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1988
Kansas State University
Turfgrass Research

KANSAS
TURFGRASS
FOUNDATION

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FOREWORD

Welcome to all you turfgrass colleagues from the Kansas State University turfgrass team! It is again a pleasure to have the opportunity to meet with you and relay information from our turfgrass research. I hope this information makes your jobs a little easier and helps you attain our common goal -- better turf for all Kansans.

1988 is proving to be an exciting year! New putting green construction sponsored by the Heart of America and the Kansas Golf Course Superintendents Associations has received a major portion of our attention during the early first half of 1988. Completion of the project including seeding of the east half will be accomplished early this fall.

Dr. Roch Gaussoin has joined our turf team from Michigan State University. He will have both teaching and research responsibilities and we are fortunate to have a person of his strong background joining our team. Roch's research interests are in plant growth retardants and herbicide physiology. As he builds his research program, I'm sure his talent and hard work will be a benefit to all Kansas turf managers. Welcome aboard, Roch!

Dr. Ron Campbell has retired from the Horticulture Department of KSU after 35 years of faithful service. It's hard to imagine what the department will be like without Dr. Campbell, but we all wish him well, and offer our most sincere gratitude for his many years of hard work. Thanks, Ron!

Although we've made some important strides in improving our turfgrass research program, we still have a ways to go. Our current well no longer is able to supply us with the quantity of water which is necessary to maintain quality turf. Several long range solutions are currently being investigated before we can pursue the project with perhaps the most significance to the Rocky Ford Turfgrass Research Plots -- an automatic, underground irrigation system for the entire plot area.

Our goal is to make the Rocky Ford Turfgrass Research Plots the best they can be so we can expand the number and scope of research projects for Kansas turfgrass managers. With your help and understanding, we'll get there!

Sincerely,

Dr. Jeff Nus
Assistant Professor
Turfgrass Science

PERSONNEL ASSOCIATED WITH THE K-STATE TURFGRASS PROGRAM

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

Larry Leuthold - Professor of Horticulture, Extension Turfgrass Specialist

Ron Campbell - Professor of Horticulture, PGR and Herbicide Physiology

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

Paul Haupt - Superintendent, Rocky Ford Turfgrass Research Plots

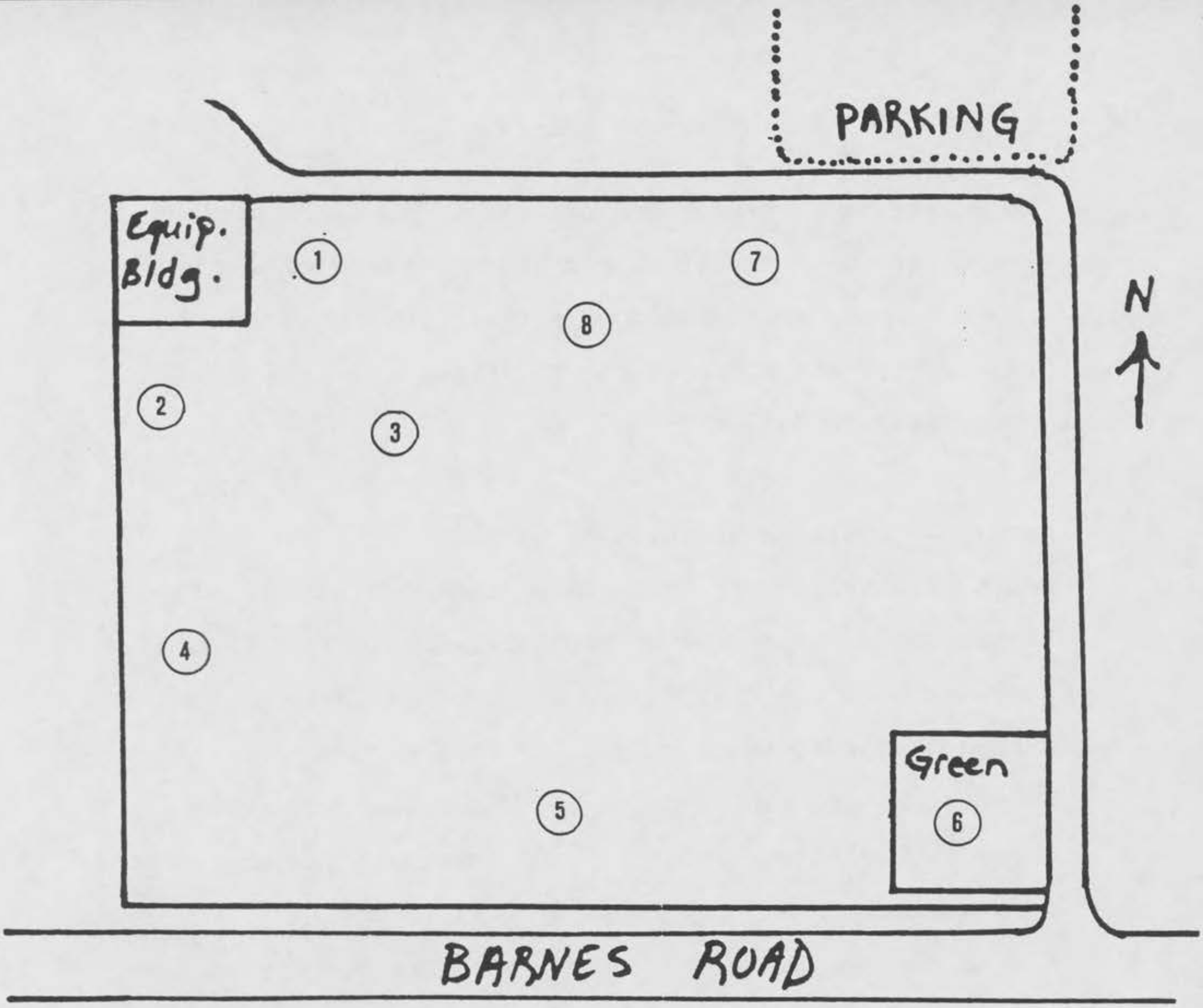
Kala Mahadeva - Turfgrass PhD candidate

Mike Sandburg - Turfgrass M.S. candidate

Dan Walker - Turfgrass M.S. candidate

Wes Ory - Turfgrass student employee

Todd Norton - Turfgrass student employee



RESEARCH STOPS

1. National Bermudagrass Cultivar Trial and Winter Cover Study - Jeff Nus

2. National Prairrie Wildflower Study - Clenton Owensby

3. Premergent Herbicide Study on Zoysia Establishment from Strip Sodding - Ron Campbell

4. Woody Ornamental Weed Cover Study - Charlie Long

5. National Perennial Ryegrass Cultivar Trial - John Pair

6. Bentgrass Studies - Paul Haupt

7. National Tall Fescue Cultivar Trial - Larry Leuthold

8. Nitrogen Source Study and description of the Topsoil Replacement Study - Mike Sandburg

THANKS !!!!!!

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

Kansas Turfgrass Foundation

Heart of America Golf Course Superintendents Association

Kansas Golf Course Supertintendents Association

Robisons Lawn and Golf, Inc.

Cushman Manufacturing

Jacobsen Manufacturing

Champion Turf Equipment

Toro Manufacturing

Nor-Am Corporation

Monsanto Corporation

Elanco

Rhone-Poulenc Ag Company

PBI/Gordon Corporation

W. A. Cleary Corporation

CIBA-GEIGY Corporation

Fermenta Plant Protection

Professional Turf Specialities

Johnson County Topsoil

Kershaw Sand Company

Premier Brands, Inc.

Grass Pad

Lebanon Chem. Corp.

Farmland Industries

E. I. DuPont

Sandoz Crop Protection

Scott's ProTurf Products

Dow Chemical

Robert Wise Company

EZ-GO Turf Vehicles

UAP Special Products

Mobay Chemicals

Estech Fertilizers

Howard Jonson Ent.

Holiday Sand

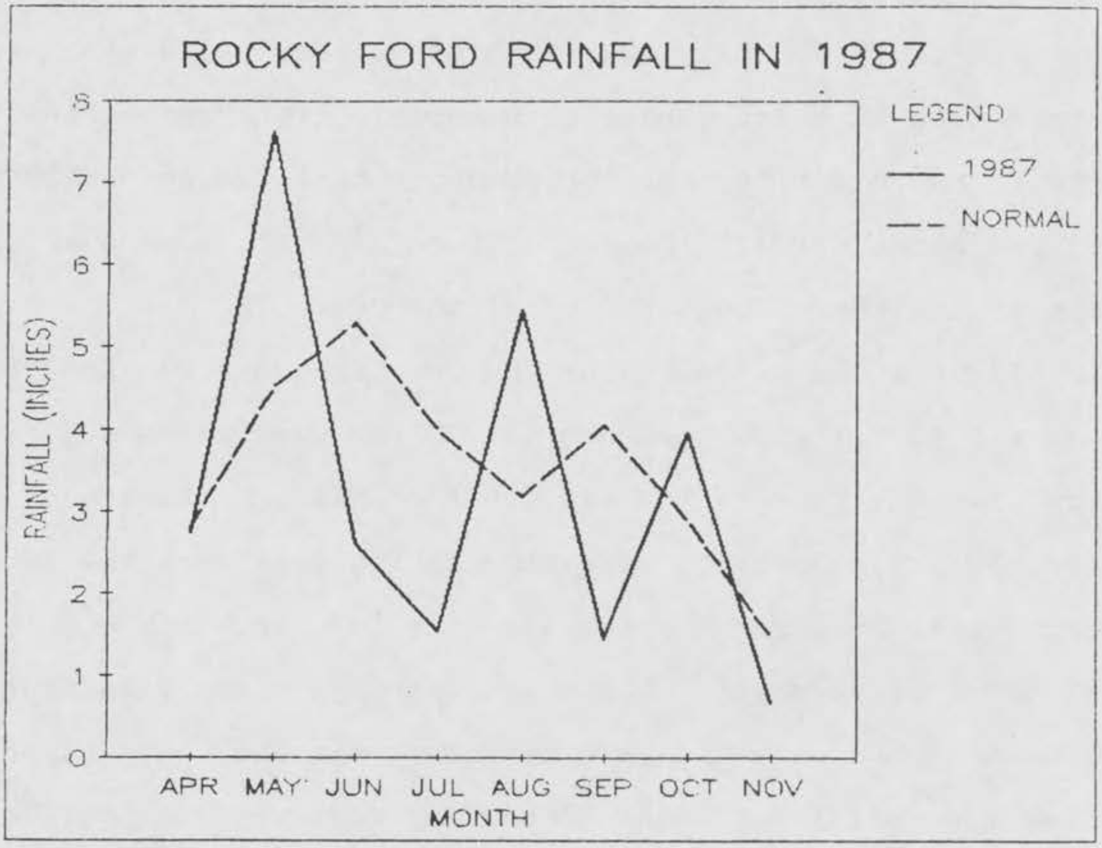
Bioscape

ANNUAL WEATHER SUMMARY FOR MANHATTAN IN 1987

Temperature. Daytime temperatures were warmer than normal for most of 1987. Only the month of October had a mean maximum temperature that was cooler than normal. The period January through May had afternoon temperatures that averaged over 4 degrees above normal. Compared to normal values, August through October was the coolest period of the year.

Temperature extremes for the year ranged from 106°F on August 2 to 7 7°F on December 13. There were 14 days during the year when the temperature was 100°F or higher. Eleven of those days, July 24-August 3, were consecutive which was the longest period with temperatures above the century mark since July, 1980 (17 consecutive days). There were no days with temperatures below zero and only 7 days during the year when they dipped below 10 -- a surprisingly small number for a mid-continental location. The last 32°F freeze occurred on April 15. Near-freezing temperatures were recorded later in the month and it is possible that some freeze damage occurred in low-lying areas. Thirty-two degrees was recorded for the first time in the fall on October 11. The first hard freeze (26°F) did not occur until October 28.

Precipitation. Precipitation totals for the year were near normal, but there were periods during thee summer where amounts were small and far apart. Growing crops suffered water stress, particularly in the extremely hot period in late July and early August when there was no rain for 16 straight days with temperatures over 100°F on 11 of those days. A two-inch rainfall on August 26 and timely showers the rest of the growing season did much to correct the water deficit.


ROCKY FORD RAINFALL IN 1987
LEGEND
1987
NORMAL
RAINFALL (INCHES)
0
1
2
3
4
5
6
7
8
APR MAY JUN JUL AUG SEP OCT NOV
MONTH

TITLE: Nitrogen Source Study

OBJECTIVE: To compare various nitrogen sources for maintaining turf quality of Kentucky bluegrass

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician
Mike Sandburg, Turfgrass MS candidate

INTRODUCTION:

This experiment was initiated in the spring of 1987 to test various nitrogen sources for maintaining a Newport-Park-Delta Kentucky bluegrass blend. The area was planted in the fall of 1981 and has received standard fertility practices. The experiment utilizes a Randomized Complete Block Design with 11 treatments which are replicated three times each. Nitrogen applications are applied 5 times per season (early April, mid-May, late August, mid-October, and early December). Each nitrogen application is at the rate of 1 lb of actual nitrogen per 1000 square feet. Nitrogen sources include: ureaform (Blue Chip, 38-0-0), sulfur coated urea (32-0-0), urea (45-0-0), urea plus micronutrients (Esmigran), Strengthen and Renew (AgroChem, 19-0-2), Green Magic (AgroChem, 20-0-2), IBDU (fine, 31-0-0), IBDU (coarse, 31-0-0), Escote 100 (40-0-0), and Escote 200 (40-0-0), and an unfertilized check. Quality parameters being recorded include monthly quality ratings, thatch accumulation at the end of the season, rooting depth, and verdure measurements.

RESULTS:

Table 1 shows the average quality ratings for the months of April, May, and June, as well as an average rating for spring green-up.

Table 1. Quality ratings of Kentucky Bluegrass as Affected by Nitrogen Source.

Nitrogen source	Spring Green-up	April	May	June
1. Strengthen and Renew	7.0	7.5	7.5	7.3
2. Green Magic	7.2	8.1	7.3	7.6
3. Blue Chip	6.3	7.3	7.1	7.6
4. SCU	7.3	8.8	8.3	8.5
5. Urea	7.1	9.0	8.1	7.5
6. Urea plus micro	6.8	8.8	8.1	8.0
7. Check (no N)	5.3	6.0	5.5	6.6
8. Escote 200	6.5	7.3	7.8	8.1
9. Escote 100	6.6	7.5	7.8	8.5
10. IBDU (coarse)	6.6	7.6	7.5	8.0
11. IBDU (fine)	7.6	8.8	8.0	8.6

It must be stressed that from this very limited amount of accumulated data, these results are certainly preliminary. However, IBDU (especially the fine graded material), sulfur coated urea, and urea alone or in combination with the micronutrients are certainly looking very good at this point.

TITLE: Influence of Growth Retardants on the Water Use Rate and Quality of 'Sydsport' Kentucky Bluegrass

OBJECTIVE: To investigate if significant amounts of irrigation can be saved by the use of growth retardants and whether quality parameters may be affected.

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician
Mike Sandburg, Turfgrass M.S. candidate

INTRODUCTION:

Growth retardants for turfgrass materials that when applied in minute quantities greatly inhibit the vertical extension of grasses. Most of these materials are phytotoxic for a 2-4 week period following application. This phytotoxicity is characterized by a browning or "burning" of the leaves. In addition, sward density may be reduced.

Because growth is a water demanding process, by retarding the growth process of these materials represent a potential means by which significant amounts of irrigation might be saved. Reduced water use rates of turfgrasses would result in less soil water depletion during periods of prolonged water stress. This may lead to an increase in drought resistance of treated turfgrasses. This study was initiated to investigate if such savings of irrigation could be realized by the use of growth retardants and how these chemicals may affect quality and density of Kentucky bluegrass turf.

MATERIALS AND METHODS:

'Sydsport' Kentucky bluegrass was established in the fall of 1982 on Section B of the Toro Research Irrigation System at the Rocky Ford Turfgrass Research Plots. This section consists of twelve 15 x 15 ft. plots. Each plot can be irrigated independently from the rest. Label rates of Limit, Embark, and Cutless were applied to three replications on May 18 and compared to non-treated control plots. Plots were retreated using the same randomization after an eight week period. Plots were irrigated when soil matric potentials indicated 60 centibars from Irrometer tensiometers placed at a 4-inch depth. Overall irrigation requirement, quality, sward density, and clipping yields were recorded for each treatment.

