ft. per season and were irrigated to prevent severe water stress. Data collected included a subjective monthly quality rating.

Wichita

A trial of 72 cultivars and experimental numbers was established on September 18, 1985. Plots were maintained at 4 lbs. N/1000 sq. ft. per year, mowed at 2 $^{1}/_{2}$ in. with clippings removed, and irrigated to prevent excessive stress. Team (Balan/Treflan) was applied in April and June to prevent crabgrass.

**RESULTS:**

Best performing cultivars at Manhattan were Midnight, Bristol, America, Blacksburg, Coventry, Chateau, Baron, Challenger, Cheri, Lofts 1757, Nassau, Sydsport, Able 1, Aspen, Gnome, and Ram I. Similar results were obtained at Wichita. After 5 years, top performing cultivars and experimental numbers were Midnight, P-104, Blacksburg, Challenger, Victa, Eclipse, Lofts 1757, Bristol, Nassau, Destiny, America, Ba 73-626, Ba 72-500, Merit, and Glade (Table 1). Preliminary data on the new low maintenance trial appear in Table 2.

Table 1. Performance of Bluegrass Cultivars at Wichita, KS 1/

| Cultivar | 1986 | 1987 | 1988 | 1989 | 1990 | Avg. |
|---|---|---|---|---|---|---|
| Midnight | 7.9 | 8.2 | 8.0 | 8.3 | 8.2 | 8.1 |
| P-104 | 7.1 | 8.0 | 8.0 | 8.2 | 7.5 | 7.7 |
| Blacksburg | 7.8 | 7.8 | 8.1 | 7.8 | 7.2 | 7.7 |
| Challenger | 7.2 | 7.6 | 7.5 | 7.2 | 7.8 | 7.5 |
| Victa | 7.2 | 7.2 | 7.7 | 7.1 | 7.7 | 7.4 |
| Eclipse | 7.3 | 7.6 | 7.5 | 7.4 | 7.0 | 7.4 |
| Lofts 1757 | 7.5 | 7.4 | 7.3 | 8.0 | 7.0 | 7.4 |
| Bristol | 7.5 | 7.2 | 7.2 | 7.2 | 7.2 | 7.3 |
| Nassau | 7.4 | 7.3 | 7.5 | 7.0 | 7.5 | 7.3 |
| Destiny | 7.3 | 7.1 | 7.5 | 6.6 | 7.8 | 7.3 |
| America | 7.2 | 7.1 | 7.6 | 7.6 | 7.0 | 7.3 |
| Ba 73-626 | 7.2 | 7.3 | 7.5 | 6.9 | 7.7 | 7.3 |
| Merit | 6.6 | 7.1 | 7.4 | 7.5 | 7.2 | 7.2 |
| Ba 72-500 | 7.5 | 7.2 | 7.3 | 5.7 | 8.2 | 7.2 |
| Glade | 7.5 | 7.3 | 7.6 | 6.8 | 6.7 | 7.2 |
| Aspen | 7.1 | 6.9 | 7.1 | 7.2 | 7.2 | 7.1 |
| Merion | 6.9 | 6.8 | 7.4 | 7.2 | 7.0 | 7.1 |
| Cheri | 7.3 | 7.3 | 7.6 | 5.7 | 7.5 | 7.1 |
| WW Ag 468 | 7.0 | 7.6 | 7.2 | 6.2 | 7.5 | 7.1 |
| Tendos | 7.1 | 7.0 | 7.4 | 6.9 | 7.3 | 7.1 |
| Ba 72-441 | 7.2 | 6.9 | 7.0 | 6.7 | 7.2 | 7.0 |
| Ba 70-242 | 7.1 | 6.9 | 7.2 | 6.4 | 7.2 | 7.0 |
| Ikone | 7.3 | 7.0 | 7.3 | 5.4 | 8.0 | 7.0 |
| Sydsport | 7.2 | 7.3 | 7.5 | 6.0 | 7.0 | 7.0 |
| WW Ag 496 | 6.9 | 6.8 | 7.3 | 6.6 | 7.3 | 7.0 |
| Asset | 7.2 | 6.8 | 7.1 | 6.2 | 7.5 | 7.0 |
| Ba 73-540 | 7.4 | 7.5 | 7.3 | 4.5 | 8.3 | 7.0 |
| Baron | 6.7 | 7.2 | 7.3 | 6.7 | 7.2 | 7.0 |
| Georgetown | 7.0 | 6.8 | 7.1 | 7.0 | 6.8 | 6.9 |
| F-1872 | 6.9 | 7.0 | 6.8 | 7.1 | 6.5 | 6.9 |
| Gnome | 6.6 | 6.8 | 7.2 | 6.7 | 7.0 | 6.9 |
| Dawn | 7.2 | 7.1 | 7.3 | 5.8 | 7.3 | 6.9 |
| Liberty | 7.1 | 6.9 | 7.0 | 6.7 | 6.8 | 6.9 |
| A-34 | 7.0 | 7.2 | 7.2 | 6.4 | 6.5 | 6.9 |
| Parade | 7.0 | 7.0 | 7.0 | 7.2 | 6.2 | 6.9 |
| Ba 69-82 | 7.4 | 7.3 | 7.4 | 4.9 | 7.5 | 6.9 |
| Haga | 7.0 | 6.9 | 6.8 | 6.9 | 6.5 | 6.8 |
| Julia | 7.2 | 6.6 | 6.9 | 5.4 | 7.7 | 6.8 |
| Welcome | 7.2 | 6.6 | 7.2 | 5.6 | 7.5 | 6.8 |
| Ba 70-139 | 7.6 | 7.0 | 7.2 | 4.2 | 8.0 | 6.8 |
| Ba 72-492 | 7.3 | 6.8 | 7.3 | 5.3 | 7.3 | 6.8 |
| PST-CB1 | 6.9 | 6.7 | 7.1 | 6.6 | 6.8 | 6.8 |
| Trenton | 7.0 | 6.7 | 6.9 | 7.1 | 6.2 | 6.8 |
| Rugby | 6.8 | 6.8 | 7.0 | 7.0 | 6.3 | 6.8 |
| Classic | 6.6 | 7.0 | 6.9 | 6.7 | 6.3 | 6.7 |
| K3-178 | 6.9 | 6.9 | 6.7 | 6.9 | 6.2 | 6.7 |
| Harmony | 7.1 | 7.0 | 6.9 | 5.4 | 7.3 | 6.7 |
| Barzan | 6.8 | 6.8 | 6.9 | 6.0 | 7.0 | 6.7 |
| Able I | 6.8 | 6.6 | 7.1 | 5.9 | 7.2 | 6.7 |

Table 1 (cont'd.)

| Cultivar | 1986 | 1987 | 1988 | 1989 | 1990 | Avg. |
|---|---|---|---|---|---|---|
| Ram-1 | 6.7 | 6.3 | 7.1 | 5.4 | 7.8 | 6.7 |
| BAR VB 577 | 6.9 | 6.8 | 6.9 | 5.6 | 7.5 | 6.7 |
| HV 97 | 7.1 | 6.9 | 7.1 | 5.7 | 6.8 | 6.7 |
| Amazon 239 | 6.7 | 6.8 | 7.0 | 6.5 | 6.0 | 6.6 |
| Annika | 5.9 | 6.5 | 7.1 | 6.0 | 7.7 | 6.6 |
| WW Ag 495 | 7.5 | 6.3 | 7.1 | 5.1 | 7.0 | 6.6 |
| K1-152 | 6.8 | 6.7 | 6.6 | 6.9 | 5.8 | 6.6 |
| Somerset | 6.4 | 6.8 | 6.6 | 6.7 | 6.3 | 6.6 |
| NE 80-88 | 7.2 | 6.4 | 7.1 | 5.6 | 6.8 | 6.6 |
| BAR VB 534 | 6.8 | 6.7 | 6.9 | 5.7 | 6.8 | 6.6 |
| Conni | 6.6 | 6.2 | 7.2 | 5.0 | 7.7 | 6.5 |
| 239 | 6.4 | 6.4 | 6.5 | 6.9 | 6.2 | 6.5 |
| Huntsville | 6.4 | 6.2 | 6.9 | 6.0 | 6.8 | 6.5 |
| Cynthia | 7.2 | 6.5 | 7.1 | 5.3 | 6.0 | 6.4 |
| Wabash | 7.2 | 6.6 | 6.3 | 5.9 | 6.0 | 6.4 |
| WW Ag 491 | 6.8 | 6.3 | 6.7 | 5.0 | 7.2 | 6.4 |
| Monopoly | 6.6 | 6.3 | 6.7 | 5.1 | 7.0 | 6.3 |
| Aquila | 7.0 | 5.7 | 6.7 | 4.6 | 7.7 | 6.3 |
| Mystic | 6.7 | 6.1 | 6.1 | 5.7 | 6.7 | 6.3 |
| Compact | 6.1 | 5.9 | 6.7 | 5.7 | 6.8 | 6.2 |
| Joy | 5.7 | 6.0 | 6.3 | 4.9 | 6.2 | 5.8 |
| Kenblue | 5.9 | 5.2 | 5.5 | 5.2 | 6.2 | 5.6 |
| S. Dakota Cet. | 5.8 | 5.3 | 5.8 | 4.9 | 5.7 | 5.5 |

1/ Planted Sept. 18, 1985. Maintained at 4 lbs. N/1000 sq. ft. Mowing height was 2.5" with clippings removed.

Table 2. National Low Maintenance Kentucky Bluegrass Cultivar Trial, Wichita [1/]

| Cultivar Name | Seedling Vigor Avg. | Genetic Color | Quality 4-25-91 [2/] |
|---|---|---|---|
| Monopoly | 6.0 | 7.2 | 7.3 |
| Merit | 5.0 | 6.7 | 7.8 DG |
| Park | 6.7 | 5.5 | 6.8 LG |
| Kyosti | 4.8 | 7.5 | 7.7 DG |
| Baron | 5.0 | 7.3 | 7.8 DG |
| Barzan | 3.0 | 6.2 | 6.5 |
| Barsweet | 4.0 | 8.2 | 7.0 DW |
| Bartitia | 5.0 | 8.2 | 7.3 DG |
| Barmax | 6.2 | 7.0 | 7.3 LG |
| BAR VB 895 | 6.0 | 6.5 | 7.3 |
| MN 2405 | 4.8 | 6.7 | 5.7 LG |
| Bronco | 4.8 | 7.3 | 6.8 |
| Crest | 4.8 | 7.2 | 7.0 |
| Ba 78-376 | 6.0 | 5.0 | 6.3 LG |
| Ba 74-017 | 4.7 | 7.3 | 6.5 DW |
| GEN-RSP | 5.0 | 7.0 | 6.5 |
| NJIC | 5.2 | 7.8 | 7.0 |
| NE 80-47 | 4.7 | 6.7 | 7.3 |
| Fortuna | 4.7 | 7.0 | 7.5 |
| Miracle | 5.0 | 7.7 | 7.5 DG |
| ISI-21 | 7.0 | 6.3 | 7.0 |
| Sophia | 2.7 | 7.3 | 6.5 |
| Cynthia | 4.7 | 7.5 | 6.5 |
| EVB 13.703 | 4.8 | 7.3 | 7.2 |
| EVB 13.863 | 5.0 | 6.7 | 6.7 W |
| Ram-1 | 4.7 | 8.0 | 7.5 DG |
| 798 | 2.8 | 7.5 | 7.0 |
| Unknown | 4.3 | 7.0 | 7.7 DG |
| ZPS-84-749 | 5.8 | 7.3 | 7.2 |
| Livingston | 4.3 | 6.5 | 7.0 |
| PST-C-391 | 4.5 | 7.0 | 7.5 |
| Voyager | 5.8 | 7.3 | 6.5 LG |
| PST-C-303 | 4.0 | 6.7 | 8.0 |
| Midnight | 3.3 | 7.7 | 6.0 DW,W |
| PST-C-76 | 4.0 | 7.5 | 6.8 DG |
| PST-YQ | 5.7 | 5.8 | 6.7 |
| PST-A7-111 | 5.0 | 7.5 | 6.8 |
| Liberty | 4.5 | 6.3 | 6.5 W |
| Suffolk | 5.2 | 6.8 | 7.3 |
| Amazon | 4.7 | 7.8 | 7.3 DG |
| Destiny | 3.7 | 7.2 | 7.2 |
| H76-1034 | 5.7 | 7.2 | 7.0 LG |
| Washington | 4.5 | 7.8 | 7.3 |
| Freedom | 6.0 | 6.8 | 7.5 |
| Merion | 1.0 | 7.2 | 5.8 T,W |
| NuStar | 2.0 | 8.2 | 7.2 W |

Table 2 (cont'd.)

| Cultivar Name | Seedling Vigor Avg. | Genetic Color | Quality 4-25-91 2/ |
|---|---|---|---|
| J-335 | 3.7 | 7.8 | 7.0 W |
| J-386 | 4.0 | 6.3 | 6.7 |
| J-229 | 4.3 | 6.5 | 7.0 |
| Haga | 4.3 | 5.3 | 7.2 |
| Opal | 5.3 | 8.7 | 7.7 DG |
| SR 2000 | 3.7 | 7.2 | 7.0 |
| Gnome | 4.8 | 6.7 | 6.3 W |
| Chelsea | 2.0 | 7.7 | 7.2 DG |
| Cobalt | 4.0 | 8.0 | 7.8 DG |
| KWS Pp 13-2 | 3.0 | 8.2 | 7.2 DG |
| BAR VB 1169 | 5.0 | 8.2 | 8.2 DG |
| BAR VB 1184 | 4.3 | 7.8 | 7.2 |
| BAR VB 7037 | 4.8 | 7.8 | 7.0 |
| Kenblue | 6.2 | 6.3 | 6.0 |
| South Dakota Cert. | 5.7 | 7.3 | 5.8 LG |
| Alene | 6.3 | 5.3 | 6.3 LG |

1/ Seeded Sept. 20, 1990. Seedling vigor rated 10-3-90 based on scale 0 - 9 w/0 = none germinated 9 = most vigorous.

2/ Symbols: LG = Light green, DG = Dark green, DW = Dwarf or low growing, W = Weedy, T = Thin stand.