RESULTS:

Figure 1 shows the influence of growth retardants on 1987 water use. There was no significant effect from untreated control plots, although Cutless plots received a somewhat higher level of irrigation. No consistent trend of water savings was shown for either 1986 or 1987 and thus the use of growth retardants for the primary use of reducing water consumption is questionable, and not recommended at this time.

Figure 2 shows average summer quality ratings for 'Sydsport' Kentucky bluegrass treated with Limit, Cutless, or Embark compared to untreated control plots. Limit and Cutless reduced quality of 'Sydsport' very little (non-significant), but Embark was very harsh and reduced turf quality substantially.

Figure 3 exhibits seasonal density ratings for growth retardant plots versus untreated plots. Again, both Limit and Cutless were less severe than Embark. The use of Embark resulted in a significant loss in turf density. Figure 4 shows that such a loss in turf density no doubt contributed to a significant increase in weed invasion on Embark-treated Kentucky bluegrass.

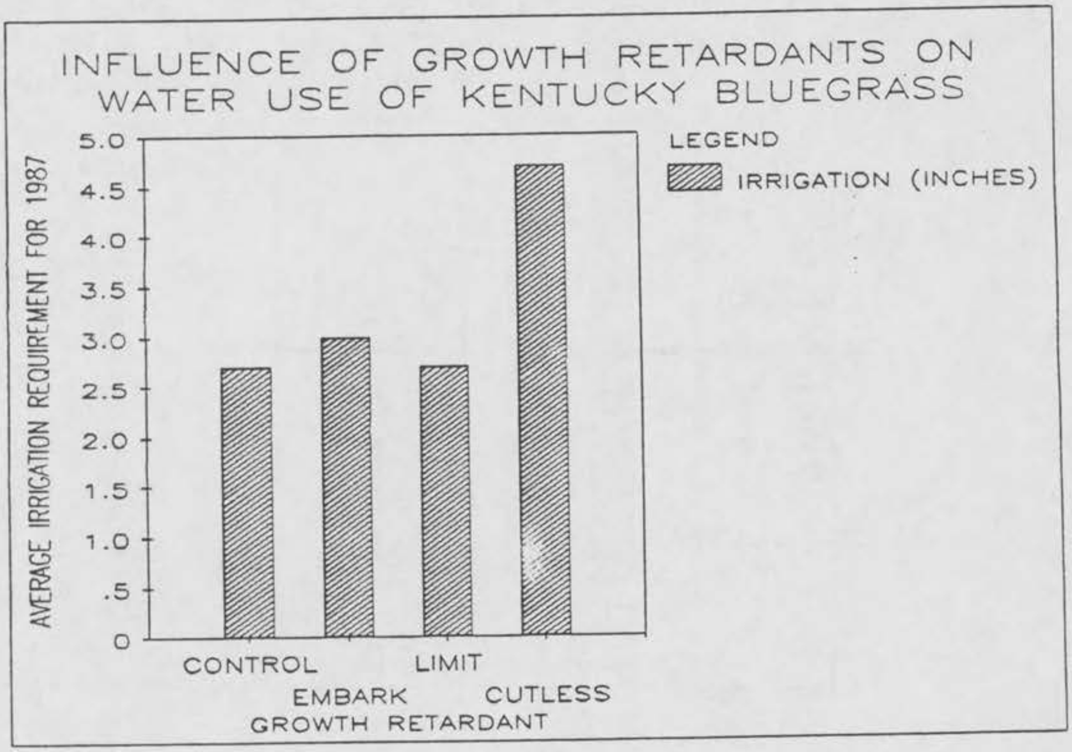


Figure 1.

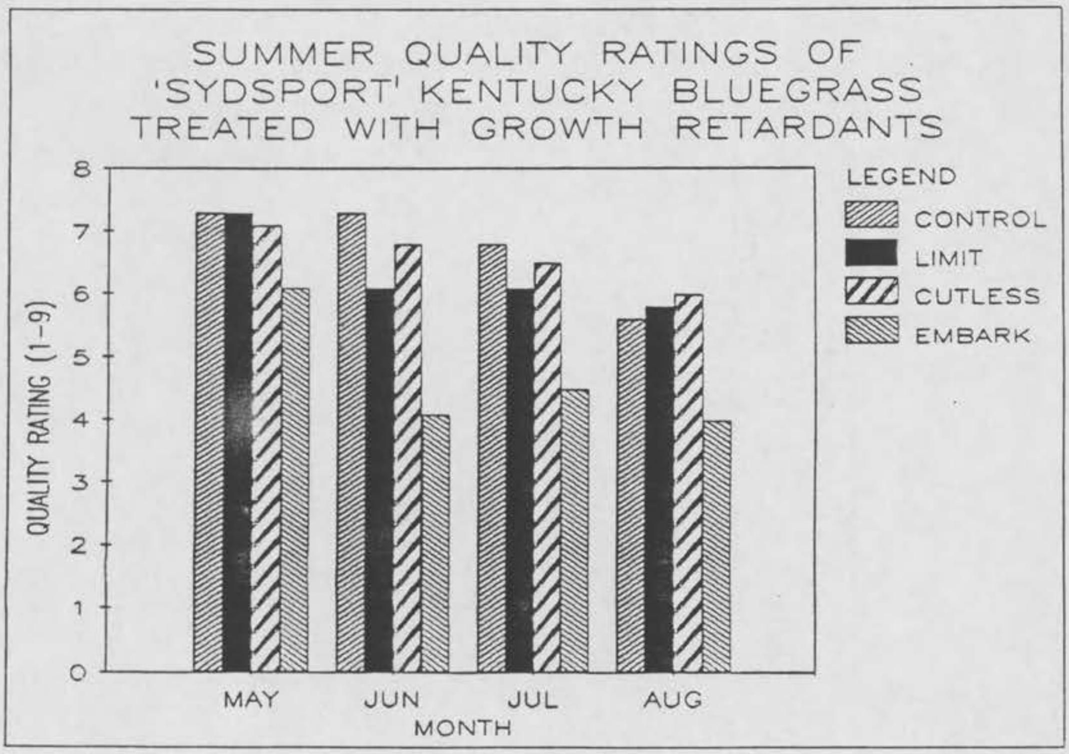


Figure 2.

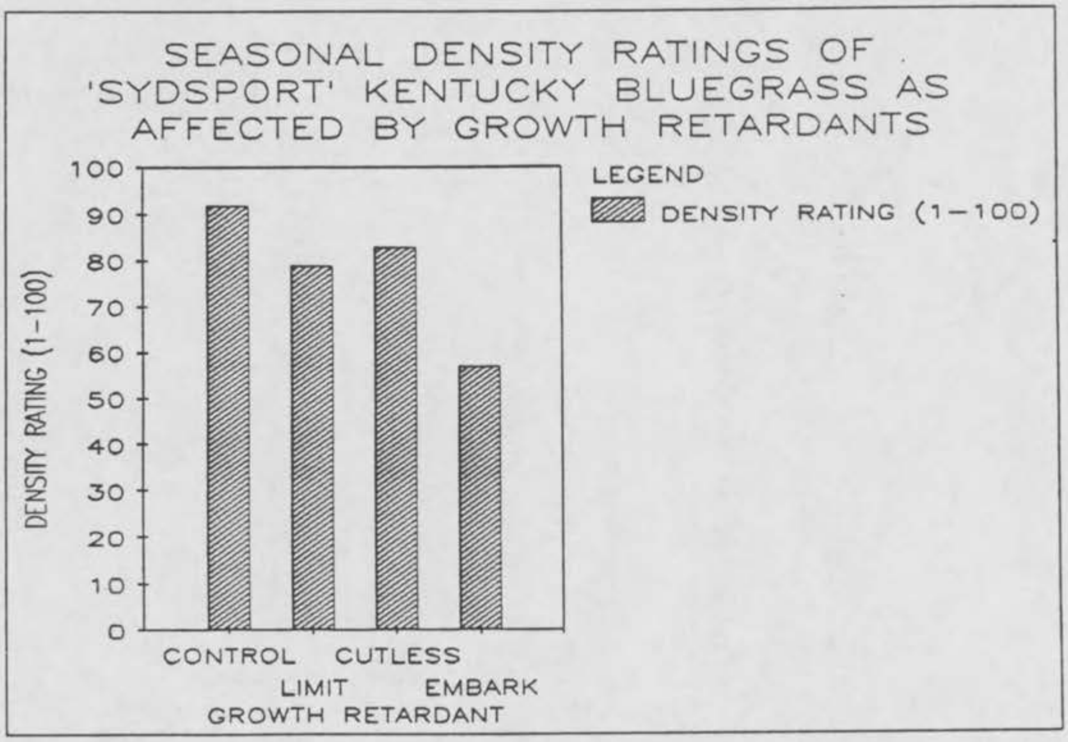


Figure 3.

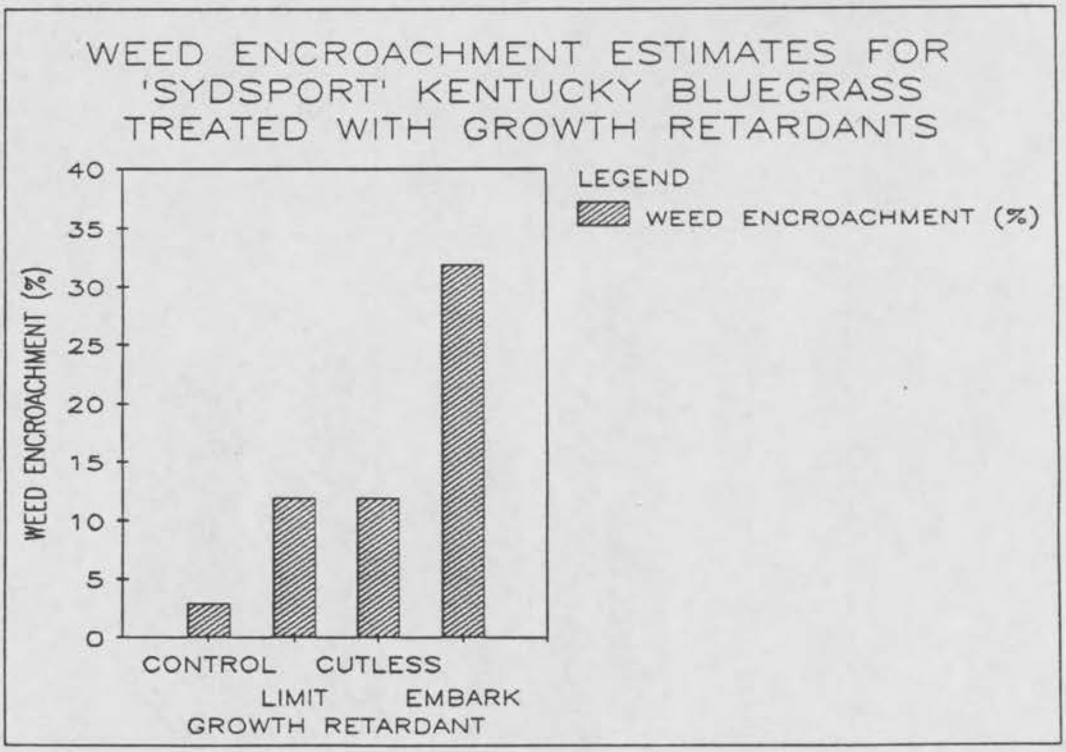


Figure 4.

TITLE: White Grub Study

OBJECTIVES: To test alternative approaches for white grub control with commercially available insecticides.

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician

INTRODUCTION:

White grubs are the most serious insect pests for Kansas turfgrass managers (1985 Kansas Turfgrass Survey). In recent years, chemical control for white grubs (Southern Masked Chafer and May Beetles) has been quite variable. With rising public concern over the use of all pesticides on turf areas, it is necessary to explore alternative approaches for insect control as well as to compare commercially available insecticides for their effectiveness in controlling these serious Kansas pests.

Commonly used insecticides for grub control include Oftanol, Turcam, and Diazinon (as well as others). Recently, Triumph has been added to this list. Dyn-O-Mite is a contact insecticide made from the skeletal remains of a family of algae known as Bacillariophyceae. Ground particles of from these algal deposits are razor sharp, and absorb over three times their weight in liquid. The theory behind effective grub control with this material is that these particles will enter the insects body and cause a lethal level of dehydration.

Nematodes are microscopic worms that can infect both plants and animals. As turf managers, we are familiar with nematodes that can become parasitic on desirable turfs such as creeping bentgrass. However, if enough insect-infecting nematodes are present in an area susceptible to grub damage, nematodes may offer a degree of biological control without the need for conventional insecticides which may represent some degree of ecological risk.

MATERIALS AND METHODS:

The White Grub Study utilizes an area slightly more than 2000 square feet composed of 'Baron' Kentucky bluegrass in Section I of the Rocky Ford Turfgrass Research Plots. This study utilizes a Completely Randomized Complete Block experimental design with 7 treatments and 3 replications. The treatments include Diazinon, Oftanol, Triumph, Turcam, Dyn-O-Mite, and nematodes (supplied through Bioscape, Wichita). Label rates are to be applied during the second week of July to the 3 by 3 meter plots. Evidence for grub damage will be monitored as well as grub population sampling in August.

TITLE: National Kentucky Bluegrass Cultivar Trial

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

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician

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. This trial was initiated to test Kentucky bluegrass genotypes from the National Turfgrass Evaluation Program for their adaptability to Kansas conditions.

MATERIALS AND METHODS:

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 square feet per season and irrigated to prevent severe water stress. Data collected included a subjective monthly quality rating (1-9, 9 = best).

Cultivars included in the National Kentucky Bluegrass Trial are shown in Table 1.

Table 1.

Classic	Monopoly	Barzan	Gnome	Tendos	P-104
Ram I	Compact	Joy	Sydsport	Haga	Georgetown
Somerset	Mystic	Baron	Able I	A-34	Merit
BAR VB577	Annika	Conni	Kenblue	Bristol	Victa
BA 70-139	BA 70-242	BA 72-441	BA 72-492	BA 72-500	BA 73-626
BAR VB534	Cynthia	America	BA 69-82	BA 73-540	Parade
Asset	HV 97	Lofts 1757		Cheri	Eclipse
Liberty	Dawn	Merion	Nassau	Amazon	239
Wabash	Julia	Ikone	Glade	Huntsville	
Aquila	K1-152	Harmony	Welcome	Aspen	Rugby
Trenton	K3-178	Midnight	Challenger		Blacksburg
PST-CB1	S.D. Certified		WW Ag 468	WW Ag 491	WW Ag 495
WW Ag 496					

During the 1987 season, some of the better performers included Monopoly, Compact, Joy, Sydsport, Somerset, Baron, Parade, Eclipse, Wabash, Huntsville, and Aquila. Poorer performers included BAR VB577, Aspen, Rugby, Challenger, and WW Ag 468.

Due to excessive infestation of tall fescue into the Kentucky bluegrass plots, total renovation of the Kentucky bluegrass cultivar trials was done in the fall of 1987. Now that the plots are clean of tall fescue, more accurate data is being collected for cultivar performance. Replacement seed for all the bluegrass cultivars was not available, however. Sixty out of the seventy-two original genotypes were reseeded. Cultivars that still need to be attained and seeded this fall include: Annika, BAR VB 534, Amazon, Julia, Huntsville, Aquila, WW Ag 468, WW Ag 491, WW Ag 495, and WW Ag 496.

TITLE: Topsoil Replacement Study

OBJECTIVE: To investigate the minimum topsoil replacement requirement for establishing and maintaining tall fescue or Kentucky bluegrass from seed or sod on disturbed sites.

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician
Mike Sandburg, Turfgrass MS candidate
Wes Ory , Turfgrass student

INTRODUCTION:

Establishing and maintaining quality turfgrass on disturbed building sites is a difficult task. Traffic from excavation and construction equipment results in soil compaction, and often much (if not all) of the topsoil is removed before construction begins. Subsoil is generally a much poorer rooting media for turfgrasses than topsoil because of reduced fertility, aeration, and drainage, as well as a greater compaction tendency. This study was initiated to investigate the minimum topsoil replacement requirements when all of the existing topsoil is removed. This information is needed by turfgrass professionals whose task is to convince the developer of replacement topsoil for establishing and maintaining property value enhancing turfgrasses.

MATERIALS AND METHODS:

Excavation began in early July of 1988 to remove the topsoil from a 32 by 72 foot rectangle from Section II of the Rocky Ford Turfgrass Research Plots. After topsoil was removed, the resultant "dish" was back-filled with subsoil to grade, 2 inches below grade, or 4 inches below grade in a Randomized Complete Block experimental design. Topsoil that was initially removed will be replaced on the plots that are sub-soil back-filled to 2 and 4 inches below grade. Plots that are sub-soil back-filled to grade will receive no topsoil replacement.

In early September, plots will be seeded with K-31 tall fescue and 'Baron' Kentucky bluegrass. In addition, plots will be sodded with the same cultivars of tall fescue and Kentucky bluegrass. Data will be taken on speed of establishment and quality for at least two seasons. Comparisons will be made for those plots being established on subsoil only, subsoil with 2 inches of topsoil, and subsoil with 4 inches of replacement topsoil.

TITLE: Comparison of Preemergence Control of Weeds From Fall and Spring Applications to Bluegrass

OBJECTIVE: Compare the efficacy of fall and spring applications of selected new and experimental preemergence herbicides

PERSONNEL: Ron Campbell, Turfgrass Research

FUNDING: Commercial Grants

INTRODUCTION:

Most weed species are prolific seed producers, especially the annuals. To be effective, preemergent herbicides must be applied to the soil surface before weed seeds germinate and emerge. Control is obtained either through root uptake or through absorption by the first leaf or shoot. In addition to proper timing, success in preemergence weed control is also dependent upon uniformity of application. Preemergence herbicides may be equally effective applied either as sprayable or as granular formulations when uniformity applied at the proper rate and time. Labels of most commercial products suggest rainfall or overhead irrigation of one-half inch shortly after application to move the herbicide from the foliage to the soil surface. Although most preemergence herbicides are applied to turfgrass stands primarily to control annual grasses, several annual broadleaf weeds such as spurges, pigweed, lambsquarter and henbit may be controlled also.

This experiment was initiated to compare the efficacy of preemergent labeled and experimental herbicides each applied in the fall of 1986 and the spring of 1987 in the control of annual weeds.

MATERIALS AND METHODS:

A compressed air field plot sprayer with a four-foot spray boom was used to treat 4 x 8 foot plots. Six herbicides were applied in the study (Table 1). Prodiamine was applied at 0.38, 0.5, 0.75, 1.0, 1.5 and 2.0 lbs/a.i. The granular form of Benefin was applied and all other herbicides were applied as sprayable formulations. Treatments were applied at two times. The fall treatments were applied November 6, 1986 and the spring treatments April 2, 1987. The tests for each chemical were established side-by-side to evaluate the spring vs. fall applications. Weed counts and phytotoxicity readings were made at regular intervals through mid-summer.

Table 1. Preemergence Herbicides Applied to Compare Effectiveness of Fall and Spring Treatments

Product name and formulation	Common name and formulation	Manufacturer
Balan 2.5 G	Benefin	Elanco
Betasan 4-E	Bensulide	Stauffer
Dacthal 75-W	DCPA	Diamond Shamrock
Weedgrass Control 60 WDG	Pendimethalin	O.M. Scott & Sons
- 65 WDG	Prodiamine	Sandoz Crop Protection
Ronstar 50 WP	Oxadiazon	Rhone-Poulenc

A major concern relative to the efficacy of preemergent herbicides is that of residual activity in the soil. A number of actors influence the disappearance or degradation in the soil. These include volatilization, degradation by ultraviolet light, microbial decomposition, and chemical decomposition. The relative importance of each of these factors is influenced by soil type, moisture content, temperature, light intensity, microflora, and method of application. In general, it is expected that the degradation processes describe would occur at a much lower rate than during the growing season.

Climate conditions were favorable for germination and growth of crabgrass and yellow foxtail. Although rainfall was nearly normal, distribution was erratic with heavy rains in April and May, and with a deficiency for the month of June and most of July. The temperatures for the growing season was also higher than normal.

Several conclusions can be drawn from the study (Table 2). The herbicide prodiamine, oxadiazon, bensulide, and benefin were effective in controlling annual grassy weeds when applied in the fall or spring. Dacthal (DCPA) sprays were more effective when applied in the fall, 92% control, than in the spring, 82%. Pendimethalin sprays also were more effective from fall applications, 88% control, compared to 84% from the spring applications. It appears likely that this herbicide should be applied at 3.0 lb. or two sequential sprays of 1.5 lb. when spring applied. Repeat sprays are probably necessary for dacthal when used in the spring. There was no injury observed from application of any of the herbicides.

Since this study represents only one years results, it is probable that some variation might be observed if multi-year studys were conducted. However, it is likely that the first four herbicides listed above could be safely applied either in the fall or spring. This might be helpful to the turfgrass manager who could find it easier to make fall applications at a time when he was normally less busy than in the spring.

Table 2. Comparison of Preemergence Control of Annual Grassy Weeds From Fall and Spring Herbicide Applications to Bluegrass, 1987.

Fall application - July 16				Spring application - July 16			
Treatment	Rate lb/acre	Avg. weed cover	% control	Treatment	Rate kg/ha	Avg. weed cover	% control
Control	--	55^z	-- A	Control	--	55^z	-- A
Prodiamine* (WDG)	0.38	7.7	86 B	DCPA** (WP)	10.5	10.0	82 B
Pendimethalin (WDG)	1.5	5.5	88 BC	Benefin (G)	3.0	1.7	97 C
DCPA (WP)	10.5	4.2	92 BC	Prodamine (WDG)	0.38	1.2	98 C
Benefin (G)	3.0	3.5	94 BC	Bensulide (E)	12.5	1.0	98 C
Bensulide (E)	12.5	3.5	94 BC	Prodiamine (WDG)	2.0	0.7	98 C
Prodiamine (WDG)	0.5	3.0	95 BC	Prodiamine (WDG)	0.50	0.25	99 C
Prodiamine (WDG)	0.75	2.7	95 BC	Prodiamine (WDG)	1.0	0.25	99 C
Prodiamine (WDG)	1.5	1.0	98 C	Prodiamine (WDG)	0.75	0	100 C
Oxadiazon (WP)	2.0	1.0	98 C	Prodiamine (WDG)	1.5	0	100 C
Prodiamine (WDG)	2.0	0.7	99 C	Pendiamethalin (WDG)	1.5	9.0	84 B
Prodiamine (WD)	1.0	0.5	99 C	Oxadiazon (W)	2.0	0	100 C

*Fall treatments applied 11-6-86

**Spring treatments applied 4-2-87

^{z}Means in column with same letter are not significantly different by Duncan's Multiple Range test at the 5% level.

TITLE: Atrazine in Irrigation Water Rate/Response Study

OBJECTIVE: To determine the threshold concentration of atrazine applied daily in irrigation water would result in death or severe loss of seedling and mature creeping bentgrass

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Ann Nus, Turfgrass Technician

INTRODUCTION:

Chemical pollution in irrigation water is becoming an increasing serious concern. Misapplication and overuse of agricultural pesticides combined with runoff can lead to serious contamination of surface and groundwater.

Atrazine (2-chloro-4-ethylamino-6-isopropylamino-s-triazine) is used for season long weed control in corn, sorghum, and certain other crops. It is primarily root absorbed and acts both as a pre- and post-emergent herbicide. At higher concentrations, it will control all vegetation. Warm season turfgrasses will generally metabolize atrazine and are thus not killed at lower concentrations. Cool season turfgrasses are extremely sensitive to atrazine and will be killed.

MATERIALS AND METHODS:

Two greenhouse studies were initiated to pin-point the concentration of atrazine necessary to elicit toxicity responses from seedling and mature 'Penncross' creeping bentgrass. 'Penncross' creeping bentgrass was seeded into 4 X 4 inch plastic pots at the rate of 2 lbs seed per 1000 square feet. Seedlings received starter fertilizer and nutrient solution and were allowed to grow 6 weeks in the greenhouse before receiving atrazine treatments. Mature 'Penncross' bentgrass was taken from the research green at the Rocky Ford Turfgrass Research Plots using a standard cup cutter. Both seedling and mature bentgrass was grown in an 80:20 sand:peat rooting mix. All pots were clipped daily at 3/16 inch mowing height.

A logarithmic progression of atrazine rates were used and applied daily in 1/4 inch of irrigation water. These rates included 0, 0.01, 0.02, 0.04, 0.08, 0.16, 0.32, 0.64, 1.28, and 2.56 ppm. Phytoxicity ratings from 1 - 9 (1 = dead turf; 9 = excellent quality, no evidence of chemical effect) were used to assess turf damage. Phytotoxicity ratings were taken at 10, 15, and 20 days and several photos were taken at 5, 10, 15, and 20 days to visually document the bentgrass response.

RESULTS

Seedling bentgrass is more sensitive to atrazine in the irrigation water than mature bentgrass because it reacts faster and at lower concentrations than mature bentgrass (Figures 1 and 2). Seedling bentgrass quality becomes unacceptable at atrazine concentrations of approximately 0.05 ppm applied in 1/4 inch of daily irrigation (Figure 1). Mature bentgrass quality becomes unacceptable at atrazine concentrations of approximately 0.1 ppm applied in 1/4 inch of daily irrigation.

Initial damage appeared on bentgrass in less than 5 days, especially at the higher concentration treatments. However, phytotoxicity development was most evident at the 20 day evaluation period (Figures 1 and 2).

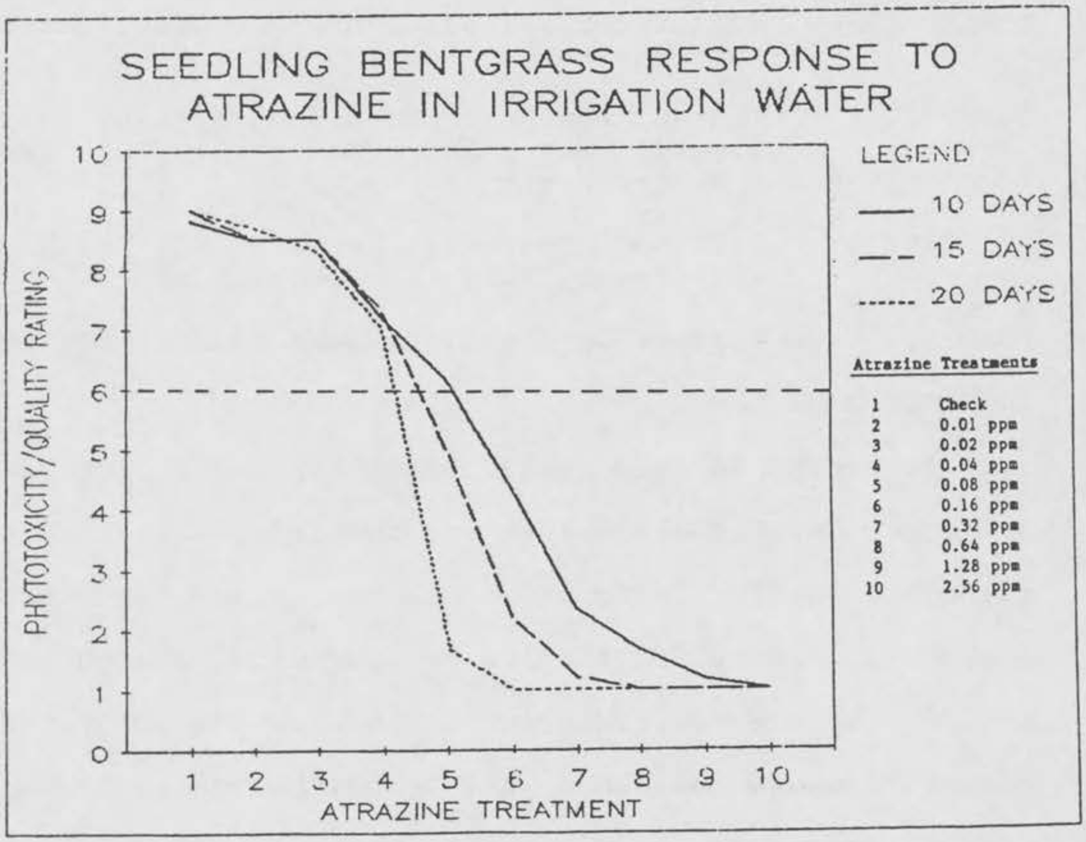


Figure 1.

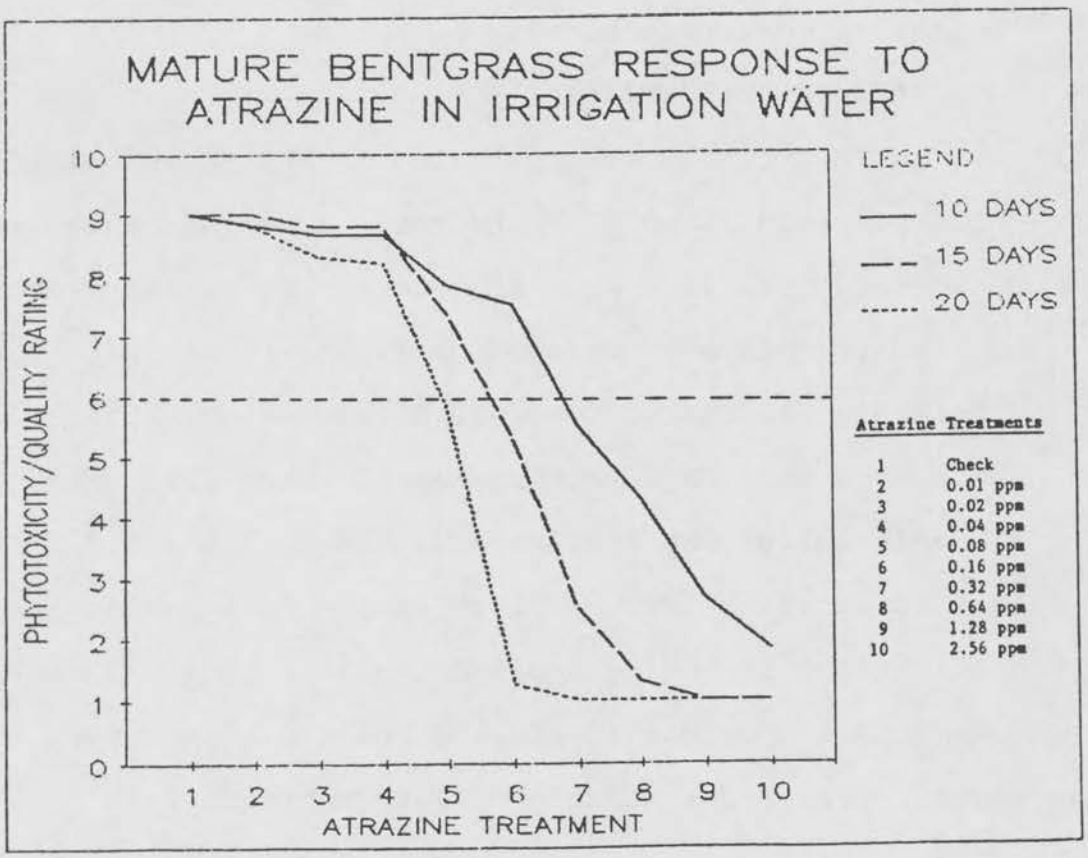


Figure 2.

TITLE: Sulfur fertilization of 'Penncross' Creeping Bentgrass

OBJECTIVE: To test whether increasing rates of sulfur fertilization may enhance the quality of 'Penncross' creeping Bentgrass

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician

FUNDING: Clearys Corporation, John Griffiths, Tech Rep

INTRODUCTION:

According to some researchers, serious sulfur deficiencies may occur in turf areas that are receiving high levels of nitrogen. Sulfur is important in many plant reactions including synthesis of certain vitamins, amino acids, and enzymes. Claimed benefits by the use of sulfur include better color, quality, reduced disease incidence, and annual bluegrass invasion. This experiment was designed to test whether the use of increasing rates of sulfur could effectively enhance the quality of 'Penncross' creeping bentgrass.

MATERIALS AND METHODS:

The experiment was initiated in the spring of 1986 on a three-year-old stand of 'Penncross' creeping bentgrass at the Rocky Ford Turfgrass Research Plots. No sulfur treatments were applied to this area before the experiment began. The experiment utilized a Randomized Complete Block Design with 5 treatments which were replicated 4 times each. Each plot was 1 X 2 meters. Flowable sulfur was applied at rates of 0.25, 0.5, 1.0, and 2.0 lbs. of actual sulfur per 1000 square feet per application. Two applications are being applied per year in April and September with an R & D carbon dioxide backpack plot sprayer. Data being collected includes monthly quality ratings (1-9).