**TITLE:** NTEP Perennial Ryegrass Cultivar Trial

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

**PERSONNEL:** John Pair, Roch Gaussoin, and Jeff Nus

**INTRODUCTION:**

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

**MATERIALS AND METHODS:**

Manhattan

Sixty-five commercial and experimental ryegrass genotypes were received from the National Turfgrass Evaluation Program and planted in Section II of the Rocky Ford Turfgrass Research Plots on March 16, 1987. Seeding rate was 6 lbs. per 1000 sq. ft., and a balanced (20-20-20) fertilizer was applied immediately after seeding at the rate of 1 lb. N/1000 sq. ft. Plot size is 1 X 2 meters. Plots are mowed at 3 in. and fertilized with 4 lbs. N, 1 lb. of P205, and 1 lb. of K20 per year.

Wichita

A trial of 65 cultivars and experimental numbers was established on September 12, 1986. Maintenance included 4 lbs. N/1000 sq. ft. per year and a mowing height of 2 $^{1}/_{2}$ in. with clippings removed. Balan/Treflan combination (Team) was applied in April and June for crabgrass prevention. A new trial of 122 cultivars was established in the fall of 1990.

**RESULTS:**

Best performing ryegrasses in Manhattan were Delray; Dasher II; Rival; Caliente; Dillon; Fiesta II; Commander; Tara; Aquarius; Blazer II; Sunrye;and experimental numbers PSU-333, SR 4100, Bar LP 410, Pick 715, PST-M2E, SR 4031, Bar LP 454, Del 946, PSU 222, and SR 4000. Those rated highest at Wichita after 4 years were PST-2H7, Saturn, Commander, Regal, Charger, PST-M2E, Sunrye, Prelude, Riviera, Citation II, Caliente, Competitor, Dasher II, Patriot, Manhattan II, Pennant, Goalie, Belle, and Lindsay (Table 1).

Preliminary performance of the new ryegrass cultivars established in 1990 is shown. Observations made on pink snow mold disease, (Fusarium nivale) infection in late winter showed specific varietal response (Table 2).

Table 1. Ryegrass Cultivar Performance at Wichita, KS 1988-90 1/

| Cultivar Name | 1988 | 1989 | 1990 | Avg. |
|---|---|---|---|---|
| PST-2H7 | 7.2 | 7.0 | 8.2 | 7.5 |
| Saturn (PST-2PM) | 7.0 | 7.4 | 7.7 | 7.4 |
| Commander | 7.1 | 7.1 | 7.3 | 7.2 |
| Regal | 6.3 | 7.6 | 7.3 | 7.1 |
| Charger (PST-2HH) | 7.3 | 6.9 | 7.0 | 7.1 |
| PST-M2E | 7.1 | 7.1 | 6.8 | 7.0 |
| Sunrye (246) | 6.6 | 7.1 | 7.3 | 7.0 |
| Prelude | 7.1 | 6.8 | 7.2 | 7.0 |
| Riviera (Pick 647) | 7.0 | 6.9 | 6.8 | 6.9 |
| SR 4100 | 6.9 | 6.6 | 7.2 | 6.9 |
| Citation II | 7.0 | 6.9 | 6.7 | 6.9 |
| PSU-333 | 6.9 | 6.8 | 6.8 | 6.8 |
| Caliente | 6.9 | 6.8 | 6.7 | 6.8 |
| Competitor | 7.0 | 6.8 | 6.5 | 6.8 |
| Dasher II (Pick 233) | 7.1 | 7.1 | 6.3 | 6.8 |
| Patriot | 7.2 | 7.0 | 5.8 | 6.7 |
| Manhattan II | 6.8 | 6.9 | 6.3 | 6.7 |
| Pennant | 6.9 | 6.8 | 6.3 | 6.7 |
| Goalie | 6.6 | 6.8 | 6.7 | 6.7 |
| Belle | 6.6 | 7.0 | 6.5 | 6.7 |
| Lindsay (ISI-851) | 6.6 | 6.3 | 7.2 | 6.7 |
| Barry | 6.3 | 6.6 | 6.8 | 6.6 |
| Regency | 6.6 | 6.4 | 6.7 | 6.6 |
| Brenda | 6.6 | 6.5 | 6.7 | 6.6 |
| SR 4000 | 6.9 | 6.5 | 6.5 | 6.6 |
| BAR Lp 410 | 6.9 | 6.0 | 6.7 | 6.5 |
| Palmer | 6.7 | 6.1 | 6.8 | 6.5 |
| Fiesta (Pick 600) | 6.7 | 6.2 | 6.2 | 6.4 |
| Allaire | 6.4 | 6.9 | 6.0 | 6.4 |
| Delray | 6.4 | 6.9 | 6.0 | 6.4 |
| Pennfine | 6.8 | 6.4 | 6.0 | 6.4 |
| Repell | 6.5 | 6.5 | 6.3 | 6.4 |
| PSU-222 | 6.3 | 6.3 | 6.5 | 6.4 |
| Gator | 7.0 | 5.6 | 6.3 | 6.3 |
| Vintage-2DF | 6.8 | 6.3 | 5.7 | 6.3 |
| Pavo (WW E 14) | 6.5 | 6.0 | 6.3 | 6.3 |
| Pick 715 | 6.7 | 6.5 | 5.7 | 6.3 |
| Omega II | 6.9 | 6.8 | 5.3 | 6.3 |
| Cowboy | 6.5 | 6.2 | 5.8 | 6.2 |
| Runaway (HE 145) | 6.7 | 6.0 | 6.0 | 6.2 |
| Birdie II | 6.9 | 6.5 | 5.3 | 6.2 |
| DEL 946 | 6.2 | 6.4 | 6.0 | 6.2 |
| Aquarius (KWS-A1-2) | 6.4 | 6.2 | 6.0 | 6.2 |
| SR 4031 | 6.4 | 6.2 | 6.0 | 6.2 |
| Blazer II | 6.5 | 5.6 | 6.5 | 6.2 |
| Acrobat (HE 177) | 6.5 | 5.8 | 6.3 | 6.2 |
| Derby | 6.8 | 6.2 | 5.3 | 6.1 |
| Rodeo | 5.9 | 5.7 | 6.7 | 6.1 |
| Mom Lp 763 | 6.7 | 5.7 | 6.0 | 6.1 |

Table 1 (cont'd.)

| Cultivar Name | 1988 | 1989 | 1990 | Avg. |
|---|---|---|---|---|
| PST-2DD | 6.4 | 5.8 | 5.8 | 6.0 |
| J207 | 6.7 | 5.7 | 5.7 | 6.0 |
| Ranger | 6.7 | 5.6 | 5.7 | 6.0 |
| Ronja (WW E 31) | 6.3 | 6.8 | 4.8 | 6.0 |
| Dillon (ISI-K2) | 6.3 | 5.5 | 6.3 | 6.0 |
| Yorktown II | 6.5 | 5.7 | 5.7 | 6.0 |
| Rival (HE 178) | 6.2 | 5.6 | 6.3 | 6.0 |
| Diplomat | 6.3 | 5.6 | 6.0 | 6.0 |
| BAR Lp 454 | 6.3 | 5.7 | 5.7 | 5.9 |
| Sheriff | 6.4 | 5.4 | 5.8 | 5.9 |
| Ovation | 6.4 | 5.5 | 5.5 | 5.8 |
| NK 80389 | 6.2 | 5.9 | 5.3 | 5.8 |
| Tara | 6.6 | 5.6 | 5.0 | 5.7 |
| Manhattan | 6.5 | 5.3 | 4.7 | 5.5 |
| J208 | 6.0 | 5.4 | 4.8 | 5.4 |
| Linn | 4.5 | 4.1 | 3.7 | 4.1 |

1/ Seeded September 12, 1986. Mowing height 2 1/2 inches with clippings removed and fertilized with 4 lbs. N/1,000 sq. ft. per season.

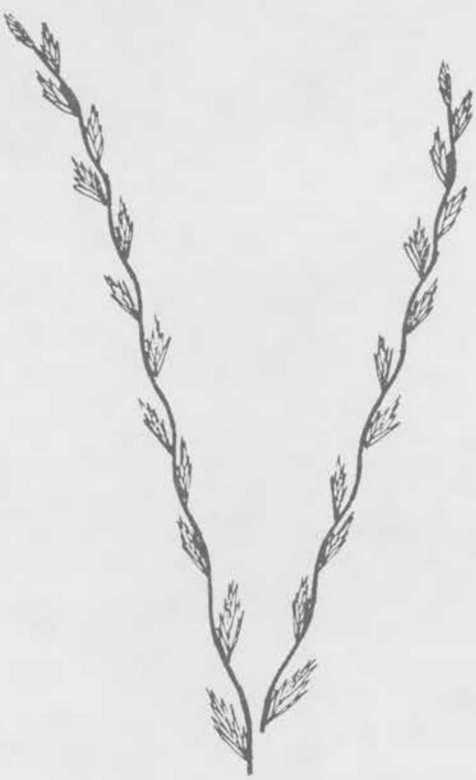


Table 2. Preliminary Performance of 1990 National Ryegrass Cultivars 1/

| Entry Name | Seedling Vigor | Genetic Color | Disease Rating 2/ 4-15-91 | Quality 4-15-91 |
|---|---|---|---|---|
| PR 8820 (Essence) | 7.2 | 7.7 | 8.5 | 8.7 |
| PST-2DPR | 7.0 | 9.0 | 8.7 | 8.5 |
| Pick 9100 | 6.8 | 9.0 | 8.8 | 8.5 |
| APM | 7.0 | 8.5 | 8.7 | 8.5 |
| 4DD-Delaware Dwarf | 7.3 | 8.2 | 8.8 | 8.3 |
| Pick 1800 | 7.0 | 8.5 | 8.8 | 8.3 |
| ZPS-28D | 7.2 | 8.2 | 8.7 | 8.3 |
| PST-2FF | 7.5 | 8.7 | 8.0 | 8.3 |
| LDRD | 7.7 | 8.3 | 8.7 | 8.3 |
| Koos 90-1 | 7.5 | 8.3 | 8.5 | 8.3 |
| Assure | 8.3 | 8.2 | 8.8 | 8.2 |
| PR 9121 | 7.3 | 7.5 | 9.0 | 8.2 |
| MVF 89-88 | 6.7 | 7.7 | 8.8 | 8.2 |
| Pinnacle | 8.2 | 8.0 | 8.8 | 8.2 |
| SR 4200 | 8.0 | 8.0 | 8.8 | 8.2 |
| 2P2-90 | 7.0 | 8.0 | 8.5 | 8.2 |
| PST-290 | 7.5 | 7.8 | 8.3 | 8.2 |
| LDRF | 8.0 | 8.0 | 8.3 | 8.2 |
| PST-28M | 7.3 | 8.2 | 9.0 | 8.2 |
| Pick 89-4 | 6.7 | 8.5 | 8.2 | 8.2 |
| PST-2FQR | 8.0 | 8.5 | 8.0 | 8.2 |
| Accolade | 7.7 | 7.2 | 8.8 | 8.2 |
| Saturn | 7.0 | 7.8 | 9.0 | 8.2 |
| WVPB-89-PR-A-3 | 7.8 | 8.0 | 8.8 | 8.2 |
| Pick 89LLG | 6.3 | 8.0 | 8.5 | 8.0 |
| Derby Supreme | 8.5 | 7.5 | 8.8 | 8.0 |
| Rodeo II | 7.3 | 8.2 | 8.3 | 8.0 |
| Legacy | 8.0 | 7.5 | 9.0 | 8.0 |
| Gator | 8.5 | 7.2 | 8.8 | 8.0 |
| SYN-P | 7.5 | 8.0 | 8.2 | 8.0 |
| Manhattan II(E) | 8.3 | 7.7 | 8.2 | 8.0 |
| Seville | 8.7 | 8.0 | 9.0 | 8.0 |
| @Poly-SH | 6.7 | 8.8 | 8.0 | 8.0 |
| PST-283 | 7.5 | 8.0 | 7.8 | 8.0 |
| Commander | 7.7 | 8.3 | 8.7 | 8.0 |
| P89 | 7.2 | 9.0 | 7.5 | 8.0 |
| Express | 7.7 | 8.0 | 7.3 | 8.0 |
| Equal | 7.3 | 7.5 | 8.5 | 8.0 |
| Unknown | 8.5 | 7.5 | 8.5 | 7.8 |
| Barrage ++ | 8.0 | 6.5 | 9.0 | 7.8 |
| PR 9119 | 7.3 | 7.8 | 8.5 | 7.8 |
| Koos 90-2 | 7.5 | 7.3 | 8.8 | 7.8 |
| N-33 | 7.3 | 7.5 | 8.3 | 7.8 |
| PR 9109 | 8.3 | 7.2 | 8.3 | 7.8 |
| WVPB-88-PR-D-10 | 7.5 | 7.5 | 9.0 | 7.8 |
| Sherwood | 7.8 | 7.8 | 8.7 | 7.8 |
| Regal | 7.3 | 7.5 | 8.2 | 7.8 |
| Lindsay | 7.7 | 7.3 | 9.0 | 7.8 |

Table 2 (cont'd.)

| Entry Name | Seedling Vigor | Genetic Color | Disease Rating 2/ 4-15-91 | Quality 4-15-91 |
|---|---|---|---|---|
| WM-II | 7.7 | 7.5 | 8.0 | 7.8 |
| PR 9118 | 7.0 | 7.5 | 8.7 | 7.8 |
| Fiesta II | 8.5 | 7.2 | 8.8 | 7.8 |
| Taya | 8.0 | 7.3 | 8.8 | 7.7 |
| GEN-90 | 8.2 | 8.0 | 9.0 | 7.7 |
| WVPB 89-92 | 8.5 | 7.2 | 9.0 | 7.7 |
| Pleasure | 8.3 | 7.2 | 8.5 | 7.7 |
| PR 9108 | 6.8 | 7.0 | 8.5 | 7.7 |
| Goalie | 8.0 | 7.3 | 9.0 | 7.7 |
| WVPB-88-PR-D-12 | 7.7 | 7.8 | 8.5 | 7.7 |
| Advent | 8.2 | 7.3 | 9.0 | 7.7 |
| Repell | 7.8 | 7.0 | 9.0 | 7.7 |
| 2H7 | 7.5 | 7.8 | 8.7 | 7.7 |
| Citation II | 8.5 | 7.3 | 8.7 | 7.7 |
| Pick DKM | 6.5 | 7.8 | 8.8 | 7.7 |
| Envy | 6.7 | 7.8 | 8.7 | 7.7 |
| Pennant | 8.7 | 7.3 | 8.7 | 7.7 |
| Barrage | 7.0 | 7.3 | 9.0 | 7.7 |
| WVPB-88-PR-C-23 | 7.3 | 7.3 | 8.8 | 7.7 |
| MVF 89-90 | 7.5 | 7.2 | 9.0 | 7.7 |
| WFPB-89-87A | 8.2 | 7.3 | 8.5 | 7.7 |
| 89-666 | 8.0 | 7.0 | 8.5 | 7.5 |
| OFI-F7 | 8.0 | 8.0 | 8.3 | 7.5 |
| Nomad | 7.5 | 7.8 | 7.0 | 7.5 |
| Bar Lp 852 | 7.8 | 6.7 | 8.3 | 7.5 |
| PST-GH-89 | 7.2 | 8.7 | 8.0 | 7.5 |
| 856 | 8.5 | 7.0 | 8.7 | 7.5 |
| Cutless | 6.8 | 7.5 | 7.7 | 7.5 |
| Calypso | 8.7 | 7.0 | 8.5 | 7.5 |
| Charger | 7.8 | 7.5 | 8.8 | 7.5 |
| PST-2ROR | 6.0 | 8.3 | 7.2 | 7.5 |
| ZW 42-176 | 8.5 | 7.0 | 8.7 | 7.5 |
| Premier | 8.3 | 6.8 | 9.0 | 7.5 |
| Pebble Beach | 7.8 | 7.7 | 7.8 | 7.3 |
| PS-105 | 8.7 | 6.7 | 8.3 | 7.3 |
| Riviera | 8.7 | 7.2 | 8.2 | 7.3 |
| Competitor | 8.0 | 7.0 | 8.7 | 7.3 |
| CLP 39 | 7.5 | 6.7 | 7.8 | 7.3 |
| Pick EEC | 6.8 | 8.5 | 7.3 | 7.3 |
| Loretta | 7.8 | 5.7 | 8.5 | 7.2 |
| Toronto | 8.7 | 6.3 | 8.8 | 7.2 |
| HE 311 | 7.2 | 7.7 | 6.8 | 7.2 |
| Dandy | 8.2 | 8.0 | 7.0 | 7.2 |
| Caliente | 8.5 | 6.8 | 8.8 | 7.2 |
| C-21 | 8.3 | 6.3 | 8.5 | 7.0 |
| OFI-D4 | 8.0 | 7.0 | 8.8 | 7.0 |
| Mom Lp 3185 | 8.7 | 6.3 | 8.3 | 7.0 |
| Patriot II | 7.8 | 7.8 | 6.8 | 7.0 |

Table 2 (cont'd.)

| Entry Name | Seedling Vigor | Genetic Color | Disease Rating [2/] 4-15-91 | Quality 4-15-91 |
|---|---|---|---|---|
| Mom Lp 3184 | 7.7 | 6.5 | 8.5 | 7.0 |
| Mom Lp 3147 | 7.3 | 7.7 | 7.5 | 7.0 |
| Duet | 8.5 | 6.7 | 8.5 | 6.8 |
| Stallion | 8.5 | 6.7 | 8.2 | 6.8 |
| PST-23C | 7.7 | 8.2 | 6.7 | 6.8 |
| EEG 358 | 8.3 | 5.8 | 9.0 | 6.8 |
| Surprise | 6.7 | 6.5 | 9.0 | 6.8 |
| Entrar | 8.3 | 6.0 | 8.7 | 6.8 |
| Ovation | 8.7 | 5.5 | 8.5 | 6.7 |
| NK 89001 | 8.5 | 6.8 | 7.0 | 6.7 |
| Troubadour | 8.5 | 6.0 | 8.0 | 6.5 |
| Danaro | 8.0 | 5.7 | 8.0 | 6.5 |
| Mom Lp 3182 | 7.5 | 7.0 | 6.3 | 6.3 |
| Cartel | 7.8 | 5.7 | 7.2 | 6.3 |
| BAR Lp 086FL | 7.7 | 7.2 | 5.3 | 6.2 |
| Target | 6.8 | 7.5 | 6.0 | 6.0 |
| Mom Lp 3179 | 7.0 | 5.3 | 7.7 | 6.0 |
| Mom Lp 3111 | 7.7 | 6.3 | 6.3 | 5.7 |
| Gettysburg | 7.5 | 8.3 | 5.5 | 5.7 |
| ZPS-2EZ | 6.3 | 8.0 | 5.7 | 5.7 |
| Pennfine | 8.2 | 6.7 | 6.0 | 5.7 |
| Danilo | 8.0 | 5.0 | 8.0 | 5.7 |
| Meteor | 8.0 | 6.3 | 8.3 | 5.7 |
| Allegro | 8.0 | 7.5 | 6.0 | 5.5 |
| Linn | 9.0 | 4.3 | 7.3 | 5.0 |
| PST-20G | 7.0 | 8.3 | 4.3 | 4.7 |
| CLP 144 | 7.0 | 6.7 | 4.7 | 4.3 |

1/ Established September, 1990. Rating scale based on 0 - 9 with 0 = dead and 9 most vigorous, darkest green, and least disease.

2/ Snow mold (Fusarium nivale) observed in late winter (rated 0 - 9 with 9 = least infection).

**TITLE:** National Tall Fescue Cultivar Trial

**OBJECTIVE:** To evaluate commercial and experimental tall fescue genotypes under Kansas conditions and provide that data to the National Turfgrass Evaluation Program.

**PERSONNEL:** Jeff Nus, John Pair, and Ned Tisserat

**INTRODUCTION:**

Tall fescue is the best adapted, cool-season turfgrasses 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 coarse leaf texture and does not recover from injury, because it lacks stolons and has only very short rhizomes. Efforts to improve tall fescue cultivars include selection for finer leaf blades, good mowing quality, a rich green color, and better sward density, while maintaining good stress tolerance characteristics.

**MATERIALS AND METHODS:**

Manhattan

Sixty-five commercial and experimental tall fescue genotypes were provided by the National Turfgrass Evaluation Program in the fall of 1987. They were planted in Section I of the Rocky Ford Turfgrass Research Plots during the first week of September. Each genotype was replicated three times in a randomized complete block experimental design. Seeding was done by hand at the rate of 8 lbs. of seed per 1000 sq. ft. Monthly quality ratings are being recorded for each genotype.

Wichita

A trial of 65 cultivars and experimental numbers was established on September 10, 1987. Plots were maintained at 4 lbs. N/1000 sq. ft. per year, mowed at 2 $^{1}/_{2}$ in. with clippings removed, and irrigated to alleviate stress. Team (Balan/Treflan) was applied in April and June to prevent crabgrass growth.

**RESULTS:**

Best performing cultivars at Manhattan in 1989 were Twilight, Avanti, Aztec, Amigo, Crossfire, BEL 86-2, Shortstop, Hubbard 87, Normarc 99, Guardian, Trailblazer, PE-7, ElDorado, Shenandoah, Emperor, PST-SAG, Silverado, PST-5MW, Tribute, Carefree, KWS-DUR, Normarc 25, and Cochise.

Cultivars rated highest quality at Wichita in 1990, after a very stressful summer, were Avanti, Aztec, Crossfire, Trailblazer, Murietta, Apache, Maverick II, Rebel II, Amigo, Chieftan, Cimmaron, Legend, Shortstop, Titan, Mesa, Olympic, Sundance, Emperor, Jaguar, Monarch, Taurus, and Wrangler.

Because the trial was nearing termination and there was concern for Rhizoctonia Brown Patch among tall fescue cultivars, all plots were inocculated in August, 1990. The September 10 rating reflects recovery from this disease. However, there was no clear indication of resistance among any of the cultivars.

Turfgrass plots at Horticulture Research Center, Wichita

Table 1. 1990 Performance of Tall Fescue Cultivars, Wichita, KS 1/

| Name | Quality Rating by Dates 2/ June 30 | Sept. 10 | Oct. 10 | Season Average |
|---|---|---|---|---|
| Adventure | 6.0 T,LG | 6.3 | 5.0 BP | 5.8 |
| BAR Fa 7851 | 7.2 D | 7.0 | 7.0 | 7.1 |
| Trident | 6.7 | 7.0 | 6.3 | 6.7 |
| Titan | 7.0 DG | 6.2 | 6.7 | 6.6 |
| Shortstop | 7.0 | 7.3 | 7.7 DG | 7.3 |
| Cochise | 6.3 | 7.3 | 6.0 BP | 6.5 |
| Guardian | 6.5 | 7.8 | 5.3 BP | 6.5 |
| Emperor | 6.7 | 7.0 | 5.7 | 6.5 |
| PE-7 | 7.8 D,DG | 7.5 | 7.7 DG | 7.7 |
| Shenandoah | 7.5 D,DG | 8.2 | 6.7 | 7.5 |
| Hubbard 87 | 7.2 F,D | 8.0 | 7.2 DG | 7.5 |
| Syn Ga | 5.5 LG | 6.3 | 5.7 | 5.8 |
| Legend | 7.0 | 7.3 | 5.8 BP | 6.7 |
| Taurus | 6.7 | 7.5 | 6.5 | 6.9 |
| Aztec | 7.5 DG,F | 7.5 | 7.0 DG | 7.3 |
| Sundance | 6.8 | 7.0 | 6.3 | 6.7 |
| Fatima | 6.0 LG,C | 6.0 | 6.2 | 6.1 |
| Normarc 25 | 6.8 | 7.7 | 7.0 DG | 7.2 |
| Normarc 77 | 7.3 D | 7.2 | 6.8 | 7.1 |
| KWS-DUR | 7.3 D | 6.5 | 5.5 | 6.4 |
| KWS-BG-6 | 7.0 DG | 7.2 | 5.3 BP | 6.5 |
| Willamette | 5.7 LG,C | 6.5 | 6.2 | 6.1 |
| Chieftan | 7.0 D | 7.0 | 6.0 BP | 6.7 |
| Maverick II | 7.2 DG | 7.0 | 6.8 | 7.0 |
| Thoroughbred | 6.3 | 7.2 | 6.2 | 6.6 |
| Crossfire | 7.3 DG | 7.5 | 7.3 DG | 7.4 |
| PST-50L | 7.0 DG | 7.3 | 6.8 | 7.0 |
| Murietta | 7.3 D | 7.3 | 5.2 BP | 6.6 |
| Cimmaron | 7.0 | 7.0 | 6.7 | 6.9 |
| Bonanza | 5.2 | 7.7 | 7.2 DG | 6.7 |
| PST-5AG | 6.2 | 7.2 | 6.0 | 6.5 |
| Silverado | 7.5 D,DG | 7.5 | 6.7 DG | 7.2 |
| PST-5MW | 6.2 | 7.8 | 6.7 | 6.9 |
| Trailblazer | 7.5 D,DG | 7.0 | 6.0 DG | 6.8 |
| ElDorado | 6.3 | 7.5 | 6.3 BP | 6.7 |
| PST-5AP | 7.0 DG | 7.2 | 6.7 | 7.0 |
| Amigo | 7.0 DG | 7.8 | 7.3 | 7.4 |
| Jaguar | 6.0 | 6.8 | 5.5 BP | 6.1 |
| PST-DBC | 6.8 | 7.0 | 6.8 | 6.9 |
| Olympic | 6.8 DG | 7.2 | 6.7 | 6.9 |
| Jaguar II | 6.7 | 6.7 | 6.5 | 6.6 |
| Monarch | 6.7 | 7.2 | 6.8 | 6.9 |
| Apache | 7.2 DG | 6.8 | 6.5 | 6.8 |
| PST-5DM | 6.8 | 7.5 | 6.2 BP | 6.8 |
| Avanti | 7.5 DG | 7.8 | 4.7 BP | 6.7 |
| Noramarc 99 | 7.2 DG | 7.8 | 6.0 | 7.0 |

Table 1. (cont'd.)

| Name | Quality Rating by Dates [2] June 30 | Sept. 10 | Oct. 10 | Season Average |
|---|---|---|---|---|
| Pacer | 5.3 T,LG | 6.5 | 4.7 BP | 5.5 |
| Carefree | 6.2 | 7.2 | 6.3 | 6.6 |
| Richmond | 5.7 C | 6.2 | 6.2 | 6.0 |
| Tip | 5.0 LG,C | 6.3 | 5.3 BP | 5.5 |
| Ky-31 | 4.7 LG,C | 5.3 | 5.0 LG | 5.0 |
| Bel 86-1 | 6.2 | 7.3 | 6.8 | 6.8 |
| Bel 86-2 | 6.7 | 7.3 | 7.0 | 7.0 |
| PST-5EN | 6.3 | 7.3 | 6.2 | 6.6 |
| PST-5F2 | 7.3 DG,D | 6.8 | 6.5 | 6.9 |
| Finelawn 5GL | 6.0 | 6.7 | 5.3 BP | 6.0 |
| Finelawn I | 5.8 C | 6.2 | 5.3 BP | 5.8 |
| Rebel | 6.2 | 6.3 | 6.3 | 6.3 |
| Rebel II | 7.2 D | 7.2 | 6.8 | 7.1 |
| Tribute | 6.7 | 7.0 | 6.7 DG | 6.8 |
| Arid | 6.0 T,LG | 7.2 | 5.7 BP | 6.3 |
| Wrangler | 6.7 | 6.8 | 4.8 BP | 6.1 |
| Mesa | 6.8 | 7.3 | 7.7 | 7.3 |
| JB-2 | 6.3 | 6.3 | 5.7 LG | 6.1 |
| Falcon | 4.8 LG | 6.0 | 6.0 | 5.6 |

1/ Planted Sept. 10, 1987. Seeding rate: 6 lbs. per 1,000 sq. ft. (50 gms. per plot).

2/ Rated 0 - 9, with 9 = best. Symbols: T = Thin stand, LG = Light Green, DG = Dark Green, F = Fine Texture, C = Coarse, D = Dense, BP = Brown Patch.