Table 1. 1987 Monthly 'Penncross' Quality of Creeping Bentgrass as Affected by Sulfur Applications

Treatment	April	May	June	July	Sept.	Oct.
1. 0	6.25	7.25	7.25	7.125	7.375	7.25
2. 1/4 lb S/ 1000 ft/yr	6.125	7.125	7.5	7.375	7.25	7.125
3. 1/2 lb/yr	6.25	7.25	7.375	7.375	7.375	7.0
4. 2 lb/yr	6.375	7.125	7.125	7.375	7.375	7.0
5. 4 lb/yr	6.25	7.375	7.5	7.25	7.125	7.375
	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

RESULTS:

Average 'Penncross' creeping bentgrass monthly quality for 1987 is given in Table 1. At no time did increasing rates of sulfur applications result in enhanced or diminished quality. In fact, no significant effects on bentgrass quality were noted all through the 1986 and 1987 growing seasons. This experiment will be discontinued to free up much needed bentgrass research space. The use of sulfur to enhance bentgrass quality under the conditions of this experiment is not recommended.

TITLE: Iron Fertilization of Bentgrass

OBJECTIVE: To investigate the efficacy of iron fertilization on 'Penncross' creeping bentgrass

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician

INTRODUCTION:

In recent years, the use of iron to fertilize putting greens has received increased attention. And less nitrogen is used in an effort to deepen root systems and reduce the susceptibility of creeping bentgrass to certain diseases, a general loss of color is exhibited. The addition of iron has been shown to enhance color of turfgrasses in some instances, especially at very low nitrogen levels. This experiment was initiated to test whether the addition of chelated iron will enhance the quality of 'Penncross' creeping bentgrass.

MATERIALS AND METHODS:

An R & D carbon dioxide plot sprayer was used to treat 1 X 2 meter plots with a 10% iron chelate (Sequestrene 330) at rates of 0.5, 1, 2, 4, 6, and 8 oz. of Sequestrene per 1000 square feet per application. A non-treated control was also included. Four applications per year are being applied amounting to 0, 2, 4, 8, 16, 24, and 32 oz. of Sequestrene per 1000 square feet per season. The experiment utilized a randomized complete block design with 7 treatments which were replicated 4 times each. Monthly quality ratings (1-9) are being recorded for each treatment.

Table 1. Monthly Quality of 'Penncross' Creeping Bentgrass Affected by Iron Applications

Treatment	April	May	June	July	Sept.	Oct.
1.0 treatment	6.25	7.0	7.25	7.125	7.125	7.0
2. (0.5)	6.375	7.25	7.375	7.25	7.125	7.0
3. (1)	6.125	7.0	7.25	7.5	7.25	7.25
4. (2)	6.375	7.125	7.0	7.25	7.125	7.125
5. (4)	6.0	7.125	7.25	7.125	7.375	6.625
6. (6)	6.0	7.125	7.375	7.125	7.125	7.25
7. (8)	6.125	7.125	7.375	7.25	7.375	7.375
	N.S.	N.S.	N.S.	N.S.	N.S.	*

RESULTS:

Monthly quality of 'Penncross' creeping bentgrass as affected by iron applications is shown in Table 1. Only during October were any significant differences found between any of the iron treatments. It must be noted, however, that aquifers located in this part of the state, contain water that is generally high in iron, and should be kept in mind when deciding if the results of this study are applicable to your situation.

The final step of this experiment will be to withhold nitrogen fertility from all of the iron treated plots to see if the plots receiving higher levels of iron will retain a better degree of color as nitrogen becomes very limiting. This experiment will be discontinued after the 1988 season.

TITLE: Effect of Mowing Height and Potassium Fertilization on Quality Parameters of 'Penncross' Creeping Bentgrass

OBJECTIVE: To assess the quality of 'Penncross' creeping bentgrass at two mowing heights and increasing rates of potassium fertilization

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician

INTRODUCTION:

Golf course superintendents are constantly under pressure to increase and maintain a high level of ball speeding on putting greens. The most common method of improving speeds is to lower mowing height on creeping bentgrass. Reducing mowing height, however, introduces additional turf management problems. Lower cut greens are less tolerant of environmental stresses than greens that are maintained at a higher cut. Of particular importance is high temperature stress. As the mowing height is reduced, the potential of increased high temperature stress becomes obvious as green quality is often sacrificed.

The use of potassium as a 'stress tolerance" nutrient has gained wide acceptance in recent years among turf managers. Claimed benefits include increased heat, drought, cold temperatures, and disease resistance. This experiment was initiated in early summer of 1986 to test whether the general loss of green quality from the additional stress caused by lower mowing heights could be partially alleviated by the use of increased rates of potassium on 'Penncross' creeping bentgrass greens.

MATERIALS AND METHODS

The experiment was initiated on a 4-year-old stand of

'Penncross' creeping bentgrass at the Rocky Ford Turfgrass Research Plots. It utilizes a Randomized Complete Block Design with 10 treatment combinations. Each block is divided in half with one-half being mowed at 0.18 inches and the other half cut at 0.09 inches. Each block is further divided into five potassium treatments: 0, 2, 4, 6, and 8 lbs. of K per 1000 square feet per year applied in 4 applications (April, June, August, and October). Data to be collected include monthly quality, canopy temperature (taken with infrared thermometer), ball speed, and density ratings.

RESULTS:

Unfortunately, at the time of this printing, results from data taken on this study had not been completely analyzed, but a few general points can be made.

<u>Quality</u>

Generally, reducing the mowing height of 'Penncross' creeping bentgrass from 3/16 to 3/32 of an inch will reduce the quality rating (1-9) of the turf by approximately 1.5-2.0 quality points. This is especially evident during the hot summer months, where quality of the 3/32 inch cut turf suffers dramatically, and sward density is sacrificed. Although, the effect is small, there appears to be some quality enhancement by application of the higher rates of potassium. No conclusions concerning potassium's effect on quality can be drawn at this time, however.

<u>Canopy Temperature</u>

Surprisingly, very little difference in canopy temperatures were noted between mowing heights or potassium treatments. After the 1987 data is analyzed and the 1988 data is in, we should have a fairly clear picture of mowing height and potassium treatment effects on turf canopy temperatures.

Ball Speed

Ball speed, as expected, increased several inches as the mowing height was reduced to 3/32 from 3/16 of an inch. Loss of turf quality, however, was always evident at the lower mowing height and turf at the lower mowing height dried out sooner than the 3/16 inch mowed bentgrass. There does not appear to be a substantial effect of higher rates of potassium on ball speed. These data, as well as the 1988 data, will be analyzed and reported at a later date.

TITLE: Sandoz Fungicide Trial

OBJECTIVE: To evaluate to new experimental fungicides for effective control of brown patch and dollar spot of 'Penncross' creeping bentgrass.

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician

INTRODUCTION:

Brown patch and dollar spot are the two most often encountered disease problems on creeping bentgrass for Kansas golf course superintendents (1985 Kansas Turfgrass Survey). Although there are currently effective fungicidal controls for Rhizoctonia solani and Sclerotinia homeocarpa, it is necessary to continue to evaluate experimental fungicides because new, more chemically-resistant, virulent fungal races may evolve limiting the effectiveness of current-market fungicides.

MATERIALS AND METHODS:

Experimental fungicides were supplied to the K-State turf program by Sandoz Corportation (John Fenderson) which were code named 619F and 832F. Two projects were designed and implemented on the bentgrass green at the Rocky Ford Turfgrass Research Plots. A Brown Patch Study was iniated to evaluate the effectiveness of 619F at a single rate, and 832F at 2 rates, and compare the level of control with a standard such as Daconil 2787, as well as an untreated check. A Dollar Spot Study was also initiated to test 619F at two rates, and 832F at a single rate against Daconil 2787 and untreated plots. Data to be collected includes efficacy, phototoxicity, and any noticeable growth retardant effects.

TITLE: Bentgrass Establishment Using Various Nitrogen Sources

OBJECTIVES: To test various nitrogen source fertilizers for their effectiveness in establishing 'Penncross' creeping bentgrass on high percentage sand greens.

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician
Wes Ory, Turfgrass Student

INTRODUCTION:

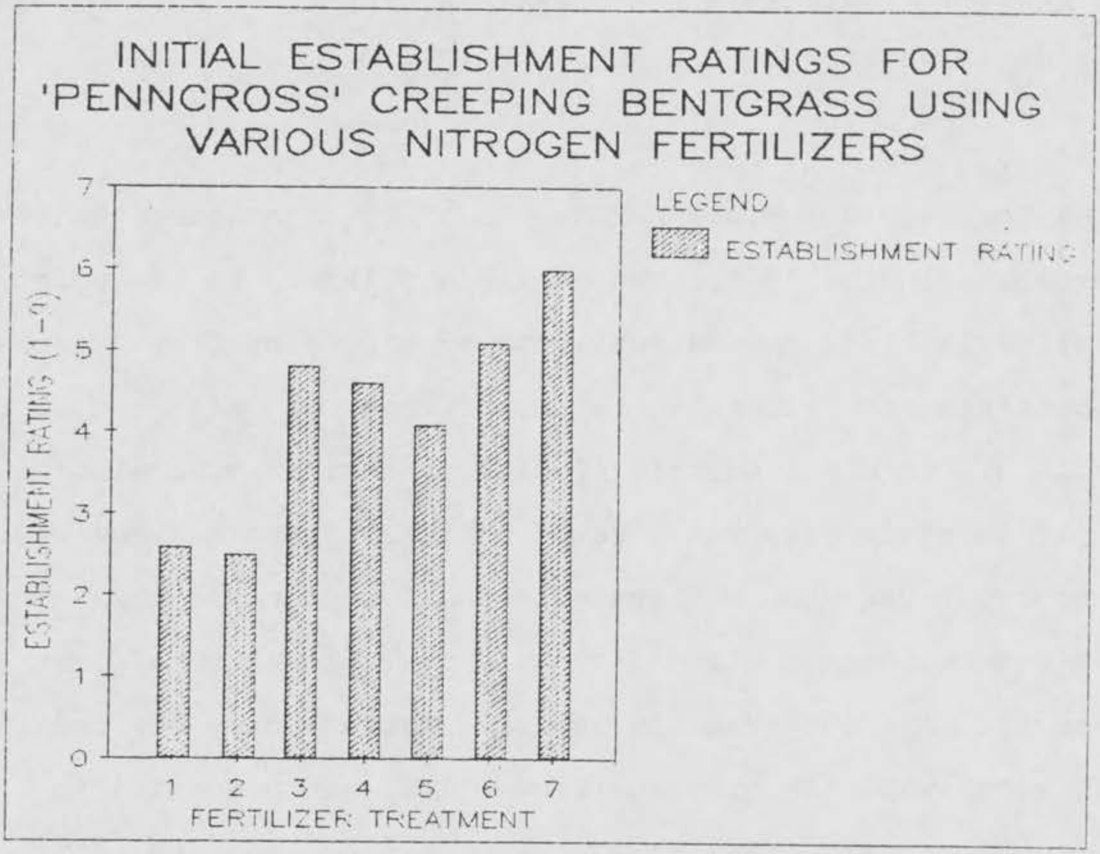
Establishing creeping bentgrass on high percentage sand greens is often difficult due to sands inherent low moisture and nutrient retention capacities. Although various amendments such as peat, rice hulls, sawdust, or sewage sludge have been used to help alleviate these problems, the choice of starter fertilizer can have a major effect on the success of the establishment. This study was initiate to test various nitrogen sources for their effectiveness in enhancing rapid establishment of seeded bentgrass.

MATERIALS AND METHODS:

Area 2 of the newly constructed research green was used for this study. The experiment utilized a Randomized Complete Block experimental design with 7 treatments replicated three times each. Treatments included ureaform (Blue Chip, 38-0-0) at 10 lbs and 20 lbs per 1000 square feet tilled into the surface 6-8 inches, sulfur coated urea at 12 and 14 lbs per 1000 square feet tilled into the top 6-8 inches, urea surface applied at 1 lb of actual N per 1000 square feet followed by an additional 1 lb of N three weeks later, a 13-25-12 starter fertilizer at 1 lb of N per 1000 square feet surface applied at seeding followed by an additional 1 lb N application three weeks later, and Milorganite at 100 lbs per 1000 square feet tilled into the top 6-8 inches just prior to seeding.

RESULTS:

The Rocky Ford Turfgrass Research plots experienced major well problems in the 1988. The well has dried up to the point of only delivering less than 40 gallons per minute outflow. A team of specialists was brought in to recondition the well, but it was ineffective. To compound this problem, the river pump also went down. A new river pump was ordered but has yet to be received. An emergency river pump was installed, but seeding of this project was not done until mid-June (a terrible time to plant bentgrass!). Although data is being collected, only the initial ratings were available at press time. They are presented in Figure 1. The best establishment results (to date) are coming from plots that have been treated with 100 lbs of Milorganite per 1000 square feet (tilled in), followed by sulfur coated urea, and Blue Chip treatments. Urea (1 lb N at seeding plus 1 lb N three weeks later) and the starter fertilier (13-25-12) at the same nitrogen rates as urea do not appear to be effective for rapid establishment of seeded creeping bentgrass on high percentage sand greens. More establishment ratings are being taken and will be included in subsequent research reports.



Fertlizer treatments in the Bentgrass Establishment Study:

1. 1 lb of N per 1000 sq ft at seeding as urea followed by an additional 1 lb of N per 1000 sq ft three weeks later.

2. 1 lb of N per 1000 sq ft at seeding from a 13-25-12 starter fertilizer followed by an additional 1 lb of N per 1000 square feet three weeks later.

3. 10 lbs of Blue Chip (38-0-0) per 1000 square feet tilled in prior to seeding.

4. 20 lbs of Blue Chip (38-0-0) per 1000 square feet tilled in prior to seeding.

5. 12 lbs of sulfur coated urea (32-0-0) per 1000 square feet tilled in prior to seeding.

6. 24 lbs of sulfur coated urea (32-0-0) per 1000 square feet tilled in prior to seeding.

7. 100 lbs of Milorganite (6-2-0) per 1000 square feet tilled in prior to seeding.

TITLE: National Perennial Ryegrass Cultivar Trial

OBJECTIVES: To evaluate several perennial ryegrass genotypes for their adaptability and performance under east/central Kansas conditions.

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician
Ann Nus, Turfgrass Technician

INTRODUCTION:

Perennial ryegrasses are used widely in most areas of the United States because they germinate very quickly and cover rapidly, possess good wear tolerance and a rich deep color. Efforts to improve perennial reygrasses include selecting for better mowing quality, disease resistance, and environmental stress tolerance. It is important to supply the Kansas turfgrass manager with performance evaluations of commercial and experimental ryegrass genotypes, so he can make the best choice of ryegrasses for Kansas conditions.

MATERIALS AND METHODS:

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 ws 6 lbs per 1000 square feet and a balanced (20-20-20) fertilizer was applied immediately after seeding at the rate of 1 lb N per 1000 square feet. Monthly quality ratings (1-9, 9 = superb quality) are being recorded for each genotype which is replicated 3 times in a Randomized Complete Block experimental design. Plot size is 1 by 2 meters. They are mowed at 3 inches and fertilized with 4 lb N, 1 lb of P2O5, and 1 lb of K2O per year.

RESULTS:

Quality ratings for the 65 perennial ryegrasses grown at the Rocky Ford Turfgrass Research Plots are shown in Table 1. Both monthly and overall quality means are presented. Ryegrass cultivars which performed well include Aquarius, Blazer II, PST-2DD, Fiesta II, Ranger, Allaire, Dasher II.

Differences in ryegrass genotypes are often very subtle, especially during mid-season. Slight color differences are noted, but density, smoothness, and mowing quality differences are often more evident. These genotypes will be evaluated throughout the 1988 and 1989 seasons for their continued performance.