**TITLE:** NTEP Bentgrass Cultivar Trial

**OBJECTIVE:** To evaluate new and existing bentgrass cultivars for performance at Manhattan and Wichita.

**PERSONNEL:** Roch Gaussoin, John Pair, Kevin Kamphaus, and Ward Upham

**SPONSOR:** Heart of America Golf Course Superintendents Association

**INTRODUCTION:**

Turfgrass plant breeders are currently developing new and experimental bentgrass cultivars for use on golf course greens, tees, and fairways. The National Turfgrass Evaluation Program (NTEP) has provided Kansas State University with many of the new bentgrass cultivars for regional evaluation in 1991. The NTEP trials are designed to evaluate new and/or experimental turfgrass cultivars for regional and national recommendations.

Both creeping and colonial bentgrasses were included in the trial.

**MATERIALS AND METHODS:**

Two evaluations were conducted. One involved the establishment of 23 bentgrass cultivars on the USGA green in Manhattan. The other test included 20 entries established on a native soil at the same location. The native soil test was designed to provide evaluation of bentgrass entries under fairway/tee management conditions. This test was conducted in both Manhattan and Wichita. All tests were established in the fall of 1989, with treatments being initiated in the spring of 1990. Treatments at Manhattan included two mowing heights for the fairway trial, 0.5 and 0.75 inch. At Wichita, two nitrogen fertility levels were evaluated. Data were collected on establishment, quality, and color for both the fairway and green trials. The fairway trial and green trial were rated once for establishment and twice for color and quality. Ball speed data were taken on the green trial.

**RESULTS:**

The fairway trial yielded significant differences for establishment, color (for both dates and both mowing heights), and quality (also for both dates and both mowing heights).

The green trial showed significant differences for establishment, ball speed, and the 10/9/90 color rating. Non-significant differences were noted for quality ratings on both dates and the 9/4/90 color rating.

Table 1. Identification of Species for Bentgrass Cultivars Manahattan, KS

| Cultivar | Type |
|---|---|
| Penneagle | *Agrostis palustris* (Creeping bent) |
| Providence | Creeping |
| Putter | Creeping |
| Forbes 89-12 | Creeping |
| Normarc 101 | Creeping |
| WVPB 89-D-15 | Creeping |
| SR 1020 | Creeping |
| Penncross | Creeping |
| Pennlinks | Creeping |
| TAMU 88-1 | Creeping |
| National | Creeping |
| 88.CBE | Creeping |
| 88.CBL | Creeping |
| Bardot | *Agrostis tenuis* (Colonial bent) |
| Emerald | Creeping |
| Cobra | Creeping |
| Egmont | *Agrostis capillaris* (Browntop bent) |
| Carmen | Creeping |
| BR 1518 | *Agrostis castellana* (Dryland bent) |
| Allure | Colonial |
| Tracenta | Colonial |
| MSCB-6 | Creeping |
| MSCB-8 | Creeping |
| UM 84-01 | Creeping |

Creeping and colonial bentgrasses are members of the same genus (*Agrostis*) but differ markedly in certain characteristics. Colonial bents are best adapted to oceanic climates because of poor heat and drouth tolerance. Creeping bents are more widely adapted.

Under close mowing conditions, creeping bentgrasses are noted for superior shoot density, uniformity, and turfgrass quality. Colonial bents tend to be of a finer, more delicate texture with a growth habit that is more upright. The creeping bents exhibit vigorous stolon growth (minimal in colonial types) that results in better "fill-in" during establishment. Recuperative potential is also greater for the creeping bentgrasses.

Table 2. Establishment of Bentgrass Cultivars under Fairway/Tee Mowing Heights, Manahattan, KS

| Cultivar | Source | Percent Plot Covered |
|---|---|---|
| Penneagle | Penn State Univ. (1975) | 85.0 |
| Providence | Rhode Island Univ. (1989) | 78.3 |
| Putter | Washington St. Univ. (1988) | 78.3 |
| Forbes 89-12 | Forbes Seed & Grain | 76.7 |
| Normarc 101 | Normarc, Inc. | 76.7 |
| WVPB 89-D-15 | Williamette Valley Plant Breeders | 75.0 |
| SR 1020 | Univ. Arizona (1989) | 75.0 |
| Penncross | Penn State Univ. (1956) | 75.0 |
| TAMU 88-1 | Texas A&M University | 71.7 |
| 88.CBE | International Seeds | 71.7 |
| National | Pickseed West (1989) | 71.7 |
| 88.CBL | International Seeds | 70.0 |
| Bardot | Barengrug USA | 68.3 |
| Emerald | W. Weibull Co. Sweden (1965) | 68.3 |
| Cobra | Rutgers Univ. and Intern. Seeds (1988) | 66.7 |
| Egmont | Olsen-Fennell Seed Co. | 61.7 |
| Carmen | Van der Have Oregon | 61.7 |
| BR 1518 | USGA Green Section | 51.7 |
| Allure | Willamette Seed Co. | 48.3 |
| Tracenta | Van der Have Oregon | 30.0 |
| LSD (P=0.05) | | 17.4 |

Establishment ratings (% plot covered) 6/22/90

Table 3. Performance of Bentgrass Cultivars under Two Fairway/Tee Mowing Heights, Manhattan, KS

| | Quality[1] | | | | Color | | | |
|---|---|---|---|---|---|---|---|---|
| | 9/4/90 | | 10/9/90 | | 9/4/90 | | 10/9/90 | |
| Cultivar | 0.5" | 0.75" | 0.5" | 0.75" | 0.5" | 0.75" | 0.5" | 0.75" |
| BR 1518 | 3.0 | 2.7 | 4.0 | 3.3 | 3.7 | 3.0 | 7.0 | 7.0 |
| Carmen | 4.7 | 5.3 | 6.0 | 5.7 | 6.7 | 7.0 | 7.0 | 7.0 |
| Tracenta | 2.7 | 3.0 | 4.0 | 3.3 | 3.0 | 2.7 | 6.7 | 6.3 |
| Putter | 7.0 | 6.3 | 7.6 | 6.7 | 7.0 | 6.7 | 7.0 | 7.0 |
| SR 1020 | 5.0 | 5.0 | 5.7 | 5.7 | 6.7 | 6.7 | 7.3 | 7.3 |
| Providence | 6.0 | 6.0 | 7.3 | 7.3 | 7.3 | 7.3 | 8.0 | 7.7 |
| Bardot | 4.0 | 4.3 | 4.7 | 4.3 | 3.3 | 2.7 | 6.0 | 5.7 |
| Penncross | 6.3 | 5.3 | 7.0 | 6.3 | 6.7 | 6.7 | 7.0 | 7.3 |
| Penneagle | 5.3 | 4.3 | 6.3 | 6.0 | 6.7 | 7.0 | 7.0 | 7.0 |
| Egmont | 3.7 | 3.3 | 4.3 | 4.3 | 3.7 | 4.3 | 6.7 | 5.7 |
| Normarc 101 | 5.3 | 5.7 | 7.0 | 6.0 | 7.0 | 6.7 | 7.0 | 7.0 |
| Forbes 89-12 | 5.7 | 6.7 | 6.7 | 7.0 | 7.3 | 7.0 | 7.3 | 8.0 |
| WVPB 89-D-15 | 5.7 | 5.0 | 6.7 | 6.7 | 7.0 | 6.7 | 7.3 | 8.0 |
| National | 6.7 | 7.7 | 7.0 | 7.0 | 6.7 | 6.7 | 6.7 | 6.7 |
| 88.CBE | 7.0 | 7.3 | 6.3 | 7.0 | 7.7 | 7.7 | 7.3 | 8.0 |
| 88.CBL | 7.0 | 6.3 | 6.7 | 7.0 | 7.3 | 7.3 | 7.3 | 7.3 |
| Cobra | 6.3 | 6.3 | 6.7 | 6.7 | 7.0 | 7.0 | 7.0 | 7.0 |
| Emerald | 5.7 | 5.3 | 6.3 | 7.0 | 6.7 | 6.3 | 6.0 | 6.7 |
| TAMU 88-1 | 5.3 | 6.0 | 7.3 | 7.0 | 6.3 | 7.0 | 6.7 | 6.3 |
| Allure | 3.7 | 3.3 | 4.3 | 3.7 | 3.3 | 2.7 | 6.0 | 6.0 |
| LSD (P=0.05) | 1.9 | 1.7 | 0.9 | 1.1 | 0.9 | 1.0 | 0.6 | 0.8 |

Color and quality ratings 1-9, 9 = ideal turf

[1] Quality and color ratings less than 6.0 are considered unacceptable.

Table 4. Establishment of Bentgrass Cultivars under Green Mowing Heights, Manahattan, KS

| Cultivar | | Rating |
|---|---|---|
| Providence | Rhode Island Univ. (1989) | 6.7 |
| Emerald | W. Weibull Co. Sweden (1965) | 6.0 |
| TAMU 88-1 | Texas A&M University | 6.0 |
| Putter | Washingto St. Univ. (1988) | 6.0 |
| Normarc 101 | Normarc, Inc. | 6.0 |
| Cobra | Rutgers Univ. and Intern. Seeds (1988) | 6.0 |
| 88.CBL | International Seeds | 5.7 |
| 88.CBE | International Seeds | 5.7 |
| MSCB-8 | Missippi State University | 5.3 |
| National | Pickseed West (1989) | 5.3 |
| Pennlinks | Penn State (1989) | 5.3 |
| Penncross | Penn State (1954) | 5.3 |
| SR 1020 | Univ. Arizona (1989) | 5.0 |
| BR 1518 | USGA Green Section | 4.7 |
| Forbes 89-12 | Forbes Seed & Grain | 4.7 |
| WVPB 89-D-15 | Williamette Valley Plant Breeders | 4.7 |
| Bardot | Barengrug USA | 4.0 |
| UM 84-01 | Johnson Seeds, Ltd. | 3.7 |
| Egmont | Olsen-Fennell Seed Co. | 3.7 |
| MSCB-6 | Mississippi State University | 3.7 |
| Tracenta | Van der Have Oregon | 3.3 |
| Carmen | Van der Have Oregon | 3.3 |
| Allure | Williamette Seed Co. | 3.0 |
| LSD (P=0.05) | | 2.0 |

Establishment ratings (1-9 with 9 = best) 5/15/90

Table 5. Performance of Bentgrass Cultivars under Green Mowing Height, Manhattan, KS

| Name | Quality[1] 9/4/90 | Quality[1] 10/9/90 | Color 9/4/90 | Color 10/9/90 |
|---|---|---|---|---|
| BR 1518 | 6.3 | 5.0 | 6.5 | 6.7 |
| Carmen | 6.2 | 5.0 | 6.8 | 6.3 |
| Tracenta | 6.3 | 5.3 | 6.2 | 6.0 |
| Putter | 6.7 | 6.3 | 6.7 | 7.3 |
| SR 1020 | 6.5 | 5.7 | 6.7 | 7.0 |
| Providence | 6.5 | 7.3 | 6.7 | 7.0 |
| Bardot | 6.3 | 5.3 | 6.5 | 6.3 |
| Penncross | 6.5 | 6.0 | 6.7 | 6.7 |
| Pennlinks | 6.0 | 6.0 | 6.5 | 7.0 |
| UM 84-01 | 6.0 | 5.3 | 6.3 | 6.7 |
| Egmont | 6.7 | 5.7 | 6.5 | 6.0 |
| Normarc 101 | 5.8 | 6.3 | 6.5 | 7.0 |
| Forbes 89-12 | 6.5 | 6.0 | 6.7 | 6.7 |
| WVPB 89-D-15 | 6.5 | 5.3 | 6.8 | 6.7 |
| National | 5.5 | 5.0 | 5.8 | 6.0 |
| 88.CBE | 6.5 | 7.3 | 7.0 | 7.7 |
| 88.CBL | 6.3 | 6.0 | 5.0 | 7.0 |
| Cobra | 6.2 | 6.3 | 6.2 | 7.0 |
| Emerald | 6.0 | 6.3 | 6.5 | 6.3 |
| TAMU 88-1 | 5.7 | 6.3 | 5.5 | 6.7 |
| Allure | 6.3 | 4.7 | 6.8 | 5.7 |
| MSCB-6 | 7.0 | 5.0 | 6.8 | 6.7 |
| MSCB-8 | 6.2 | 5.7 | 6.3 | 6.7 |
| LSD (P=0.05) | NS[2] | NS | NS | 0.9 |

Color and quality ratings 1-9, 9 = ideal turf

[1] Quality and color ratings less than 6.0 are considered unacceptable.

[2] Non-significant

Table 6. Ball Speed Ratings of Bentgrass Cultivars under Green Mowing Height, Manhattan, KS

| Cultivar | Source | Ball Speed Ratings[1] Inches/Sec |
|---|---|---|
| National | Pickseed West (1989) | 57.20 |
| Egmont | Olsen-Fennell Seed Co. | 56.51 |
| Normarc 101 | Normarc, Inc. | 56.28 |
| SR 1020 | Univ. Arizona (1989) | 56.25 |
| MSCB-6 | Mississippi State University | 56.10 |
| BR 1518 | USGA Green Section | 55.62 |
| Carmen | Van der Have Oregon | 55.61 |
| Cobra | Rutgers Univ. and Intern. Seeds (1988) | 55.60 |
| Tracenta | Van der Have Oregon | 55.57 |
| Penncross | Penn State (1956) | 55.07 |
| UM 84-01 | Johnson Seeds, Ltd | 54.89 |
| Bardot | Barengrug USA | 54.78 |
| WVPB 89-D-15 | Williamette Valley Plant Breeders | 54.75 |
| MSCB-8 | Mississippi State University | 54.47 |
| Providence | Rhode Island Univ. (1989) | 54.46 |
| Putter | Washington St. Univ. (1988) | 54.43 |
| 88.CBE | International Seeds | 54.10 |
| Pennlinks | Penn State (1989) | 53.47 |
| Allure | Williamette Seed Co. | 53.46 |
| Emerald | W. Weibull Co. Sweden (1965) | 53.26 |
| TAMU 88-1 | Texas A&M University | 51.93 |
| Forbes 89-12 | Forbes Seed & Grain | -----[2] |
| 88.CBL | International Seeds | ----- |
| LSD (P = 0.05) | | 3.37 |

[1] Ratings made 10/30/90

[2] Insufficient plot coverage to run test.