MEAN TURFGRASS QUALITY RATINGS OF PERENNIAL RYEGRASS CULTIVARS
IN THE NATIONAL PERENNIAL RYEGRASS TEST AT MANHATTAN, KS
1987 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=BEST

NAME	APR	MAY	JUN	JUL	AUG	SEP	OCT	MEAN
KWS-AL-2 (AQUARIUS)	7.3	7.7	7.7	7.0	6.7	8.0	8.0	7.5
PICK 300 (BLAZER II)	7.7	8.0	7.0	6.7	7.3	7.7	8.0	7.5
PST-2DD	7.3	8.0	7.3	6.7	6.3	8.0	8.0	7.4
PICK 600 (FIESTA II)	6.3	7.3	8.0	6.7	7.0	8.0	7.7	7.3
RANGER	7.0	7.7	7.3	7.0	6.7	7.3	8.0	7.3
ALLAIRE	6.7	7.7	7.7	7.0	6.0	7.3	8.0	7.2
PICK 233 (DASHER II)	6.7	7.3	7.3	7.0	7.0	7.3	8.0	7.2
PICK 647	7.0	7.7	7.7	6.7	6.3	6.7	7.7	7.1
PST-2H7	6.3	7.7	7.7	7.0	6.0	7.3	8.0	7.1
PST-2HH	6.7	7.7	6.7	7.0	6.3	7.3	8.0	7.1
BAR LP 410	6.7	7.7	6.7	6.7	6.3	7.0	7.7	7.0
GATOR	7.0	7.7	6.7	6.3	6.3	7.0	8.0	7.0
ISI-851	6.7	7.7	7.0	6.3	5.7	7.3	8.0	7.0
OMEGA II	6.7	8.0	7.0	6.7	6.3	6.7	8.0	7.0
PST-M2E	7.0	7.3	6.7	7.0	6.3	7.3	7.7	7.0
REPELL	6.0	7.3	7.3	6.7	6.3	7.3	7.7	7.0
DERBY	7.0	7.0	7.7	7.0	6.0	6.0	7.3	6.9
NK 80389	6.0	8.0	7.3	6.0	6.0	7.3	7.7	6.9
PST-250 (COMPETITOR)	6.7	7.7	6.7	6.3	6.0	7.0	7.7	6.9
PST-2PM	7.0	7.3	7.0	6.3	6.3	6.7	7.3	6.9
RODEO	6.3	7.7	7.0	6.3	6.3	6.7	7.7	6.9
SR 4000	6.7	7.7	7.0	6.3	6.3	6.7	7.3	6.9
SR 4100	7.3	7.3	7.0	6.3	6.0	6.7	7.7	6.9
TARA	6.7	7.7	7.0	6.7	6.0	6.0	8.0	6.9
YORKTOWN II	6.7	7.3	7.0	6.7	5.7	7.0	7.7	6.9
ISI-K2	6.0	7.7	7.3	6.0	6.0	7.0	7.3	6.8
MANHATTAN II	6.7	7.3	7.0	6.3	6.0	7.0	7.3	6.8
PALMER	7.0	7.3	6.7	6.3	6.0	6.7	7.3	6.8
ACROBAT	6.0	7.0	7.0	6.3	6.0	7.3	7.3	6.7
BELLE	6.3	7.3	7.3	6.0	5.3	7.0	7.3	6.7
GOALIE	7.0	6.7	7.3	6.3	6.0	6.3	7.3	6.7
PATRIOT	7.0	7.0	6.7	6.3	5.7	6.7	7.3	6.7
PRELUDE	7.3	7.0	6.7	6.3	5.7	6.3	7.7	6.7
PST-259	7.0	7.0	6.7	6.0	6.3	6.3	7.7	6.7
CITATION II	7.3	7.0	6.3	6.0	5.7	6.3	7.3	6.6
DIPLOMAT	6.7	7.0	6.7	6.0	5.7	6.3	7.7	6.6
PAVO	5.7	7.3	6.7	6.7	6.0	6.7	7.0	6.6
PSU-222	7.0	7.0	7.0	6.0	6.0	5.7	7.3	6.6
BAR LP 454	5.0	7.7	6.7	6.0	6.0	6.7	7.3	6.5
CALIENTE	7.0	6.7	6.7	6.3	5.7	6.0	7.0	6.5
MOM LP 763	6.7	6.7	6.7	6.0	5.7	6.7	7.0	6.5
OVATION	6.7	7.0	6.0	6.3	6.0	6.7	6.7	6.5
PENNANT	6.7	7.0	6.7	6.3	5.7	6.3	7.0	6.5
PICK 715	6.7	7.3	6.0	6.0	6.0	6.7	7.0	6.5
RONJA	5.7	8.0	6.0	6.3	5.7	7.0	7.0	6.5
RUNAWAY	6.0	7.7	6.3	5.7	6.3	6.3	7.0	6.5
SR 4031	6.3	7.0	6.0	6.3	5.7	6.7	7.3	6.5
BRENDA	6.3	6.7	6.7	6.3	6.0	5.7	7.0	6.4
DEL 946	7.0	6.7	7.0	6.0	5.3	6.0	7.0	6.4
J207	6.0	7.3	6.3	6.0	5.3	6.7	7.0	6.4

MEAN TURFGRASS QUALITY RATINGS OF PERENNIAL RYEGRASS CULTIVARS
IN THE NATIONAL PERENNIAL RYEGRASS TEST AT MANHATTAN, KS
1987 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=BEST

NAME	APR	MAY	JUN	JUL	AUG	SEP	OCT	MEAN
PSU-333	6.7	6.7	6.7	6.3	6.0	5.7	7.0	6.4
246	6.3	7.0	5.3	6.3	5.7	6.3	7.0	6.3
BIRDIE II	6.0	7.0	6.3	6.0	5.7	5.7	7.3	6.3
RIVAL	5.3	7.0	6.0	6.3	5.3	7.0	7.3	6.3
SHERIFF	5.7	6.7	6.3	5.7	6.0	6.3	7.3	6.3
VINTAGE-2DF	6.0	6.7	6.7	6.0	5.7	6.0	7.0	6.3
MANHATTAN	6.0	7.3	6.7	6.0	5.0	5.3	7.3	6.2
BARRY	5.3	7.3	5.7	5.7	5.7	6.3	7.0	6.1
COWBOY	6.0	6.3	6.3	6.0	5.0	6.0	7.0	6.1
DELRAY	6.3	6.3	6.0	6.7	5.3	5.7	6.7	6.1
J208	5.0	7.0	5.7	5.3	5.7	7.0	7.3	6.1
REGAL	7.0	7.0	6.7	5.0	5.3	5.0	7.0	6.1
REGENCY	6.3	6.7	6.0	6.0	5.3	5.3	7.3	6.1
PENNFINE	6.7	6.3	6.7	5.3	5.3	4.7	7.0	6.0
LINN	3.7	5.7	4.0	4.3	5.0	4.3	5.7	4.7

TITLE: Water Use and Quality of 'Manhattan' Perennial Ryegrass as Affected by Application of Increasing Rates of Wetting Agent

OBJECTIVE: To investigate whether water use rates and quality of 'Manhattan' perennial ryegrass can be significantly altered by the use of soil wetting agents.

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician

INTRODUCTION:

Wetting agents have long been used by turfgrass managers to relieve localized dry spots, provide more even coverage of pesticides, and to prevent dew formation on greens to help inhibit the incidence of certain turfgrass diseases. Some wetting agent manufacturers have claimed an increase in irrigation efficiency with the use of wetting agents.

The long-term future of irrigation agriculture depends on the efficient use of irrigation water. On many of the major aquifers of the United States, especially in the Great Plains, recharging of aquifers by natural means is not keeping pace with the demand placed on them by irrigation agriculture. Any means by which water could be saved and lower the demand from those aquifers warrants research attention. This study was initiated to test if increasing rates of wetting agent would result in a lower water use rate or improvement in quality of 'Manhattan' perennial ryegrass.

MATERIALS AND METHODS:

Section A of the Toro Research Irrigation System was planted in the fall of 1983 with 'Manhattan' perennial ryegrass. This section consists of twelve 15 x 15 plots which can be irrigated independently. Irrometer tensiometers were buried at a 4-inch depth in each of these plots and irrigation is performed when soil tension reaches 60 centibars. Plots have been treated with 0, 2, 4, or 8 fluid ounces per 1000 square feet of Super Wet (Clearys). Data collected includes summer monthly quality and total supplemental irrigation for each treatment.

1987 RESULTS:

1987 Water requirement and summer quality of 'Manhattan' perennial ryegrass as affected by wetting agents is shown in Figures 1 and 2, respectively. 1987 was not a dry year overall, but due largely to short very rainy periods (See Rocky Ford Rainfall at the beginning of this report). Application of wetting agents to perennial ryegrass did provide some water savings, however, the total amount of supplemental irrigation was small. In addition, a high degree of within treatment variation, precluded statistically significance. In 1986, no trends in water savings were noted, and although a trend is noted in 1987, statistically it is insignificant. The use of wetting agents on fine textured soils with the primary objective of water savings, therefore, is not highly advised.

Summer monthly quality of 'Manhattan' perrenial ryegrass is shown in Figure 2. Although monthly quality decreased from May to August (as expected), no significant effect of wetting agents on monthly quality were noted.

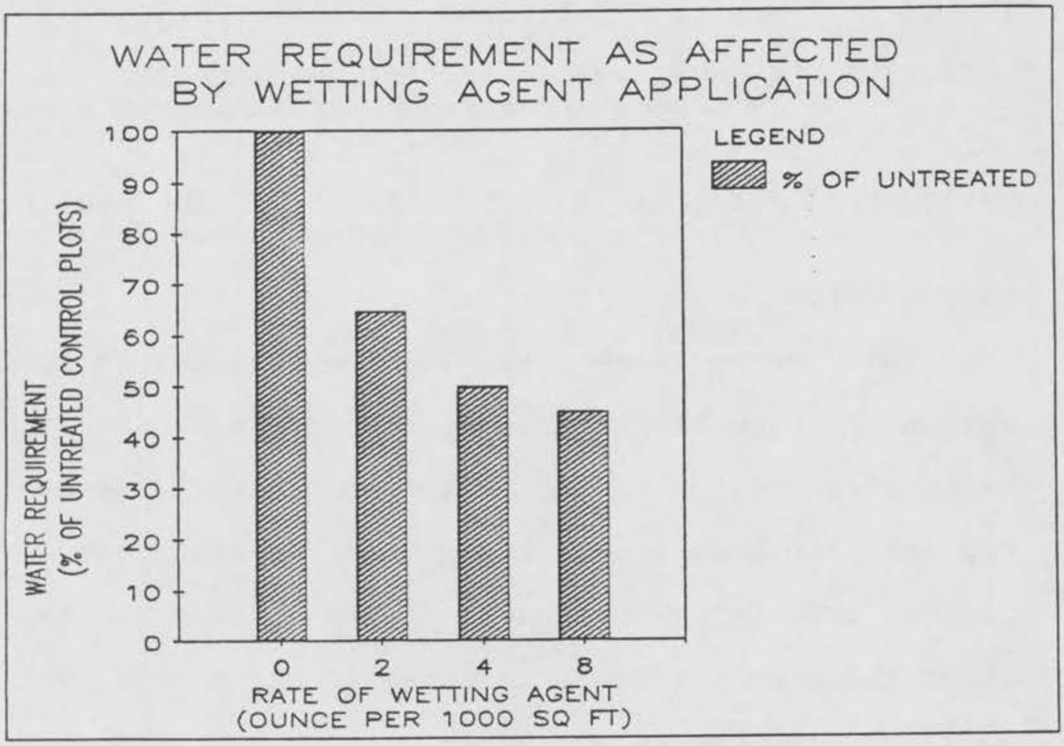


Figure 1.

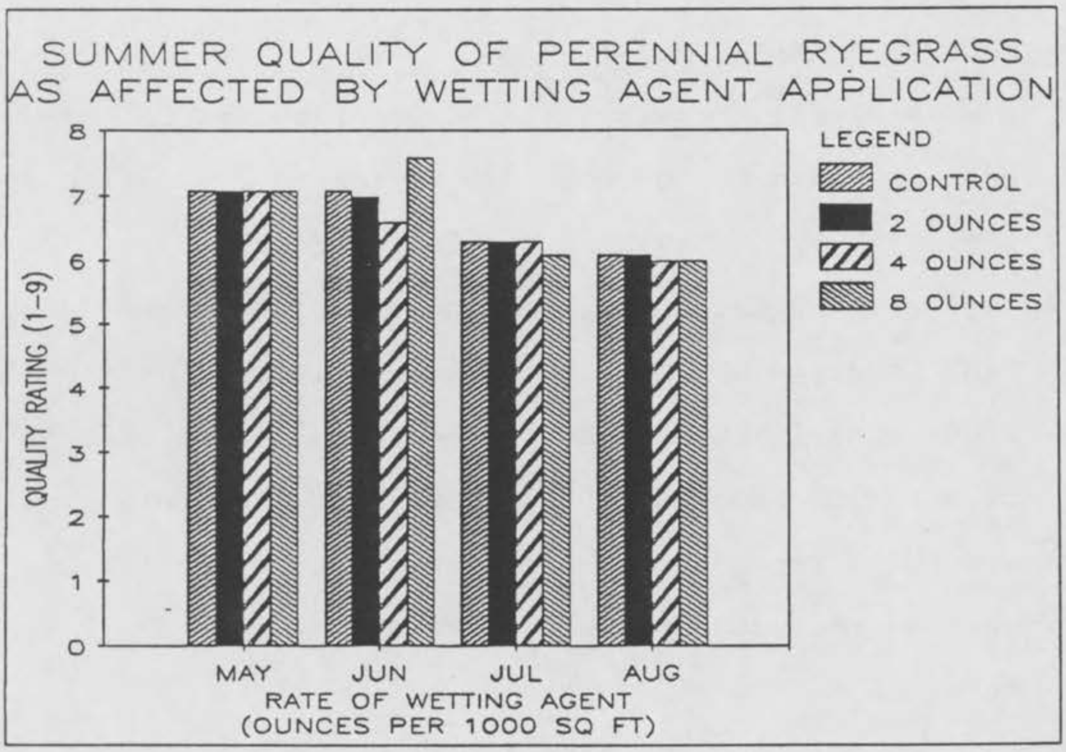


Figure 2.

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, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician

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 seriouis 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 select for improved tall fescue cultivars include selection for finer leaf blades, good mowing quality, a good rich greeen color, anjd improved sward density while maintaining good stress tolerance characteristics.

MATERIALS AND METHODS:

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 square feet. Monthly quality ratings are being recorded for each genotype. Table 1 shows the 65 entries included in the national trial.

RESULTS:

Monthly quality data has been taken for April, May and June, 1988 at the time of this printing. A close examination of those ratings reveals that most of the very best performing cultivars are experimentals with only a couple exceptions. Some of the very best performers to date include: PE-7E (Reed Funk, Rutgers), KWS-BG-6 (KWS-Einbeck), PST-5D1 (Pure Seed Testing, Inc.), Pick 127 (Pickseed West, Inc.), PST-5AP (Turf Seed, Inc.), Normarc 99 (Normarc, Inc.), Bel 86-1 (Jack Murray, USDA), 'Sundance' (Seaboard Seed Co.), and 'Tribute' (Lofts Seed, Inc.).

Table 1. 1987 National Tall Fescue Test - Entries and Sponsors

Entry No.	Name	Sponsor
1	Adventure	Warren's Turf Nursery
2	BAF Fa 7851	Barenbrug Breeding
3	Trident	Seed Research of Oregon
4	Titan	Seed Research of Oregon
5	Pick DDF	Pickseed West, Inc.
6	Pick 127	Pickseed West, Inc.
7	Pick 845PN	Pickseed West, Inc.
8	Pick SLD	Pickseed West, Inc.
9	PE-7	Reed Funk - Rutgers
10	PE-7E	Reed Funk - Rutgers
11	Hubbard 87	Reed Funk - Rutgers
12	Syn Ga	O.M Scott & Sons
13	Legend	Agway
14	Taurus	Turf Merchants, Inc.
15	Aztec	Turf Merchants, Inc.
16	Sundance	Seaboard Seed Co.
17	Fatima	Van der Have Oregon, Inc.
18	Normarc 25	Reed Funk - Rutgers
19	Normarc 77	Reed Funk - Rutgers
20	KWS-DUR	KWS-Einbeck
21	KWS-BG-6	KWS-Einbeck
22	Willamette	Willamette Seed & Grain
23	Chieftan	Roberts Seed Co.
24	Pick GH6	Pickseed West, Inc.
25	Thoroughbred	Pickseed West, Inc.
26	Pick TF9	Pickseed West, Inc.
27	PST-50L	Turf-Seed, Inc.
28	PST-5D7	Pure-Seed Testing, Inc.
29	Cimmaron	LESCO, Inc.
30	Bonanza	Cenex Seed Plant
31	PST-5AG	Pure-Seed Testing, Inc.
32	PST-5BL	Pure-Seed Testing, Inc.
33	PST-5MW	Pure-Seed Testing, Inc.
34	Trailblazer	LESCO, Inc.
35	PST-5D1	Pure-Seed Testing, Inc.
36	PST-5AP	Turf-Seed, Inc.
37	PST-5HF	Pure-Seed Testing, Inc.
38	Jaguar	Garfield Williamson, Inc.

(cont.)

Entry No.	Name	Sponsor
39	PST-DBC	Pure-Seed Testing, Inc.
40	Olympic	Turf-Seed, Inc.
41	Jaguar II	Garfield Williamson, Inc.
42	Monarch	Turf-Seed, Inc.
43	Apache	Turf-Seed, Inc.
44	PST-5DM	Pure-Seed Testing, Inc.
45	Pick DM	Pickseed West, Inc.
46	Normarc 99	Normarc, Inc.
47	Pacer	International Seeds, Inc.
48	Carefree	International Seeds, Inc.
49	Richmond	Jonathan Green, Inc.
50	Tip	NPI Seed, Inc.
51	Ky-31	-
52	Bel 86-1	Jack Murray-USDA, ARS
53	Bel 86-2	Jack Murray-USDA, ARS
54	PST-5EN	Pure-Seed Testing, Inc.
55	PST-5F2	Turf-Seed, Inc.
56	Finelawn 5GL	Finelawn Research Corp.
57	Finelawn I	Finelawn Research Corp.
58	Rebel	Loft's Seed, Inc.
59	Rebel II	Loft's Seed, Inc.
60	Tribute	Loft's Seed, Inc.
61	Arid	Jacklin Seed Co.
62	Wrangler	Jacklin Seed Co.
63	Mesa	Jacklin Seed Co.
64	JB-2	Jacklin Seed Co.
65	Falcon	E.F. Burlingham

TITLE: Buffalograss Management Study

OBJECTIVE: To test the quality response of 'Texoka' buffalo grass managed under increasing rates of nitrogen and different mowing heights.

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician

INTRODUCTION:

Buffalograss is the only turfgrass species that is native to North America. Its natural range covers most of the Great Plains and extends eastward through mid-Iowa. It has been generally accepted that buffalograss is a low maintenance species in that it requires very little (if any) nitrogen application and supplemental irrigation. The density of buffalograss under these conditions is quite low, however, and its color is a dull green. It has also been stated that increased rates of nitrogen adds to weed encroachment, especially from more aggressive perennial grasses. This experiment was initiated to test to what extent buffalograss turf quality can be improved at increased rates of nitrogen and different mowing heights when strict weed control is practiced.

MATERIALS AND METHODS:

'Texoka' buffalograss was established in Section II of the Rocky Ford Turfgrass Research Plots in 1984. This experiment utilizes 4 yearly rates of nitrogen: 1 lb. of N per 1000 square feet applied in mid-May, 2 lbs. of N per 1000 square feet applied in split applications in mid-May and mid-July, 3 lbs. of N per 1000 square feet applied in split applications in mid-May, mid-June, and mid-July, and 4 lbs. of N per 1000 square feet applied in split applications in mid-May, mid-June, mid-July, and mid-

August. Each fertility treatment is divided into two mowing heights: 1.75 inches and 3.5 inches. Strict weed control will be practiced using simazine glyphosate, benefin, and trimec. Insecticides will be applied as needed. Quality ratings (1-9) will be recorded for each treatment combination beginning in August, 1987.

RESULTS:

Quality ratings of buffalograss as affected by mowing height and nitrogen level are presented for August and September, 1987, and June, 1988, in Figures 1 through 3, respectively. Buffalograss quality sifnificantly increased as mowing height increased from 1.75 inches to 3.5 inches, and as nitrogen applications increased from 1 lb N per 1000 square feet year to 4 lb N per 1000 square feet per year. Increases in quality were largely due to deeper, richer green color, and noticeable increases in sward density. Weed control is absolutely essential to maintain Buffalograss at this level. Simazine, used both as a premergent and postemergent herbicide, is a very important part of maintaining buffalograss at this level and should be part of a buffalograss management program. Without strict weed control, more agressive cool-season grasses may take over a buffalograss turf in only a couple of growing seasons. Removing weed pressure chemically enables the buffalograss to respond to higher mowing and nitrogen levels for enhanced quality.

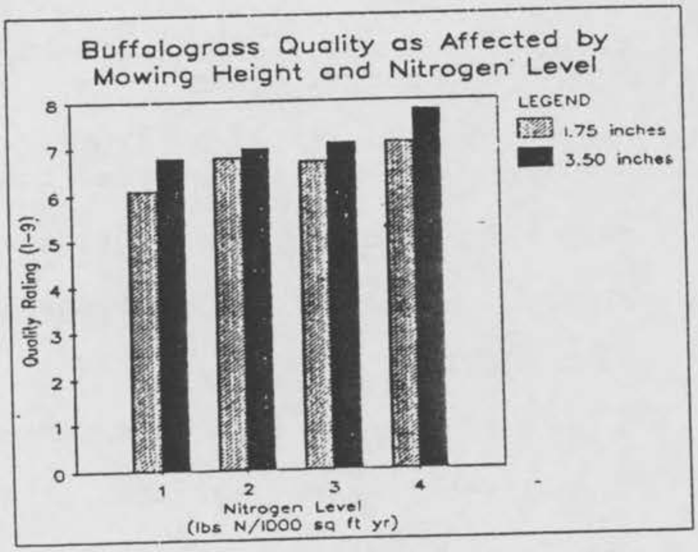


Figure 1. August, 1987

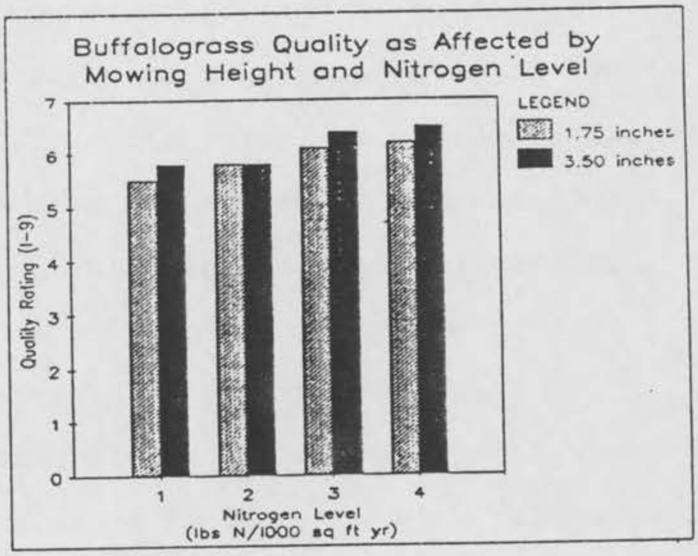


Figure 2. September, 1987

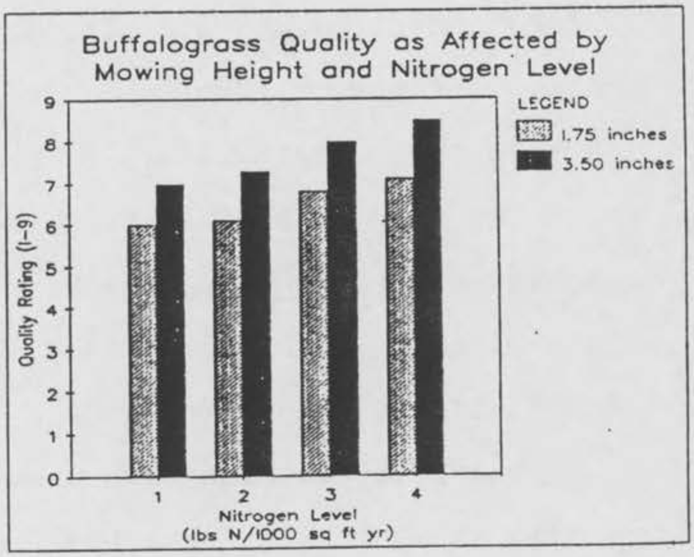


Figure 3. June, 1988

TITLE: Rhone-Poulence Preemergence Herbicide Study on Buffalograss

OBJECTIVE: To determine herbicide efficacy and turf tolerance of Ronstar applied to dormant buffalograss

PERSONNEL: Ron Campbell, Turfgrass Research

FUNDING: Rhone-Poulenc Ag Company

INTRODUCTION:

Buffalograss is a warm season species native to the transitional, warm, semiarid, and subhumid regions. It has excellent hardiness to high temperatures and tolerates low temperature in comparison to most warm season grasses. The spring green up rate and low temperature color retention are intermediate to fair. The excellent drought resistance of buffalograss is one of its most outstanding characteristics. It is best adapted to regions having 12 to 25 inches of rainfall per year.

Buffalograss forms a fine textured, low growing, soft, grayish-green turf of fairly good shoot density. It spread vegetatively by numerous stolons that branch profusely and form a light sod. Weed control may be a problem during the establishment period and also as a result of overwatering and other improper cultural practices. There are a few herbicides labeled for buffalograss.

The purpose of this study was to evaluate effectiveness of Ronstar GR and WP formulations on annual grass control and to determine the herbicide effect on the turf.

MATERIALS AND METHODS:

The study was put down on a thin stand of buffalograss seeded in 1987. The area had a heavy population of common crabgrass and yellow foxtail the year of planting. Single applications of Ronstar G and WP formulations each at 1.0, 2.0 and 3.0 lbs/acre. Pendamethalin at 3.0 lbs. and unsprayed controls completed the treatments. A field type compressed air plot sprayer equipped with a 4 ft. boom was used to spray 4 x 8 ft. plots of buffalograss. A fertilizer application was used to apply the granules. The herbicide treatments were made April 13 to the dormant buffalograss.

RESULTS:

Results of the study as shown in Table 1. Good control of annual grasses was obtained from all herbicide treatments except for plots receiving the 1G Ronstar treatments. Weed pressure was very great with a 52 percent cover of annual grasses estimated in the control plots. The observed population of grass weeds was approximately 2:1, crabgrass to yellow foxtail. There were no observed differences in control based on species.

Two weeks after application the buffalograss was still dormant with no injury apparent. Two weeks later, or 4 weeks after treatment, the plots treated with Ronstar 50WP at 3 lbs. showed a slight amount of discoloration. Eight weeks after treatment there was no obvious difference in color from any treatment.

Based on this years results it appears that effective control of crabgrass and yellow foxtail can be obtained by applying either Ronstar WP or G formulation to dormant buffalograss.

Table 1. Efficacy of Various Formulations and Rates of Ronstar in Control of Annual Grasses in Buffalograss Turf

Herbicide	Rate	Control 7-11-88*
	(lb/acre)	--- % ---
Ronstar 2G	1.0	83 a
Ronstar 2G	2.0	92 a
Ronstar 2G	3.0	98 a
Ronstar 50WP	1.0	91 a
Ronstar 50WP	2.0	98 a
Ronstar 50WP	3.0	99 a
Pendimethalin 60WDG	3.0	95 a
Control	--	0 b (52)**

*Means followed by the same letter in the same column are not significantly different at the 0.05 level according to Duncan's Multiple Range.

**Value in parenthesis indicate percent crabgrass cover.

TITLE: National Bermudagrass Cultivar Trial and Winter Cover Study

OBJECTIVE: To test several Bermudagrass genotypes for their adaptability and to test whether the use of protective winter covers and fall applied fungicides affect Bermudagrass quality and/or incidence of Spring Dead Spot

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician
Kala Mahadeva, Turfgrass Ph.D. Candidate

INTRODUCTION:

Much of Kansas is located in the transition zone for turfgrass adaptation. Cool season grasses are severely stressed by mid-summer high temperatures, and warm season grasses are often killed by winter low temperatures. Bermudagrass is susceptible to winter kill and efforts to breed for improved germplasm must evaluate for winter survival.

The use of winter covers to prevent winter damage by desiccation and low temperatures has been used on bentgrass, but its use is largely uninvestigated with Bermudagrass. One drawback with the use of winter protective covers is enhancement of disease activity. This experiment was designed to investigate the efficacy of such protective covers alone and in combination with mid-fall application of fungicide with known activity against the suspected causal organism of Spring Dead Spot.

MATERIALS AND METHODS:

Sprigs were received from the National Turfgrass Evaluation Program in early 1986 and planted into flats in the greenhouse. Several flats of each genotype were vegetatively propagated from new stolons. A complete set was thus generated for the Horticulture Research Center in Wichita.

Plugs were transplanted into the field in mid-May 1986 into 10 X 10 foot plots. The planting utilized a randomized complete block design with 28 treatments and 3 replications. The plots were fertilized with 1 lb. of N per 1000 square feet per growing month using urea form. Each plot was divided in half during October 1986 and one-half of each plot was treated with label rates of Rubigan. The plots were divided in half again in December where one-half of each plot was covered with a spun-woven polyester winter cover.

Data that is being collected includes monthly quality winter survival and greenup, incidence of Spring Dead Spot, daily winter maximum and minimum crown temperatures under the winter covers and in the exposed turf, texture ratings, color ratings, and percent cover. Additional environmental data collection included daily air minimum and maximum temperatures, total daily solar radiation, daily soil temperatures at 2 and 4 inch depths, and mean daily wind speed. The following genotypes and their sponsors were used in this test.

CT 23 Cal-Turf - Camarillo, CA
NM 43 - New Mexico State Univ.
NM 72 - New Mexico State Univ.
NM 375 - New Mexico State Univ.
NM 471 - New Mexico State Univ.
NM 507 - New Mexico State Univ.
Vamont - Virginia Tech
E-29 - Kansas State Univ.
A-29 - Kansas State Univ.
RS-1 - Univ. of Kentucky
MSB-10 - Mississippi St. Univ.
MSB-20 - Mississippi St. Univ.
MSB-30 - Mississippi St. Univ.
A-22 - Kansas State Univ.
Texturf - Texas A&M Univ.
Midiron - Kansas State Univ.
Tufcote - Texas A&M Univ.
Tifgreen - Texas A&M Univ.
Tifway - Texas A&M Univ.
Tifway II - Texas A&M Univ.
NMS 1 - New Mexico State
NMS 2 - New Mexico State
NMS 3 - New Mexico State
NMS 4 - New Mexico St Univ.
NMS 14 - New Mexico St Univ.
Arizona Common NMS Univ.
Guymon Enid, Oklahoma
FB-119 - Univ. of Florida

Mean Turfgrass Quality Ratings of Bermudagrass Cultivars in the National Bermudagrass Test at Manhattan, KS 1987 Data

Turfgrass Quality Ratings 1-9; 9 = Best

Name	May	June	July	Aug	Sep	Mean
Tifway	4.3	7.3	8.0	7.7	8.0	7.1
Tifway II	4.3	7.7	7.7	8.0	8.0	7.1
MSB-10	4.3	7.3	7.7	7.7	7.7	6.9
MSB-30	4.0	7.7	7.3	7.7	7.7	6.9
MSB-20	4.3	7.0	7.7	7.0	7.7	6.7
Texturf 10	4.7	7.0	7.7	7.3	7.0	6.7
Tifgreen	4.0	7.7	7.7	7.0	7.0	6.7
Tufcote	5.0	6.7	7.3	7.0	7.3	6.7
A-22	4.0	7.3	7.0	7.3	7.3	6.6
A-29	4.7	7.0	7.3	6.7	6.7	6.5
NM 43	4.7	6.7	7.3	7.0	6.7	6.5
CT 23	3.0	6.5	7.0	7.0	8.0	6.3
E-29	4.7	6.3	6.7	7.0	6.7	6.3
Midiron	3.7	7.0	7.3	7.0	6.7	6.3
NM 507	2.0	5.7	7.7	7.3	7.3	6.0
RS-1	4.3	6.0	7.0	6.7	6.0	6.0
Vamont	5.7	6.0	6.3	6.0	5.7	5.9
FB-119	2.0	5.7	6.7	7.0	7.0	5.7
NM 375	2.3	5.7	6.3	7.0	7.0	5.7
NMS 14	3.0	5.3	6.7	7.0	6.3	5.7
NMS 4	2.0	5.7	7.3	7.0	6.3	5.7
NMS 1	3.3	6.0	6.7	6.3	5.7	5.6
AZ.Common	2.7	5.7	6.7	6.3	6.0	5.5
NM 471	1.0	5.0	7.0	7.0	6.3	5.5
NMS 2	3.0	5.0	6.7	6.3	6.0	5.4
NMS 3	1.3	3.3	7.3	7.0	7.0	5.2
Guymon	3.0	5.0	5.3	5.7	5.0	4.8
NM 72	1.0	4.0	6.7	6.3	6.0	4.8

RESULTS:

Mean quality ratings for the Bermudagrass cultivars are listed in Table 1. Tifway, Tifway II, MSB-10, and MSB-30 exhibited superior seasonal quality than the other genotypes. Poorest quality genotypes were the seeded cultivars of Guymon and

NM 72.

The effect of winter covers (Trevira) on spring clipping weight, spring coverage estimates, and spring biomass ratings are shown in Figures 1, 3, and 5, respectively. The presence of covers highly significantly increased each parameter. The effect of mid-fall fungicide (Rubigan) treatments on spring clipping weight, spring coverage estimates, and spring biomass ratings are shown in Figures 2, 4, and 6, respectively. In no case did the application of fungicide significantly affect any of these parameters.