Table 7. Fairway Bentgrass Cultivar Trial, Wichita, 1990

| Cultivar | Average Quality[1] Rating 6/27/90 | Average Quality Rating 7-13-90 | | Average Heat Stress Rating 8-29-90 | |
|---|---|---|---|---|---|
| | | Low N | High N | Low N | High N |
| BR 1518 | 6.0 | 5.0 | 5.3 | 4.0 | 4.0 |
| Carmen | 8.0 | 6.0 | 7.5 | 4.7 | 4.7 |
| Tracenta | 6.0 | 6.3 | 6.5 | 4.0 | 4.0 |
| Putter | 8.5 | 7.8 | 8.3 | 6.5 | 6.5 |
| SR 1020 | 7.8 | 7.7 | 8.0 | 7.5 | 7.5 |
| Providence | 8.5 | 7.8 | 8.3 | 6.7 | 6.7 |
| Bardot | 6.7 | 6.3 | 7.0 | 3.7 | 3.7 |
| Penncross | 8.0 | 7.5 | 8.2 | 7.5 | 7.5 |
| Penneagle | 8.2 | 7.8 | 8.5 | 6.7 | 6.7 |
| Egmont | 7.3 | 6.7 | 7.0 | 4.3 | 4.3 |
| Normarc 101 | 8.3 | 7.7 | 8.2 | 7.0 | 7.3 |
| Forbes 89-12 | 8.3 | 7.5 | 8.3 | 7.2 | 7.2 |
| WVPB 89-D-15 | 8.3 | 7.7 | 8.2 | 6.5 | 6.5 |
| National | 7.8 | 7.3 | 7.7 | 6.5 | 6.5 |
| 88.CBE | 7.7 | 7.7 | 8.2 | 7.2 | 7.2 |
| 88.CBL | 8.2 | 8.2 | 8.7 | 6.5 | 6.5 |
| Cobra | 7.7 | 7.5 | 8.0 | 7.0 | 7.0 |
| Emerald | 7.7 | 7.5 | 8.0 | 6.5 | 6.5 |
| TAMU 88-1 | 8.3 | 8.0 | 8.5 | 5.0 | 6.0 |
| Allure | 6.0 | 5.3 | 5.7 | 3.7 | 3.7 |

Seeded on September 27, 1989. Rate of 13 gms/plot equivalent to 4.4 lbs/100 sq. ft. Plot size 8' x 8'.

[1]Quality rating on 6-27-90: 1/2 lb. N effect disappeared, plots all rated same.

Quality rating on 7-13 and 8-29-90; with 2 fertilizer rates.

Heat stress rating on 8-29-90 after severe injury to certain cultivars on a scale of 0-9, with 0 = dead and 9 = no injury.

Low N = 2 lbs. N; High N = 4 lbs. N/1000 sq. ft.

**TITLE:** Evaluation of Bermudagrass Cultivars for Resistance to Spring Dead Spot.

**PERSONNEL:** John Pair and Ned Tisserat

**INTRODUCTION:**

Spring dead spot continues to be the most damaging disease of bermudagrass in Kansas. Efforts to control the disease by cultural managment and fungicide applications have been erratic. A more reliable and durable means of control is the selection of bermudagrass hybrids with resistance or tolerance to the disease. Our previous studies suggested that there is variation in the susceptibility of bermudagrass clones to spring dead spot. In the fall of 1987, bermudagrass clones in the NTEP trials in Wichita were inoculated with <u>Ophiosphaerella</u> <u>herpotricha</u>, the cause of spring dead spot. Final readings on the susceptibility of the cultivars were taken in the spring of 1991.

**MATERIALS AND METHODS:**

Bermudagrass clones were planted in a randomized complete block design with three replications at the Horticulture Research Farm in 1986. The plots were inoculated with oats contaminated with <u>Ophiosphaerella</u> <u>herpotricha</u> in 1987. Symptoms of spring dead spot initially developed in 1989. In 1991, readings on the number of spots per plot, the percentage area of each plot damaged by the disease, and the overall appearance of the plots were recorded.

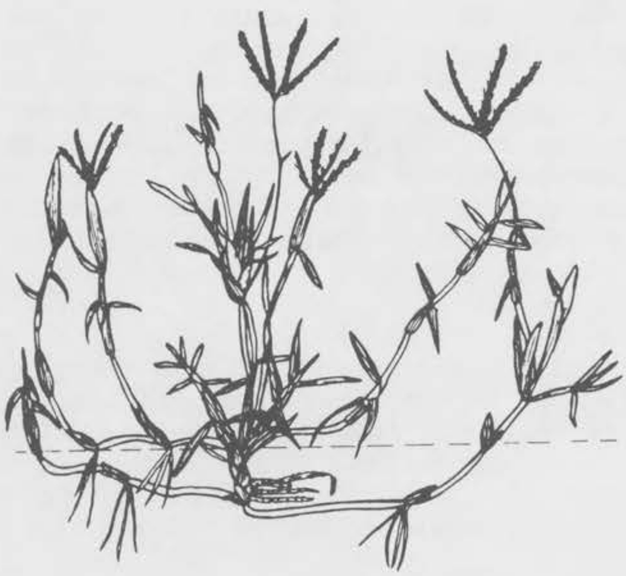
**RESULTS:**

Many of the bermudagrass clones were killed by cold temperatures in December, 1989. Therefore, only 11 cultivars could be rated in 1991. Nevertheless, significant differences in the susceptibility to spring dead spot among the surviving clones were recorded. None of the cultivars was immune to the disease. Midiron, A-22, E-29, and A-29 had the fewest number of spots and the lowest percentage of turf area damaged by the disease. In addition, not all of the turfgrass within the spring dead spot areas had been killed in these cultivars. This factor should help these cultivars recover much more quickly from the disease. Other cultivars, like Tifgreen, had numerous, large, dead spots. Most of the turfgrass withing the spots had been killed.

Table 1. Evaluation of Bermudagrass Clones at the Horticultural Research Station, Wichita for Susceptibility to Spring Dead Spot.

| Bermudagrass Clone[a] | Number of Spots | % Area with Spots | % Kill in Spots | Total Plot Quality[b] |
|---|---|---|---|---|
| Midiron | 2.0 | 4.0 | 26.7 | 8.7 |
| A-22 | 1.3 | 6.2 | 21.7 | 9.0 |
| E-29 | 2.3 | 7.8 | 26.7 | 8.0 |
| A-29 | 2.3 | 12.9 | 33.3 | 8.0 |
| Guymon | 2.7 | 10.0 | 70.0 | 6.0 |
| Midway | 2.0 | 11.5 | 43.3 | 7.0 |
| RS-1 | 3.3 | 20.6 | 70.0 | 6.3 |
| Texturf 10 | 3.0 | 24.7 | 96.7 | 5.7 |
| Vamont | 3.3 | 26.1 | 95.0 | 4.6 |
| Sunturf | 3.3 | 32.7 | 90.0 | 4.7 |
| Tifgreen | 4.0 | 36.1 | 98.3 | 4.0 |
| LSD (P=0.05) | 0.3 | 14.7 | 17.0 | 1.4 |

[a] Other clones in test with complete winter kill in at least two of the three replicate plots included CT-23, NM43, NM72, NM375, NM471, NM507, MSB-10, MSB-20, MSB-30, Tufcote, Tifway, Tifway II, NMS1, NMS3, NMS4, NMS14, Arizona Common, and FB119.
[b] Plot quality rating where 0 = complete kill of plot, and 9 = 90% or better coverage of plot.



**TITLE:** Preventive Fall Fungicide Applications for Control of Zoysia Patch.

**OBJECTIVE:** To determine whether fall applications of fungicides will prevent the development of zoysia patch in the fall and spring.

**PERSONNEL:** Ned Tisserat

**INTRODUCTION:**

Zoysia patch develops in September as air temperatures cool and zoysiagrass begins the dormancy period. Previous research indicated that application of certain fungicides in the spring after zoysia patch was active helped suppress further disease development. However, significant injury to the turf had already occurred by the time fungicides were applied. An alternative would be to use preventive applications of fungicides in late summer and fall before the development of the disease. Because patches tend to occur in the same location each year, applicators may be able to identify specific problem areas and apply preventive applications.

**MATERIALS AND METHODS:**

Fungicide plots were established on zoysiagrass fairways at Shadow Glen, Milburn, Hallbrook, and Topeka Country Clubs. Locations on fairways with active zoysia patch were mapped in May 1990. In August and September 1990, various fungicide treatments were applied to the zoysiagrass plots with a history of the disease. Weather conditions in the fall of 1990 and early spring 1991 were not conducive to zoysia patch development. Only plots at Topeka Country Club showed any signs of zoysia patch development on the fungicide-treated plots, and results will be presented from this location only.

The experimental plan at Topeka Country Club was an incomplete block with three replications. Fungicides were applied in August, September, or both August and September 1990 with a $CO_2$ backpack sprayer. Fungicide plots were 5 X 15 feet. Fungicides were applied in approximately 2 liters of water per 200 sq feet at 20 psi. Plots were rated in April and May 1991 for overall quality and area of each plot affected by the disease.

**RESULTS:**

Extensive variation occurred in the development of zoysia patch in the spring of 1990; therefore, no significant differences were seen among treatments. Nevertheless, applications of Chipco 26019, Lynx, and Banner suppressed disease development in April and May. Results suggest that fall application of certain fungicides, before disease symptoms have appeared, may help suppress zoysia patch.

Table 1. Fungicide Evaluations for Zoysia Patch at Topeka Country Club.

| Treatment Rate/1000 sq ft | | | Turf Quality (1-9)[a] | % Plot with Patch |
|---|---|---|---|---|
| Chipco 26019 | 4oz | August and September | 9.0 | 0 |
| Lynx 3.6F | 2oz | August | 6.7 | 10.3 |
| Lynx 3.6F | 2oz | August and September | 9.0 | 0 |
| Banner 1.1E | 2oz | August | 7.3 | 7.7 |
| Banner 1.1E | 2oz | August and September | 9.0 | 1.7 |
| Rubigan 11 AS | 4oz | August | 6.3 | 18.3 |
| Rubigan 11 AS | 4oz | August and September | 6.3 | 13.3 |
| Control - no fungicide | | | 6.0 | 21.0 |
| LSD | | | ns | ns |

Applications were made in August and September 1990. Data presented are from observations taken on May 5, 1991.

[a] Turf quality ratings are visual estimation of overall greenup of plot, including areas outside of patches, where 0 = 0% turfgrass alive, and 9 = 90-100% plot area with vigorous turfgrass.

**TITLE:** Identification of Ophiosphaerella herpotricha with a Cloned DNA Probe.

**PERSONNEL:** K. Sauer, N. Tisserat, and S. Hulbert, Dept. of Plant Pathology

**INTRODUCTION:**

Differentiation of Ophiosphaerella herpotricha from other ectotrophic fungi associated with spring dead spot of bermudagrass is difficult because of similarities in colony morphology and the inability to induce ascocarp formation in some isolates. Therefore, a DNA hybridization technique was developed to detect O. herpotricha in infected plant tissue.

**RESULTS:**

DNA of O. herpotricha was digested with XbaI and cloned. A 1.5 Kb insert (pOh29) strongly hybridized to total DNA of 29 isolates of O. herpotricha from four states, but not to DNA of 29 other fungal species, including Leptosphaeria korrae and Gaeumannomyces graminis var. graminis. pOh29 also hybridized to DNA of O. herpotricha isolated from 1 $\mu$g lyophilized mycelium and from 200 mg (wet weight) of infected bermudagrass roots, but not to DNA of healthy root tissue. This technique should be useful in identifying O. herpotricha.

**TITLE:** Evaluation of Fungicides for Control of Spring Dead Spot of Bermudagrass, 1991.

**PERSONNEL:** Ned Tisserat

**MATERIALS AND METHODS:**

Fungicides were evaluated for control of spring dead spot on a bermudagrass plot at the Independence Country Club. Treatments were applied to 10 X 10 ft plots arranged in a randomized complete block design with four replications. Fungicides were applied on the 27 Aug and 4 Oct, 1990 with a hand-held $CO_2$-powered sprayer with 8004 Tee jet nozzles, at 30 psi and in water equivalent to 5 gal/1000 sp ft. Plots were irrigated immediately after applications with approximately 1/4 inch of water. Plots were rated on 5 May 1991 for the number of dead spots, the percent area of each plot damaged by the patches, and an overall percentage of healthy turf (% coverage) in each plot. The latter rating was necessary because of small areas of dead turf not directly associated with distinct spring dead spot patches.

**RESULTS:**

Spring dead spot severity on plots was moderate. Applications of the Rhone-Poulenc experimental EXP 10064 plus Chipco 26019 in August and October, EXP 10064 in August and October, or high rates of EXP 10064 in August were effective in reducing the number of spots and the percentage of turfgrass affected. Results indicate that applications in late August are more effective than later applications.

Table 1. Evaluation of Experimental Fungicides for Control of Spring Dead Spot of Bermudagrass, Independence Country Club.

| Treatment | Application Times | # of SDS Spots | % area Damaged | Turf Quality |
|---|---|---|---|---|
| EXP 10064 1.5 oz plus Chipco 26019 4 oz | Aug and Oct | 1.8 | 7.5 | 8.0 |
| EXP 10064 1.5 oz | Aug and Oct | 2.8 | 12.5 | 7.5 |
| EXP 10064 3.0 oz | Aug | 2.5 | 11.3 | 7.8 |
| EXP 10064 1.5 oz | Oct | 3.5 | 45.0 | 4.5 |
| EXP 10064 1.5 oz | Aug | 4.0 | 32.5 | 6.3 |
| EXP 10064 3.0 oz | Oct | 4.3 | 35.0 | 5.5 |
| Chipco 26019 8 oz | Aug and Oct | 5.5 | 52.5 | 5.5 |
| Chipco 26019 8 oz | Aug | 5.8 | 27.5 | 4.0 |
| No fungicide | | 5.8 | 55.0 | 3.8 |
| LSD (0.05) | | 2.1 | 23.4 | 1.9 |

Turf quality based on 0-9 scale, where 0 = complete plot damaged (no green turf) and 9 = 90-100% coverage of plots.