Table 2 shows the temperature data for January, February, March, and April, 1988, as well as the soil surface temperatures for covered and uncovered plots for January through March. The presence of 'Trevira' increased the maximum surface temperature up to about 15 degrees (F). The presence of 'Trevira' also was effective in retaining that heat during the night when minimum temperatures under the blanket were up to 4-5 degrees (F) warmer than soil surface temperatures of uncovered plots.

Table 1.

Mean Turfgrass Quality Ratings of Bermudagrass Cultivars in the National Bermudagrass Test at Manhattan, KS 1987 Data

Turfgrass Quality Ratings 1-9; 9 = Best

Name	May	June	July	Aug	Sep	Mean
Tifway	4.3	7.3	8.0	7.7	8.0	7.1
Tifway II	4.3	7.7	7.7	8.0	8.0	7.1
MSB-10	4.3	7.3	7.7	7.7	7.7	6.9
MSB-30	4.0	7.7	7.3	7.7	7.7	6.9
MSB-20	4.3	7.0	7.7	7.0	7.7	6.7
Texturf 10	4.7	7.0	7.7	7.3	7.0	6.7
Tifgreen	4.0	7.7	7.7	7.0	7.0	6.7
Tufcote	5.0	6.7	7.3	7.0	7.3	6.7
A-22	4.0	7.3	7.0	7.3	7.3	6.6
A-29	4.7	7.0	7.3	6.7	6.7	6.5
NM 43	4.7	6.7	7.3	7.0	6.7	6.5
CT 23	3.0	6.5	7.0	7.0	8.0	6.3
E-29	4.7	6.3	6.7	7.0	6.7	6.3
Midiron	3.7	7.0	7.3	7.0	6.7	6.3
NM 507	2.0	5.7	7.7	7.3	7.3	6.0
RS-1	4.3	6.0	7.0	6.7	6.0	6.0
Vamont	5.7	6.0	6.3	6.0	5.7	5.9
FB-119	2.0	5.7	6.7	7.0	7.0	5.7
NM 375	2.3	5.7	6.3	7.0	7.0	5.7
NMS 14	3.0	5.3	6.7	7.0	6.3	5.7
NMS 4	2.0	5.7	7.3	7.0	6.3	5.7
NMS 1	3.3	6.0	6.7	6.3	5.7	5.6
AZ.Common	2.7	5.7	6.7	6.3	6.0	5.5
NM 471	1.0	5.0	7.0	7.0	6.3	5.5
NMS 2	3.0	5.0	6.7	6.3	6.0	5.4
NMS 3	1.3	3.3	7.3	7.0	7.0	5.2
Guymon	3.0	5.0	5.3	5.7	5.0	4.8
NM 72	1.0	4.0	6.7	6.3	6.0	4.8

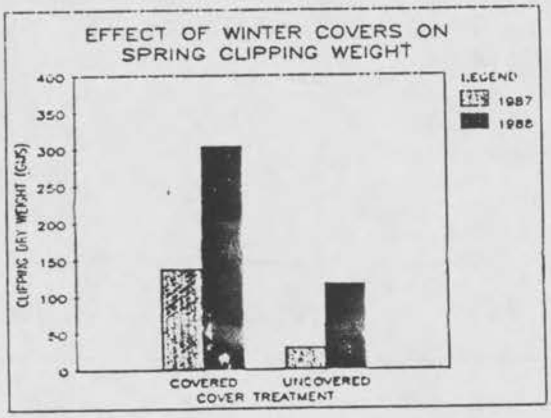


Figure 1.

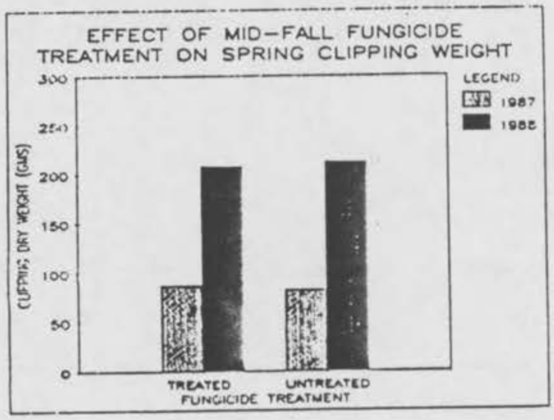


Figure 2.

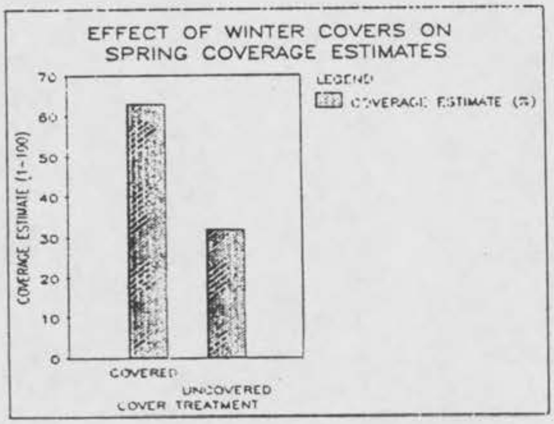


Figure 3.

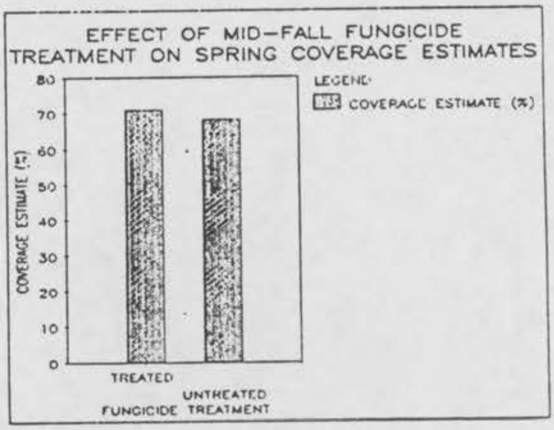


Figure 4.

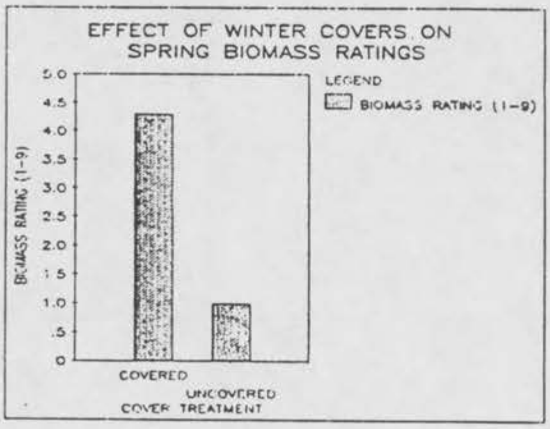


Figure 5.

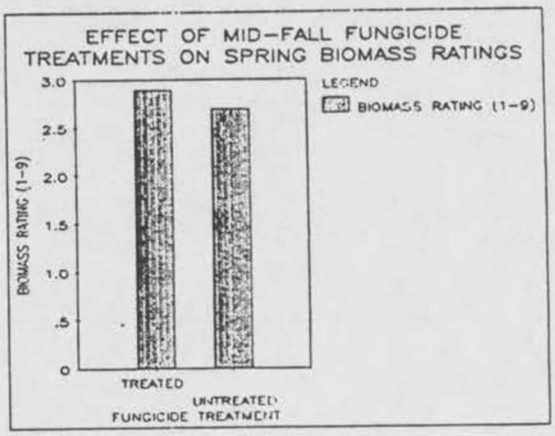


Figure 6.

TEMPERATURE DATA

Date	Air Temp Max (^{o}F)	Air Temp Min (^{o}F)	Total Solar Rad. (LY)	Soil Temp-2" Max (^{o}F)	Soil Temp-2" Min (^{o}F)	Mean Wind speed (mph)	Soil Surface Temp Uncovered Max	Soil Surface Temp Uncovered Min	Soil Surface Temp Covered Max	Soil Surface Temp Covered Min
JANUARY										
1	30	8	241.1	31	25	4.2	27.0	14.6	32.7	20.3
2	39	10	235.3	31	24	6.0	31.2	14.3	32.4	19.4
3	36	16	233.3	31	27	6.8	29.4	16.7	37.6	20.6
4	17	4	251.4	28	20	7.8	22.6	13.2	26.9	16.8
5	17	5	137.7	28	20	5.5	24.7	12.6	28.9	17.0
6	12	9	80.4	27	22	7.4	19.3	12.5	22.6	18.8
7	27	-2	248.3	29	26	2.3	22.8	16.7	23.4	19.2
8	19	-5	243.2	28	26	4.1	22.7	16.3	23.0	18.9
9	26	-2	254.2	29	26	2.0	22.9	16.5	23.5	18.4
10	23	-5	124.0	28	25	5.2	22.4	15.4	22.8	18.0
11	39	22	171.8	31	28	10.9	23.3	20.2	23.4	21.6
12	36	9	256.0	31	27	10.4	23.3	16.0	24.0	17.2
13	35	3	262.5	29	24	3.9	26.3	12.9	33.4	16.9
14	37	16	230.3	31	27	5.2	26.7	16.2	33.3	18.7
15	50	23	253.8	32	27	7.5	36.7	16.2	37.4	18.1
16	49	37	160.0	32	32	7.3	33.0	23.0	35.5	24.4
17	51	28	253.2	35	32	2.4	36.4	20.5	44.1	21.0
18	50	25	146.0	35	32	6.6	39.7	20.7	41.8	22.2
19	43	29	51.5	38	32	9.5	36.1	22.8	36.6	25.8
20	32	17	162.1	32	32	11.4	24.1	19.1	33.2	21.6
21	31	8	279.4	32	32	2.7	27.1	14.6	35.6	18.0
22	37	13	209.4	32	31	5.5	24.7	14.2	31.5	19.5
23	46	20	93.9	32	30	7.7	31.1	17.4	32.9	20.0
24	43	17	200.3	32	29	9.6	25.6	15.3	30.3	16.2
25	21	7	276.3	32	22	9.9	22.3	14.1	31.4	16.7
26	31	7	261.6	31	22	4.5	31.3	16.8	34.1	20.2
27	54	20	291.0	32	26	3.8	42.9	19.4	43.9	20.0
28	62	23	293.7	32	31	2.6	42.9	17.6	47.7	20.0
29	61	40	233.6	39	32	9.2	44.1	21.6	49.1	25.2
30	62	44	185.9	46	37	8.5	44.2	22.9	48.7	27.3
31	44	22	164.1	39	33	11.5	30.8	31.5	40.6	24.1
FEBRUARY										
1	23	11	122.0	33	29	14.1	31.0	21.5	35.7	24.1
2	28	8	257.4	31	26	6.7	35.5	18.1	42.4	19.3
3	25	10	160.2	31	29	7.8	23.3	19.4	24.8	21.5
4	25	-1	298.5	31	30	5.7	23.6	19.6	24.0	21.9
5	14	-5	286.1	30	29	6.5	23.0	18.3	23.3	20.0
6	29	-12	336.2	30	27	5.5	23.3	16.0	23.5	18.3
7	37	18	332.4	31	29	5.9	23.5	20.4	23.4	21.3
8	46	20	254.0	32	30	5.1	27.7	20.9	28.2	21.6
9	35	18	312.4	32	31	6.5	37.2	20.5	35.7	22.2

Date	Air Temp Max (°F)	Air Temp Min (°F)	Total Solar Rad. (LY)	Soil Temp-2" Max (°F)	Soil Temp-2" Min (°F)	Mean Wind speed (mph)	Soil Surface Temp Uncovered Max	Soil Surface Temp Uncovered Min	Soil Surface Temp Covered Max	Soil Surface Temp Covered Min
FEBRUARY										
10	33	-3	174.9	32	30	17.7	21.9	16.3	22.7	18.3
11	14	-7	345.6	30	28	7.0	22.3	16.5	27.1	17.6
12	44	7	340.5	31	29	3.9	27.8	17.9	37.9	18.0
13	65	23	351.0	32	28	5.3	40.6	19.5	46.3	21.2
14	48	23	45.4	32	32	13.9	26.1	20.5	27.4	21.7
15	43	15	365.4	32	31	5.9	37.3	20.2	40.6	22.2
16	55	35	317.2	36	32	6.6	32.7	21.9	47.3	23.3
17	52	28	300.5	43	32	2.2	44.7	18.8	52.3	20.9
18	47	20	298.6	40	32	2.9	42.6	19.0	44.7	20.4
19	52	25	366.1	45	33	6.0	43.4	19.3	46.2	23.9
20	42	28	279.6	42	33	6.4	38.2	24.4	48.5	25.2
21	65	32	383.4	51	33	6.2	35.5	21.8	39.3	23.2
22	55	31	372.0	48	35	11.5	40.7	24.0	51.2	25.7
23	41	24	371.1	40	33	8.0	46.3	21.9	34.7	23.0
24	41	20	417.3	39	32	5.9	37.4	22.2	52.9	24.9
25	56	18	418.2	46	32	2.0	47.5	16.0	58.0	20.7
26	73	33	404.7	53	33	6.4	67.3	17.9	73.5	21.7
27	64	30	421.6	55	33	3.3	64.2	24.2	67.0	26.4
28	65	29	420.5	54	35	7.3	48.1	20.8	58.8	24.6
29	60	21	433.2	56	34	2.3	60.2	18.9	68.7	23.9
MARCH										
1	70	31	433.2	57	34	2.3	65.5	21.5	69.6	24.5
2	44	31	163.2	44	38	17.0	36.3	26.7	40.4	28.1
3	46	27	321.1	46	35	14.9	39.1	35.6	44.2	27.3
4	46	19	447.9	50	33	4.0	58.9	18.9	59.4	20.6
5	41	24	161.4	44	35	2.9	42.2	23.7	43.2	24.4
6	60	34	398.5	56	37	5.7	62.8	27.1	67.8	29.2
7	69	34	295.3	56	39	8.9	64.9	25.4	65.4	28.9
8	53	34	330.9	51	39	7.2	56.1	27.6	49.5	20.7
9	61	25	465.6	58	35	2.7	62.2	25.6	68.9	25.7
10	65	29	460.2	59	36	8.4	63.1	22.2	70.1	26.2
11	61	31	469.3	58	42	9.4	68.8	23.7	69.8	26.7
12	34	20	443.5	46	35	14.7	39.0	17.0	62.4	17.6
13	34	14	501.6	43	32	11.0	38.3	14.8	64.0	16.8
14	36	13	520.1	43	31	7.7	42.5	9.8	60.0	18.5
15	42	11	523.4	45	31	5.9	47.9	14.1	63.4	20.7
16	40	19	237.0	41	32	2.7	40.6	18.3	43.7	20.1
17	35	21	128.1	37	35	5.4	28.5	23.1	29.7	24.8
18	48	17	461.6	41	34	3.9	43.8	19.3	44.8	21.2
19	66	26	499.6	50	34	5.1	64.1	17.7	69.8	19.8
20	78	34	502.4	58	36	4.3	69.9	22.2	77.3	26.2
21	85	34	506.4	64	39	5.0	77.0	24.7	88.3	27.6
22	83	48	520.4	66	45	9.0	72.6	29.6	85.9	31.9
23	68	40	466.5	65	47	7.9	71.9	29.6	77.9	32.3
24	70	41	373.8	65	50	10.8	71.9	35.1	79.7	39.1

Date	Air Temp Max (°F)	Air Temp Min (°F)	Total Solar Rad. (LY)	Soil Temp-2" Max (°F)	Soil Temp-2" Min (°F)	Mean Wind speed (mph)	Soil Surface Temp Uncovered Max	Soil Surface Temp Uncovered Min	Soil Surface Temp Covered Max	Soil Surface Temp Covered Min
MARCH										
25	67	32	467.0	62	43	7.1	69.2	23.8	82.4	29.7
26	64	39	558.1	62	45	8.8	63.5	27.7	74.4	30.4
27	78	38	531.7	66	44	11.3	72.4	26.1	78.3	28.7
28	67	46	197.5	57	48	12.7	44.6	36.7	46.9	37.1
29	55	39	384.0	57	44	8.7	72.1	23.2	60.4	26.6
30	64	35	581.8	64	41	7.9				
31	58	33	347.6	57	42	8.5				
APRIL										
1	50	44	27.9	48	46	12.1				
2	51	41	114.0	49	43	5.9				
3	69	44	460.9	62	45	5.5				
4	82	52	500.6	71	56	3.0				
5	66	41	243.1	60	45	14.5				
6	67	37	606.6	63	40	6.2				
7	84	42	583.9	73	45	5.5				
8	85	56	575.2	75	52	9.6				
9	65	39	120.7	62	46	11.0				
10	55	36	609.6	57	42	8.6				
11	60	33	610.6	61	40	8.0				
12	71	33	621.5	70	41	2.2				
13	81	37	623.8	75	45	5.3				
14	60	43	481.6	68	51	7.1				
15	63	38	627.6	71	49	4.6				
16	71	30	621.7	73	45	4.5				
17	63	47	112.4	60	51	7.5				
18	57	35	624.5	63	42	9.5				
19	67	30	585.8	71	42	4.5				
20	78	47	592.9	75	49	5.5				
21	79	49	527.0	76	53	8.4				
22	62	39	499.1	70	53	7.9				
23	59	35	510.5	66	48	7.8				
24	74	35	574.9	74	46	5.0				
25	70	45	460.9	73	55	4.3				
26	55	37	523.1	64	51	9.7				
27	65	31	617.3	70	44	4.4				
28	77	36	658.7	78	48	3.7				
29	69	47	426.6	74	55	4.9				
30	78	53	487.2	78	57	4.5				

TITLE: Differentation of Ophiospaerella Herpotricha and Leptosphaeria Korrae, Two Fungi which Cause Spring Dead Spot, By Restriction Fragment Length Polymorphism Analysis

PERSONNEL: Ned Tisserat, Dept. of Plant Pathology, KSU

PROJECT DESCRIPTION:

Ophiosphaerella herpotricha was consistently isolated from dead patches of bermudagrass and zoysiagrass afflicted with spring dead spot (SDS) in Kansas. Pathogenicities of O. herpotricha and Leptosphaeria korrae, an incitant of SDS in other areas of the U.S. and in Australia, were compared in the greenhouse on common bermudagrass. Both fungi significantly increased root discoloration and decreased root dry weight ($p < .05$) 4 mo after inoculation. O. herpotricha-inoculated plants had significantly ($p < .05$) lower root weights than those inoculated with L. korrae. In Sep 1987, two 10-cm-diam. plugs were removed from each of three replicate plots of 15 bermudagrass cultivars in the field. Ten g of oats either infested with O. herpotricha or sterile (control) were added to the bottom of the hole on each plot; the plugs were then replaced. In May 1988, 71% of all inoculated plugs were dead; no control plugs died. This is the first report of Oh causing spring dead spot.