**TITLE:** Etiology of Zoysia Patch

**OBJECTIVE:** To determine the cause of zoysia patch disease on golf course fairways and home lawns.

**PERSONNEL:** David Green, Roch Gaussoin, John Pair, and Ned Tisserat

**INTRODUCTION:**

A patch disease of zoysiagrass continues to cause damage on golf course fairways and home lawns in many areas of the state. Zoysia patch results in the formation of roughly circular or irregular areas of blighted turfgrass in fall and spring. Affected areas often have a yellow to orange ring at the margin of the patch during periods when the fungus is active. Generally, the turfgrass is not completely killed, but is very slow to resume spring growth. Our objective is to determine the cause(s) of this disease.

**MATERIALS AND METHODS:**

Samples of diseased turf were collected from several golf courses and home lawns in 1990 and spring 1991. Several fungi, including _Gaeumannomyces incrustans_, _Gaeumannomyces_ sp., _Ophiosphaerella herpotricha_, _Rhizoctonia solani_, and a binucleate species of _Rhizoctonia_ (associated with cool-season brown patch diseases) were recovered from the diseased turfgrass. Isolates of each fungus were grown on sterile oats. Zoysiagrass at Rocky Ford was inoculated with the fungi in early March 1991. Inoculations were made by removing a 4-inch-diameter plug of turf, inserting the oat inoculum of individual isolates, and replacing the plugs. Inoculations were placed in a randomized block design with 20 inoculations of each of 10 putative pathogens (plus one control of sterile oats). The plot was observed weekly for development of patch-type symptoms.

A weather station was established at Alvamar Country Club in March 1991 to monitor soil and air temperatures, relative humidity, and rainfall during zoysia patch development. Weather conditions were monitored closely.

**RESULTS:**

By May 5 1991, 50% (10/20) of plugs inoculated with a _Rhizoctonia_ isolate at the Rocky Ford Field Plots had developed blighted turf beyond the diameter of the original area of inoculation. Symptoms on the turfgrass were identical to those occuring on zoysiagrass fairways in many areas of the state during the same time period. None of the other fungi tested, including _G. incrustans_, resulted in blighted turf.

These results indicate that _Rhizoctonia_ species can cause patch symptoms on zoysiagrass in the field. This fungus apparently is associated with the zoysia patch development in the spring. Whether this fungus is the primary cause of zoysia patch or whether other fungi also can contribute to or cause zoysia patch remains unknown. We are currently determining the species of _Rhizoctonia_ associated with the patch disease.

**TITLE:** Evaluation of Fungicides for Therapeutic Control of Zoysia Patch, 1990.

**PERSONNEL:** Ned Tisserat

**MATERIALS AND METHODS:**

Fungicides were evaluated on a zoysiagrass fairway at Milburn Country Club. The turf was mowed to a height of 1/2 inch and received 1 1/2 lb N/1000 sq ft through the summer of 1989. Treatments were applied to 10 X 10 ft plots arranged in a randomized complete block design with three replications. Fungicides were applied on 26 April 1990 with a hand-held $CO_2$-powered sprayer with 8004 Tee Jet nozzles, at 30 psi, and in water equivalent to 5 gal/1000 sq ft. Plots were irrigated immediately after application with approximately 1/4 inch of water. Zoysia patch was active at the time of fungicide application. Plots were rated on 26 April and 24 May for the number of dead spots and the percent area of each plot damaged by the patches and on 26 May for the percentage of discolored or dead foliage within the patches. The latter rating was necessary because not all of the turfgrass within the patches was killed.

**RESULTS:**

Zoysia patch was severe throughout the testing period. All three fungicides suppressed ($\underline{P}$ = 0.05) formation of new patches and increased recovery of turfgrass in established patches compared to nontreated plots. Plots treated with Banner and Lynx also had a lower percentage increase in patch size, although differences were not significant.

Table 1. Ratings of Control of Zoysia Patch by Fungicides

| Treatment and Rate/1000 sq ft | # Spots per Plot 26 Apr | # Spots per Plot 26 May | % Plot Area in Patches 26 Apr | % Plot Area in Patches 26 May | % Dead Foliage in Patches 26 May |
|---|---|---|---|---|---|
| Banner 1.1 EC 4 oz | 1.7a | 1.7a | 36.7a | 39.7a | 53.3a |
| Rubigan AS 8 oz | 2.0a | 2.7a | 17.3a | 33.3a | 73.3b |
| Lynx 1.2 EC 4 oz | 1.7a | 1.7a | 17.7a | 17.7a | 46.7a |
| No fungicide | 3.3a | 4.3b | 43.3a | 67.3a | 90.0c |

Column means followed by same letter are not significantly different ($\underline{P}$ =0.05) by Fisher's protected LSD test. Values presented are means of three replications.

**TITLE:** Evaluation of Fungicides for Control of Spring Dead Spot of Bermudagrass, 1990

**PERSONNEL:** N.A. Tisserat, J. Pair, and A. Nus

**MATERIALS AND METHODS:**

Fungicides were evaluated for control of spring dead spot on a bermudagrass plot in Wichita, KS that has been inoculated with _O. herpotricha_ in 1987. The turf received high maintenance (>4 lb n?1000 sq ft) through the summer of 1989. Treatments were applied to 5 X 5 plots arranged in a randomized complete block design with three replications. Fungicides were applied on 16 Sep 1989 with a hand-held $CO_2$-powered sprayer with 8004 Tee Jet nozzles, at 30 psi, and in water equivalent to 5 gal/1000 sq ft. Plots were irrigated immediately after application with approximately 1/4 inch of water. Plots were rated on 31 May 1990 for the number of dead spots, the percent area of each plot damaged by the patches, and an overall percentage of dead turf in each plot. The latter rating was necessary because of small areas of dead turf not directly associated with distinct spring dead spot patches.

**RESULTS:**

The bermudagrass was slow to break winter dormancy because of a cool spring, and ratings were delayed for 1 month. Spring dead spot severity was moderate. Both rates of Banner and Rubigan reduced the number of spots per plot and the total % area of dead turf compared to nontreated plots. Temperatures of -27C in December did not appear to cause extensive winter kill. Nevertheless, there were differences between the total area of bermudagrass in each plot killed and percent area damaged by distinct, circular patches typical of spring dead spot. Whether turfgrass damage outside of the patches was a result of the pathogen, cold temperatures, or a combination of both is unclear.

Table 1. Control of Spring Dead Spot by Fungicides

| | | Disease Severity | |
|---|---|---|---|
| Treatment and Rate/1000 sq ft | Number Spots/Plot | % Plot Area Diseased (Spots) | % Plot Area Diseased (Total) |
| Banner 1.12 EC 2 fl oz | 2.7a* | 7.9a | 20.0a |
| Banner 1.12 EC 4 fl oz | 2.7a | 4.0a | 16.7a |
| Rubigan 1 AS 4 fl oz | 3.0a | 9.5a | 20.0a |
| Rubigan 1 AS 8 fl oz | 1.7A | 7.6a | 13.3b |
| No fungicide | 5.7b | 28.1a | 56.7b |

*Column means followed by the same letter are not significantly different (_P_ = 0.05) by Fisher's protected LSD test. Values presented are means of three replications.

**TITLE:** Control of Crabgrass with Preemergence Herbicides

**OBJECTIVE:** To compare the efficacy of spring applications of various preemergence herbicides in controlling annual grassy weeds in cool-season turf.

**PERSONNEL:** Roch E. Gaussoin, Ward Upham, Kevin Kamphaus

**SPONSOR:** Monsanto, Ciba-Geigy, Sandoz, Dow-Elanco

**MATERIALS AND METHODS:**

The study was conducted on a Kentucky bluegrass turf located at the KSU Rocky Ford Turfgrass Research Center near Manhattan, KS. The experimental area has been overseeded for 2 years with large crabgrass to supplement native weed populations. Treatments applied are shown in Table 1.

Treatments were applied with a backpack $CO_2$ sprayer equipped with 8008 flat fan nozzles calibrated to deliver 94.6 GPA (2.2 gal/1000 $ft^2$) at 30 psi. Granular applications were applied with a shaker can. All treatments were applied on 4/10/90 except Premier, which was applied on 4/18/90. Registered compounds whose label recommends a second application were applied only once to measure residual control of these compounds. Plot size was 1 x 2 meters, and the experimental design was a randomized complete block with three replications. Data were collected on crabgrass infestation on 6/16, 6/18, 7/23, 8/8, and 9/4.

**RESULTS:**

Results are shown in Table 1. Data obtained on 6-18 showed all treatments to have significantly less crabgrass than the untreated controls, except for Balan at 3 lbs/ai/A. Examination of individual plot data, however, indicates that in one of the replications this treatment apparently was not applied. The data for this treatment should be considered suspect. On 7/23, some of the treatments began to decrease in efficacy and have crabgrass populations statistically equal to those of the control. Additionally, 13 of the treatments (followed by an E) had significantly lower crabgrass populations than any of the other treatments. By 9/4, efficacy of many of the treatments had deteriorated to unacceptable levels. However, plots treated with both formulations of Dimension had no visible crabgrass, whereas plots treated with the high rate of Team, Pre-M, and Premier and both rates of Ronstar had less than 5% crabgrass.

**SUMMARY:**
Early-season control of crabgrass was good to excellent for all compounds tested. As the season progressed, many of the compounds decreased in efficacy. Some of the compounds exhibiting this response are registered compounds that recommend a second application to ensure season-long control, which was not applied in this investigation. These compounds will require a second application, as directed by the label, to give season-long control. Dimension, Team, Pre-M, and Premier, at appropriate rates, gave season-long control of crabgrass.

Table 1. Preemergence Herbicide Trial, Manhattan, KS - 1990

| Herbicide | Rate (AI/AC) | % Crabgrass 6-18-90 | | 7-23-90 | | 9-4-90 | |
|---|---|---|---|---|---|---|---|
| Barricade (65WDG) | 0.75 | 0.3 | D | 2.7 | E | 8 | DEFG |
| Barricade (65WDG) | 1.00 | 1.0 | D | 5.0 | DE | 26.6 | CDEFG |
| Dacthal (75WP) | 10.5 | 2.7 | BCD | 20.0 | CDE | 43.3 | BC |
| Balan (60DF) | 2 | 3.7 | BCD | 28.3 | BCD | 60.0 | B |
| Balan (60DF) | 3 | 11.4 | AB | 58.3 | A | 93.0 | A |
| Team (2G) | 2 | 1.0 | D | 4.3 | E | 11.0 | DEFG |
| Team (2G) | 3 | 0.0 | D | 0.3 | E | 5.0 | FG |
| Ronstar (50W) | 1.5 | 0.0 | D | 0.3 | E | 3.3 | FG |
| Ronstar (50W) | 2.0 | 0.0 | D | 0.3 | E | 3.3 | FG |
| Lesco Pre-M (60WDG) | 1.5 | 0.0 | D | 2.0 | E | 11.0 | DEFG |
| Lesco Pre-M (60WDG) | 2.0 | 0.3 | D | 0.3 | E | 3.3 | FG |
| Betasan (4-E LF) | 12 | 1.0 | D | 3.0 | E | 15.0 | CDEFG |
| Dimension (.25G) | 0.5 | 0.3 | D | 2.0 | E | 0.0 | G |
| Dimension (1EC) | 0.75 | 0.0 | D | 0.0 | E | 0.0 | G |
| Premier | 1.5 | 0.0 | D | 2.7 | E | 6.6 | EFG |
| Premier | 2.0 | 1.0 | D | 1.7 | E | 5.0 | FG |
| UNTREATED CONTROL | | 15.7 | A | 50.0 | AB | 95.0 | A |

Means within a column followed by the same letter are not significantly different based on: LSD (P=0.05)

**TITLE:** Broadleaf Weed Control Investigations, 1990

**OBJECTIVE:** To compare the efficacy of later spring applications of Dow experimental broadleaf herbicide XRM-5202, Turflon II Amine, Turflon D, Confront, and Trimec in controlling common broadleaf weeds in cool-season turfgrass.

**PERSONNEL:** Roch Gaussoin, Ward Upham

**SPONSOR:** Dow-Elanco

**MATERIALS AND METHODS:**

The study was conducted on a tall fescue turf located on the KSU campus grounds, Manhattan, KS. The experimental area received 1 lb N/1000 $ft^2$ via urea in May, 1990, and the turf was irrigated on an as-needed basis. The area was severely infested with mature broadleaf weeds, including bindweed, dandelion, and black medic.

Treatments included: XRM-5202 (2.0, 3.0, and 4.0 pt/A); Turflon II Amine (3 pt/A); Turflon D (3 pt/A); Confront (1.0, 1.5, and 2.0 pt/A); Trimec (3 and 4 pt/A); and an untreated control. Treatments were applied with a backpack $CO_2$ sprayer equipped with 8015 nozzles calibrated to deliver 102 GPA (2.3 gal/1000 $ft^2$) at 40 psi. Treatments were applied on June 8, 1990. Data were collected on initial weed pressure (by species), toxicity to turf species 2 weeks after treatment (WAT). Initial weed pressure and percent weed control were evaluated by a visual estimate of weed populations. The initial weed estimate were used to calculate weed control by species as percent of initial infestation. Toxicity to turf species was evaluated on a visual rating from 1-9, with a 9 indicating severe phytotoxicity. Plot size was 1 x 2 meters, and the experimental design was a randomized complete block with three replications.

**RESULTS:**

No data are shown for phytotoxicity, because on both evaluation dates, no symptoms of toxicity were exhibited in any of the treatments. Tabulated data for weed control are shown in Table 1. The control plots exhibited reduction of all three species at 4 WAT and for dandelion and black medic at 8 WAT. This nonchemical reduction in weed infestation can be attributed to environmental conditions in 1990 (i.e., cool, moist) that increased the competitive ability of the tall fescue. The reduction in weed populations in the control plots ranged form 36 to 47%. Data obtained at 4 WAT indicated that all products evaluated significantly reduced dandelion and black medic populations relative to the control plots. Field bindweed, however, was harder to control, as exhibited by lower reductions in the populations. Data from the 8 WAT evaluation showed dandelion to be significantly reduced relative to the control by all products tested. Black medic populations went down (compared to 4 WAT) for all products and the control plots, except for the Turflon II Amine treatment. Populations of field bindweed went up (compared to 4 WAT), primarily as a consequence of low control at 4 WAT. As a result, no product exhibited acceptable control of bindweed at 8 WAT.

**SUMMARY:**

All of the products tested caused no toxicity to mature tall fescue turf and significantly reduced populations of dandelion on both evaluation dates. Population of black medic were also reduced at 4 WAT. At 8 WAT, however, control was reduced in plots treated with XRM-5202 (2 pt/A) and Turflon II Amine. Field bindweed was harder to control, with none of the products tested exhibiting acceptable control at 8 WAT. Repeat applications of products that exhibited acceptable control at 4 WAT (i.e., Confront, Turflon II Amine, and Trimec) may be necessary to control bindweed.

Table 1. Efficacy of Broadleaf Herbicides for the Control of Dandelion (D), Black Medic (BM), and Bindweed (BW) in Turf, Manhattan, KS - 1990

| | | % Reduction | | | | | |
|---|---|---|---|---|---|---|---|
| | | 4 WAT | | | 8 WAT | | |
| Treatment | Rate | D | BM | BW | D | BM | BW |
| Control | | 36.7 | 46.7 | 21.3 | 16.7 | 0.0 | 0.0 |
| XRM-5202 | 2 pt/A | 90.7 | 100.0 | 50.0 | 86.0 | 97.7 | 25.0 |
| XRM-5202 | 3 pt/A | 95.7 | 100.0 | 72.3 | 81.0 | 100.0 | 67.3 |
| XRM-5202 | 4 pt/A | 95.3 | 88.7 | 81.7 | 83.7 | 100.0 | 60.7 |
| Turflon II Amine | 3 pt/A | 91.7 | 100.0 | 87.7 | 100.0 | 94.3 | 68.3 |
| Turflon D | 3 pt/A | 100.0 | 100.0 | 67.7 | 97.7 | 100.0 | 51.0 |
| Confront | 1 pt/A | 91.7 | 96.7 | 84.0 | 95.0 | 100.0 | 51.7 |
| Confront | 1.5 pt/A | 100.0 | 100.0 | 89.7 | 95.7 | 100.0 | 57.7 |
| Confront | 2.0 pt/A | 83.3 | 100.0 | 92.0 | 100.0 | 100.0 | 39.3 |
| Trimec | 3 pt/A | 100.0 | 100.0 | 90.0 | 97.7 | 100.0 | 73.7 |
| Trimec | 4 pt/A | 89.0 | 93.3 | 87.7 | 87.7 | 100.0 | 67.3 |
| LSD (P=0.05) | | 29.0 | 14.2 | 34.4 | 20.5 | 5.2 | 47.4 |

**TITLE:** Turf Root Stimulator Study

**OBJECTIVE:** To compare biostimulants for turf color and rooting effects.

**PERSONNEL:** Roch Gaussoin, Ward Upham, and Kevin Kamphaus

**SPONSOR:** Plant Bioregulator Technologies, Inc.

## INTRODUCTION:

Products containing cytokinin have received more interest from industry personnel recently because of their effects on turf color and rooting. This study was undertaken to quantify these effects.

## MATERIALS AND METHODS:

This series of studies utilized randomized complete block designs. All studies were replicated three times and were done at the KSU Rocky Ford Turfgrass Research Plots.

Study 1:
A rate study was undertaken on a bentgrass green with treatments consisting of a control and Cyto-Gro used at .75, 1.5 and 3 ounces of product per 1000 square feet. Data were taken on green-up, green-down and rooting in the spring. Green-up and green-down ratings were done by a subjective color rating (1-9, 9=darkest green).

Studies 2-4:
These studies were done on three different turfs; a bentgrass green (Study 2), a Kentucky bluegrass area mowed at 3/4 inch (Study 3), and a Zoysia area also mowed at 3/4 inch (Study 4). All three studies utilized the same six treatments, which consisted of an untreated control, CytoFe applied at 3 ounces per 1000 square feet, FeRoots applied at 3 ounces per 1000 square feet, Cytogro at .8 ounce per 1000 square feet, benzyladenine at the same rate of active ingredient as Cytogro, and chelated iron at the same rate of iron as FeRoots. All treatments were applied on 10/2/90. Two weeks later, CytoFe was applied at full rate, and Cytogro and benzyladenine were applied at a half-rate. After an additional 2 weeks, Cytogro and benzyladenine were again applied at a half-rate. FeRoots and the chelated iron were not applied again. The same sequence of applications was made in the following spring starting on 4/1/91. However, the rates for the first application of CytoFe and FeRoots were doubled to 6 ounces per 1000 square feet. Data were taken on green-up and green-down for all three studies. Rooting data were taken for the study done on the bentgrass green.

Study 5:

This study was done on bermudagrass cultivars and consisted of three treatments; an untreated control, CytoFe, and Cytogro. Each cultivar plot was divided into three strips with each strip receiving one of the treatments. The timing and rates of application were identical to those used for studies 2 through 4. Data were taken on green-up, green-down and winter survival.

**RESULTS:**

There were no significant differences in any parameter for any study but Study 4. Zoysia showed an earlier spring green-up for ratings taken on 4/10/91 (Table 1). Plots treated with CytoFe and FeRoots showed significantly higher green-up ratings than the untreated control, with CytoFe plots being significantly greener than FeRoots plots.

Table 1. Green-up Ratings for Zoysia Treated with Different Root Enhancing Products.

| Treatment | Green-up |
|---|---|
| Untreated control | 4.3 |
| CytoFe | 6.5 |
| FeRoots | 5.3 |
| Cytogro | 4.3 |
| Benzyladenine | 4.2 |
| Chelated iron | 4.3 |
| LSD (P=0.05) | 0.5 |

Green-up ratings 1-9 (9=darkest green)

**TITLE:** Tall Fescue Response to Six Fertilizer Programs

**OBJECTIVES:** To compare various fertilizer programs, all at 4 lbs. of nitrogen per 1000 sq. ft. per season but some applied only once per year.

**PERSONNEL:** John C. Pair

**SPONSOR:** Grace-Sierra Company

**INTRODUCTION:**

Most fertilizer programs for home lawns consist of approximately 4 lbs. of actual nitrogen per 1000 sq. ft. per season. Applications are typically distributed over the months from April through November, with the summer applications often consisting of a slowly available nitrogen source. A series of treatments was designed to compare various fertilizer programs, all at the same nitrogen level (4 lbs. N per year), two of which were applied at the full rate all at once using a slowly available nitrogen carrier.

**MATERIALS AND METHODS:**

The following fertility programs were applied to a 3-year-old stand of a tall fescue premium blend (containing Arid, Apache, Rebel II, and Bonanza):

1. (24-6-10 ONCE product) applied at 4 lbs. N/1000 sq. ft. in Sept.
2. 24-6-12 (a commercial blend) applied at 1 lb. N/1000 sq. ft. in Sept., Nov., April, and June.
3. Same as No. 2, except June application was sulfur-coated urea (36-0-0).
4. 46-0-0 (urea) at 1 lb. N/1000 sq. ft. plus 6% $P_2O_5$ and 11% $K_2O$ applied in Sept., urea in Nov. and April, and sulfur-coated urea (36-0-0) in June.
5. 46-0-0 (urea) at 1 lb. N/1000 sq. ft. in Sept. and Nov. with 24-6-10 (ONCE) applied at 2 lbs N/1000 sq. ft. in April (with subsequent spring applications of ONCE at 4 lbs. N).
6. No fertilizer in the fall but 4 lbs. N/1000 sq. ft. in March as ONCE 24-6-10 (with subsequent spring applications at the 4 lbs. N rate).

**RESULTS:**

After only one season of observations, most treatments were providing satisfactory results based on visual quality and clipping yields. Peaks in vigor and color coincided with individual treatment applications as expected. The application of 4 lbs. of nitrogen per 1000 sq. ft. all at once in the fall provided excellent growth, quality, and spring green-up through the first spring season. Summer quality from this single fall application has not been observed nor have the effects of summer growth from 4 lbs. of nitrogen, applied all at once in March. Preliminary results appear in Table 1.

Table 1. Response of tall fescue to various fertilizer programs [1/].

| Fertilizer Program | Turf Quality (0-9 w/9 = best) 10-1-90 | 10-18-90 | 11-12-90 | 3-28-91 | 4-22-91 | Clipping Yield (gm) 11-15-90 |
|---|---|---|---|---|---|---|
| 1. ONCE (24-6-10) @ 4 lbs. N. in Sept. | 8.8 | 6.3 | 7.8 | 7.4 | 8.0 | 39.8 |
| 2. 24-6-12 @ 1 lb. N Sept., Nov., April & June | 7.0 | 6.3 | 5.6 | 6.1 | 6.9 | 26.0 |
| 3. Same as #2 above but SCU in June | 7.1 | 7.5 | 6.1 | 5.8 | 6.8 | 26.3 |
| 4. Urea (46-0-0) @ 1 lb. N. Sept., Nov., & April, SCU in June | 8.5 | 5.8 | 6.0 | 7.3 | 7.5 | 31.5 |
| 5. Urea @ 1 lb. N Sept. & Nov. ONCE (24-6-10) @ 2 lbs N. April | 8.5 | 6.6 | 6.4 | 7.3 | 7.5 | 24.8 |
| 6. No fertilizer in fall, 1990 ONCE (24-6-10) @ 4 lbs. N. in March | 4.8 | 4.0 | 5.0 | 2.9 | 8.6 | 23.5 |

[1/] Applied to a 3-year-old stand of tall fescue premium blend (mean of four replications.

**TITLE:** Organic Fertilizer Study

**OBJECTIVE:** To compare organic fertilizers (including urea) for turf color and clipping yield effects.

**PERSONNEL:** Roch Gaussoin, Ward Upham, and Kevin Kamphaus

**SPONSOR:** Farmland Industries

**INTRODUCTION:**

Turf managers and homeowners are showing increased interest in organic turf fertilizers. This study was designed to compare five organic fertilizers (including urea) for turf color and clipping yield differences.

**MATERIALS AND METHODS:**

This study utilized a randomized complete block design. The six treatments were replicated four times and included an untreated control, Urea (46-0-0) at 2.2 lbs per 1000 $ft^2$, Farmland 8-2-8-3 Fe fertilizer at 10 and 12 lbs per 1000 $ft^2$, Sustane 5-2-4 at 20 lbs per 1000 $ft^2$, and Soilquest 8-2-4 at 12 lbs per 1000 $ft^2$. Plot size was 1 x 2 meters.

All fertilizers were granular and were applied by hand to a Baron Kentucky bluegrass turf located at the KSU Rocky Ford Turfgrass Research Plots. Fertilizer applications were made on 10/1/90, 3/28/91 and 5/15/91. Plots were maintained at 3 inches high with clippings returned and were irrigated to alleviate stress. Pendimethalin was applied in March to control annual grasses.

Data collected included a subjective color rating (1-9, 9 = darkest green) and clipping yield (both fresh and dry weights). Color ratings and clipping yields were taken on April 24, 1991, with color ratings taken on 5/8/91 and every 2 weeks thereafter.

**RESULTS:**

The only significant differences as of 5/9/91 were noted for fresh weight clipping yields for 4/24/91 and color ratings for 5/8/91. The urea and the Sustane treatments produced significantly more clippings than the control treatment. There was a great deal of overlap with the 5/8/91 color ratings, making clear interpretation difficult. It is expected that differences will become more pronounced further into the season.

Table 1. Color Ratings of Kentucky Bluegrass Fertilized with Different Organic Fertilizers, Manhattan KS

| Fertilizer | Color Ratings 4/24/91 | Color Ratings 5/8/91 |
|---|---|---|
| Untreated Control | 6.7 | 6.1 |
| Urea (2.2#)[1] | 7.5 | 6.9 |
| Farmland 8-2-8-3 Fe (10#) | 7.4 | 6.6 |
| Farmland 8-2-8-3 Fe (12#) | 7.3 | 6.5 |
| Sustane 5-2-4 (20#) | 7.4 | 6.9 |
| Soilquest 8-2-4 (12#) | 7.5 | 7.2 |
| LSD (P=0.05) | NS[2] | 0.5 |

Color ratings 1-9, 9 = darkest green color

[1] Number in parentheses = pounds of product per 1000 $ft^2$
[2] NS = Non-significant

Table 2. Clipping Yields of Kentucky Bluegrass Fertilized with Different Organic Fertilizers, Manhattan, KS

| Fertilizer | Clipping Yields: 4/24/91 | |
|---|---|---|
| | Fresh Weight (Gms) | Dry Weight (Gms) |
| Untreated Control | 27.7 | 8.6 |
| Urea (2.2#)[1] | 59.2 | 18.7 |
| Farmland 8-2-8-3 Fe (10#) | 38.5 | 12.6 |
| Farmland 8-2-8-3 Fe (12#) | 32.2 | 10.4 |
| Sustane 5-2-4 (20#) | 50.5 | 15.0 |
| Soilquest 8-2-4 (12#) | 44.2 | 12.5 |
| LSD (P=0.05) | 20.6 | NS[2] |

[1] Number in parentheses = pounds of product per 1000 $ft^2$
[2] NS = Non-significant

**TITLE:** Effect of Potassium on Hardiness of Seeded Bermudagrass Cultivars

**OBJECTIVE:** To compare five seeded bermudagrass cultivars for hardiness and evaluate the effect of potassium on winter survival.

**PERSONNEL:** John C. Pair

**SPONSOR:** Grace-Sierra Company

**INTRODUCTION:**

Common bermudagrass, planted from seed, commonly winter kills in south central Kansas. New cultivars, recently introduced, offer greater hardiness. Recent interest in further increasing hardiness levels with supplemental applications of potassium sulfate provides the opportunity for testing this possibility.

**MATERIALS AND METHODS:**

A slow release form of potassium sulfate (ONCE 24-6-11) was incorporated into the top 3 inches of soil at 4 lbs. N/1000 sq. ft. prior to planting bermudagrasss cultivars: 1) Common, 2) Cheyenne, 3) Guymon, 4) Numex Sahara, and 5) Sun Devil. Seeding was at the rate of 2 lbs./1000 sq. ft. in mid-July, 1990. On August 31, 1990, 0-0-47 (ONCE) was applied at 3 lbs. $K_2O$/1000 sq. ft. A second treatment consisted of a soluble form of potassium sulfate (0-0-50) applied at 1 lb. of K/1000 sq. ft. during the months of August, April, and June. Control plots received no additional potassium.

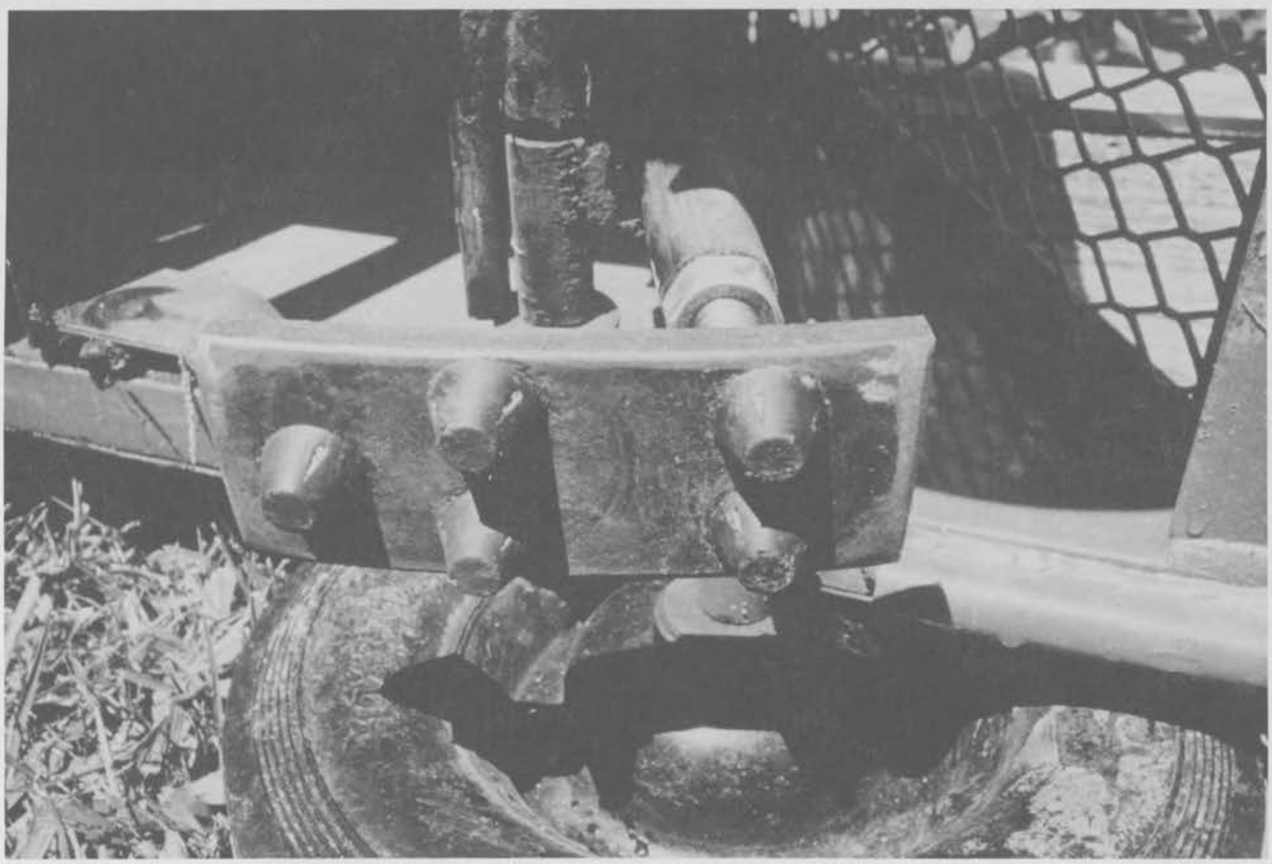
**RESULTS:**

Grass established well by early fall, and reasonably good stands were achieved for all cultivars. No response could be observed from supplemental potassium applications in either fall or during spring green-up. However, considerable difference in hardiness occurred among cultivars. Cheyenne, Guymon, and Sun Devil all appeared hardier than Numex Sahara and Arizona Common (Table 1).

Table 1. Hardiness of Five Bermudagrass Cultivars as Affected by Supplemental Potassium [1/].

| Treatment | Arizona Common | Cheyenne | Guymon | Numex Sahara | Sun Devil |
|---|---|---|---|---|---|
| ONCE 0-0-47 applied 8-31-90 | 4.5 | 7.3 | 8.3 | 2.5 | 8.0 |
| Potassium sulfate 0-0-50 Aug, April and June | 2.5 | 8.0 | 8.0 | 3.0 | 8.3 |
| Control (no additional K) | 3.0 | 7.5 | 8.3 | 3.3 | 8.0 |
| Average: | 3.3 | 7.6 | 8.2 | 2.9 | 8.1 |

[1/] Green-up rated May 2, 1991 on a scale of 0 - 9, with 0 = dead and 9 = most live turf.



Modified aerator used to simulate foot traffic on bermudagrass

**TITLE:** Effect of Three Levels of Soil Compaction on the Performance of Six Bermudagrass Cultivars

**OBJECTIVES:**
1. To screen various bermudagrasses under typical sports field conditions and
2. To measure physical effects of compaction as influenced by core aerification

**PERSONNEL:** John C. Pair and Jeff Nus

**SPONSOR:** Kansas Turfgrass Foundation

**INTRODUCTION:**

For most high school sports fields and municipal recreation areas, bermudagrass is the most wear-resistant turf species available. However, damage from winter injury and the effects of compaction severely reduce survival and hinder recovery and repair of the playing surface in the following season. The following experiment offers a screening mechanism for comparing hardiness and resistance to compaction of various bermudagrass selections.

**MATERIALS AND METHODS:**

Sprigs of vegetative bermudagrass clones, Midiron, A-29, and Westwood, were compared with seeded types, Guymon and Common (hulled bermuda). All grasses were established on June 4, 1986 and compaction treatments, consisting of weekly applications of 4, 8, and 12 times across with a modified Kisgen aerator, began on September 24. Foot traffic was simulated by replacing aerator tines with steel "feet" on which were attached five football cleats to approximate compaction equal to actual sports play. Half of each plot was core aearated to alleviate the effects of foot traffic, and physical effects were measured by a penetrometer before and after compaction.

**RESULTS:**

After three seasons of simulated traffic, considerable differences were apparent among cultivars and at various levels of compaction. The most wear resistant, vegetative selections were A-29, Midiron, and Westwood. However, Westwood winterkilled at both the 8 and 12 times across levels of compaction and did not recover following $-18^{o}F$ on December 22, 1989. All plots of Arizona Common (seeded) bermudagrass winterkilled, whereas Guymon (also seeded) survived well, even at the highest level of compaction.

Core aerification only partially reduced injury from compaction and, in fact, appeared only to move the compaction layer down to a depth of 10 to 15 cm according to penetrometer measurements. In the second season, when aerification was continued through August, injury to the turf was greater on the aerated plots compared to non-aerated treatments. This was attributed to cleats actually tearing out turf by catching in the holes left by the hollow core tines. The following year, when aerification was discontinued in July, this phenomenon was not observed. In fact, plots that were aerated had better green-up following the severe winter of 1989-90, which killed all Arizona Common and Westwood bermudagrass receiving highest levels of compaction. Best green-up occurred on Midiron bermuda (Fig. 1).

# SPRING GREEN-UP
## April, 1990

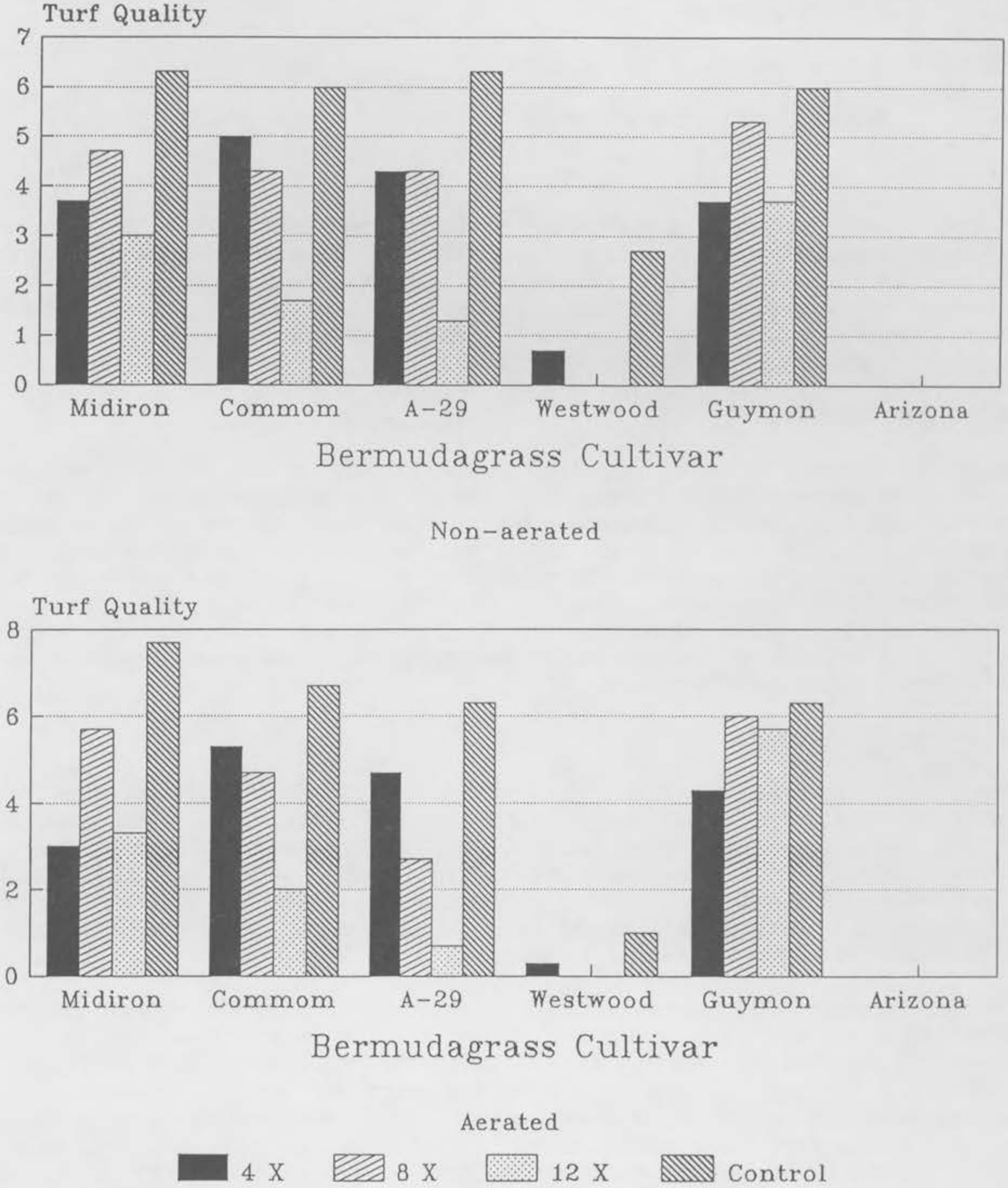



Fig. 1. Spring green-up of non-aerated (above) and aerated (below) bermudagrass plots subjected to various levels of compaction for three seasons.

**THANKS!!!!!**

The following companies and organizations have contributed to the turfgrass research and teaching effort of Kansas State University, and we express our sincere appreciation for their support. Without their generosity, the scope of our turfgrass research would be greatly curtailed.

Kansas Turfgrass Foundation
Heart of America Golf Course Superintendents Association
Kansas Golf Course Superintendents Association
Kansas Agricultural Experiment Station

Allied Colloids
Alvamar Golf, Inc.
Aquatrols Corporation
Champion Turf Equipment
Chemlawn
CIBA-GEIGY Corporation
Clifford Sales and Marketing
Cushman Manufacturing
Dow-Elanco
E.I. Dupont
Electrical and Computer Engineering Dept., KSU
Estech Fertilizers
Excel Corporation
EZ-Go Turf Vehicles
Grass Pad
Hoechst-Roussel Agri-Vet Co.
International Absorbent Products, Inc.
International Seeds
Jacklin Seed
Jacobsen Manufacturing
Karsten Turf Company
Lebanon Chem. Corp.
Lesco, Inc.
Manhattan Country Club
Manhattan Parks & Recreation
Milorganite
Mobay Chemicals
Monsanto Corporation
Nor-Am Corporation
North American Micron
O.M. Scotts
Olathe Manufacturing
PBI Gordon Corporation
Pickseed West
Plant Bioregulator Technologies
Research Seeds, Inc.
Rhone-Poulenc Ag Company
Robisons Lawn and Golf, Inc.
Sandoz Crop Protection
Spraying Systems, Inc.
Toro Manufacturing
W.A. Cleary Corporation
Western Polyacrylamide, Inc.

## Personnel Associated with the K-State Turfgrass Program

**Mike Boaz** - Turfgrass M.S. candidate

**Chad Cecil** - Turfgrass student employee

**Ron Fiest**, Turfgrass student employee

**Roch Gaussoin** - Assistant Professor of Horticulture
Turfgrass Research and Teaching

**David Green** - Turfgrass M.S. Candidate

**Kevin Kamphaus** - Horticultural Technician
Rocky Ford Turfgrass Research Plots

**Larry Leuthold** - Professor of Horticulture
Extension Turfgrass Specialist

**Kala Mahadeva** - Turfgrass Ph.D. candidate

**James "Woody" Moriarity** - Turfgrass student employee

**Christy Nagel** - Extension Horticulture Secretary

**Ann Nus** - Plant Pathology Technician

**Jeff Nus** - Assistant Professor of Horticulture
Turfgrass Research and Teaching

**John C. Pair** - Professor of Horticulture and Superintendent of Horticulture Research Center, Wichita

**Ron Smith** - Turfgrass student employee

**Ned Tisserat** - Associate Professor of Plant Pathology
Plant Pathology Research and Extension

**Bryan Unruh** - Turfgrass M.S. candidate

**Ward Upham** - Research Assistant
Turfgrass Herbicides and Growth Regulators

**Willie Wallace** - Turfgrass student employee

KSU KANSAS STATE UNIVERSITY

Agricultural Experiment Station, Kansas State University, Manhattan 66506-4008

Report of Progress 633 June 1991