TITLE: <u>Ophiosphaerella Herpotricha</u> Associated with Spring Dead Spot of Bermudagrass in Kansas.

PERSONNEL: Ned Tisserat, John Pair, Ann Nus - Departments of Plant Pathology and Horticulture, Kansas State Univ.

PROJECT DESCRIPTION:

Restriction fragment length polymorphisms (RFLP) were used to distinguish <u>Ophiosphaerella herpotricha</u> (<u>Oh</u>) and <u>Leptosphaeria korrae</u> (<u>Lk</u>); these fungi are associated with spring dead spot of bermudagrass. Total DNA was extracted from isolates and digested with <u>Eco</u>RI or <u>Hind</u>III. DNA fragments were separated by agarose gel electrophoresis and stained with ethidium bromide. Six of seven <u>Lk</u> isolates had an identical satellite DNA fragment pattern. None of the <u>Oh</u> isolates showed a similar banding pattern. A rDNA genomic clone from <u>Armillaria mellea</u> is being used in Southern blot analysis of RFLP gels to differentiate <u>Lk</u> and <u>Oh</u>. This technique may be useful in identifying fungi associated with patch diseases of turfgrass which do not readily fruit in culture.

TITLE: Evaluation of Fungicides for Control of Spring Dead Spot of Bermudagrass

PERSONNEL: N.A. Tisserat, J. Pair, and S. George, Dept. of Plant Pathology and Horticulture, KSU, and Dept. of Plant Pathology, Oklahoma State University

PROJECT DESCRIPTION:

Fungicides were evaluated on bermudagrass lawn in Wichita and Hill City. The turf received high maintenance (>4 lb N/1000 sq ft) through the summer. Treatments were applied to 10 x 10 ft plots arranged in a randomized complete block design with four replications. Fungicides were applied 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. Fungicides were applied on 29 and 30 Sep 1987, and plots were irrigated immediately after application with approximately 1/4 inch of water. Plots were rated in early May for the number of dead spots per plot and the percent diseased area of each plot.

RESULTS:

Spring dead spot was severe during the testing period. None of the fungicides gave acceptable levels of control. In Wichita, plots treated with Chipco 26019, Banner, and Rubigan had fewer spots and a lower percentage of diseased area than non-treated plots, although differences were not significant. Other fungicides tested did not improve turf quality when compared to non-treated plots. No differences between treated and non-treated plots were observed at the Hill City test plot.

Wichita Plot

Treatment and rate/1000 sq ft	Disease Severity Number spots/plot	 % plot area diseased
Banner 1.12 EL 2 oz	3.75	5.13 a*
Rubigan 50W 2 oz	3.50	5.75 a
BAY 1608 25W 2 oz	4.5	7.38 ab
Chipco 50W 40 oz	4.5	7.87 ab
Control	6.0	10.25 ab
Bayleton 25W 2 oz	7.0	11.75 ab
Fungo 50W 6 oz	5.75	12.25 ab
Control	5.0	12.75 ab
Cleary's 3336 6 oz	7.75	15.75 bc
Tersan 1991 50W 6 oz	9.0	23.00 c

* Column means followed by the same letter are not significantly different (P = 0.05) by FLSD test. Values presented are means of 4 replications.

Hill City Plot

Treatment and rate/1000 sq ft	Disease Severity Number spots/plot	 % plot area diseased
Chipco 26019	2.5*	5.0
Rubigan	3.5	10.25
Fungo	3.25	7.75
Control	3.25	6.75
Tersan 1991	4.0	5.5
BAY 1608	5.0	11.0
Cleary['s 3336	5.25	14.25
Bayleton	6.25	13.0
Banner	6.75	20.25

* Values presented are means of 4 replications. There were no significant (P = 0.05) differences in treatments.

TITLE: Enhancement of Strip-Sodded Zoysia Establishment by Chemical Means

OBJECTIVE: To test various triazine herbicides and growth retardants for their effectiveness to enhance the rate of fill of strip-sodded Zoysia into established Kentucky bluegrass turf

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician

INTRODUCTION:

In recent years the use of Zoysia for golf course fairways in the transition zone has gained popularity with golfers and turfgrass managers alike. Zoysia forms a very dense turf and has relatively few insect and disease problems. In addition, Zoysia does not require as much nitrogen fertility and irrigation as most other turfgrasses. With rising fertilizer and water costs, this is an important consideration for turfgrass managers.

Zoysia is established predominantly by vegetative means using springs, plugs, or strip sod. Zoysia sod is expensive, however, which prohibits full coverage sodding operations in most cases. Strip sodding has gained popular acceptance for Zoysia establishment because less sod is required to establish a given area. Fill of Zoysia is often slow requiring up to three years for complete coverage, depending on the amount of sod used and its spacing, as well as cultural care after the sodding operation.

MATERIALS AND METHODS

A modified sod cutter was used to remove 3-inch wide trenches on 15-inch center of mature 'Park' Kentucky bluegrass on June 19, 1986 at the Rocky Ford Turfgrass Research Plots. Mature Zoysia was cut into 3-inch wide strips and transplanted into these trenches. On July 2, 2 x 2 meter plots were treated with various chemical treatments to retard the growth of the Kentucky bluegrass in hope to favor Zoysia competition and subsequent fill. These chemical treatments are listed below.

1. Control, no chemical treatment
2. Embark 2S at 1.5 pints per acre (label rate)
3. Embark 2S at 0.75 pints per acre (half label rate)
4. EMbark 2S at 0.38 pints per acre (quarter label rate0
5. Cutless 50 WP at 3 lbs per acre (label rate)
6. Cutless 50 WP at 1.5 lbs per acre (half label rate)
7. Cutless 50 WP at 0.75 lbs per acre (quarter label rate)
8. Limit F at 2.5 quarts per acre (label rate)
9. Limit F at 1.75 quarts per acre (half label rate)
10. Limit F at 0.63 quarts per acre (quarter label rate)
11. Atrazine 80 WP at 1.25 lbs per acre
12. Atrazine 80 WP at 0.63 lbs per acre
13. Atrazine 80 WP at 0.32 lbs per acre
14. Simazine (Princep) 80 WP at 1.25 lbs per acre
15. Simazine (Princep) 80 WP at 0.63 lbs per acre
16. Simazine (Princep) 80 WP at 0.32 lbs per acre

RESULTS:

Results shown for February and June evaluations are shown in Figures 1-4. The only enhancement of fill rate was done by atrazine and simazine at the 1.25 lb per acre rate. Since this completely destroyed the Kentucky bluegrass, it is not recommended for gradual species transition. All other treatments did not prove to enhance spread of Zoysia into established Kentucky bluegrass.

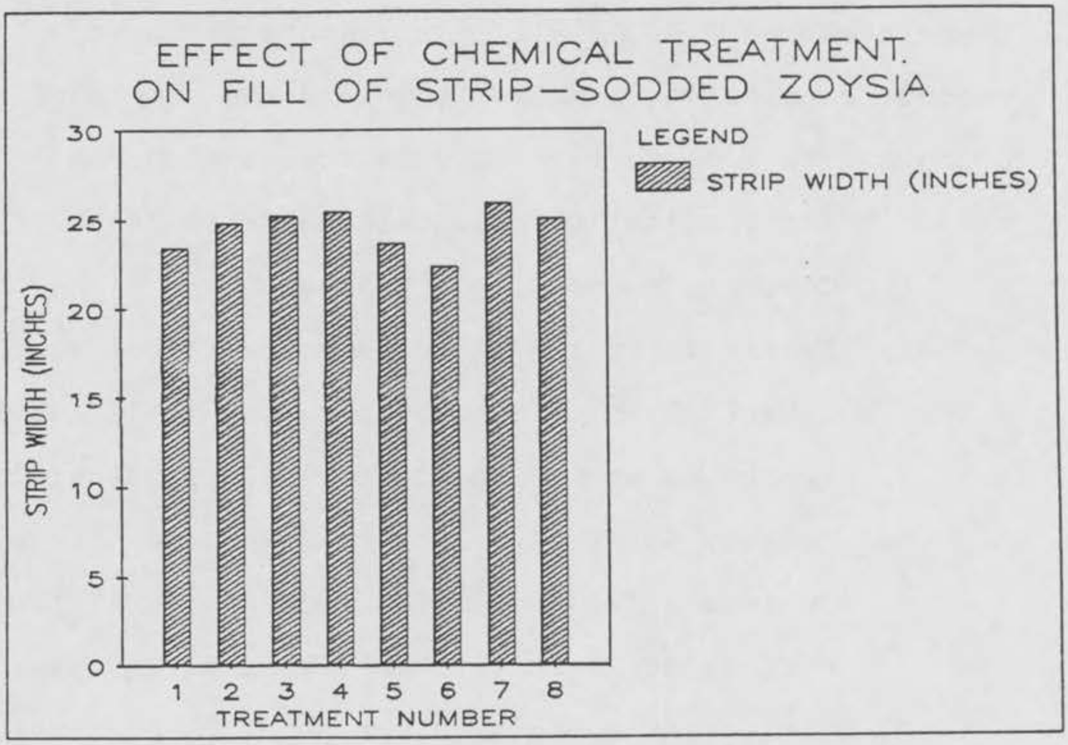


Figure 3 Evaluated on June 16, 1988

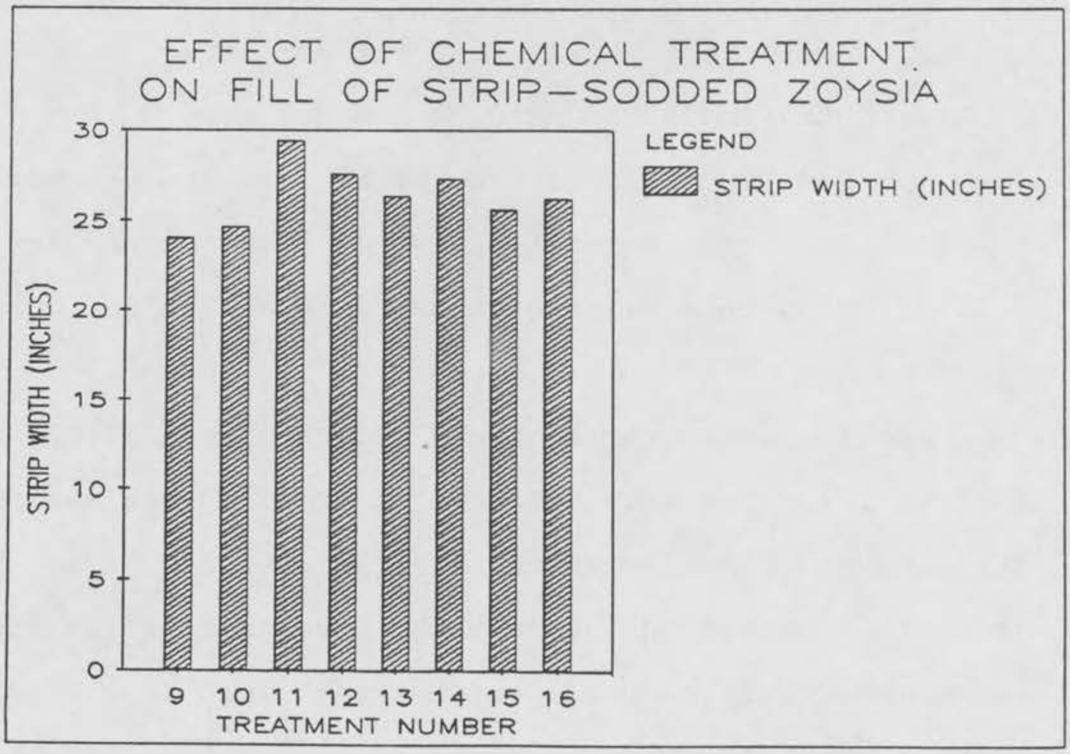


Figure 4. Evaluated on June 16, 1988

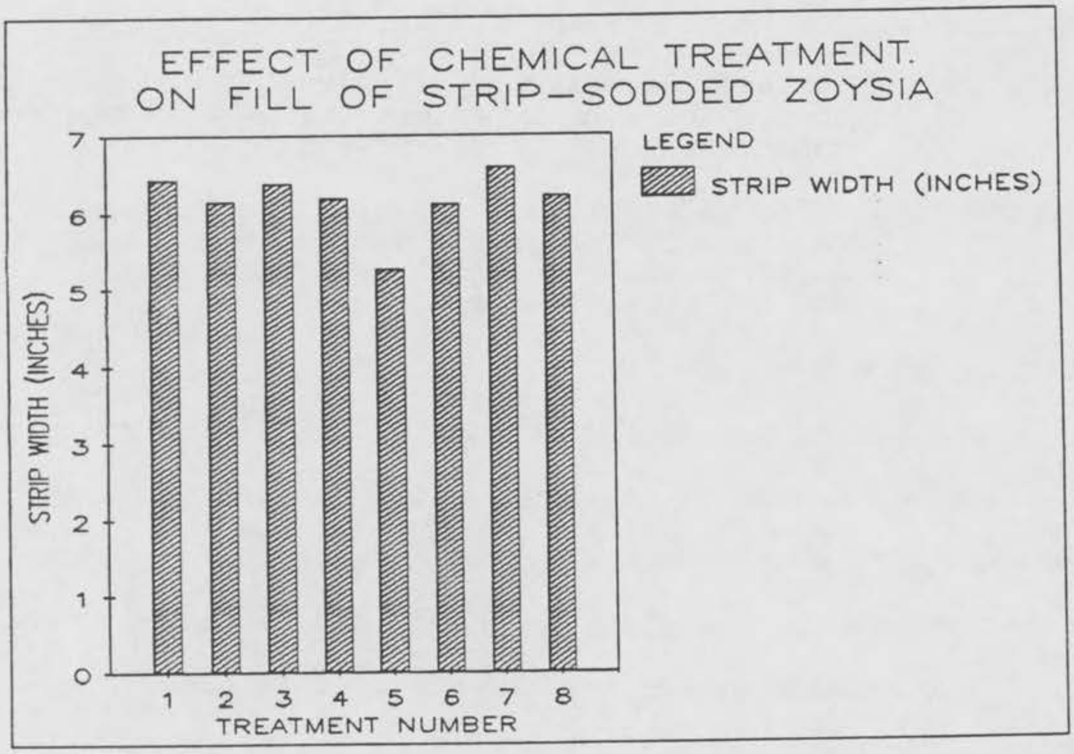


Figure 1. Evaluated on Feb 2, 1988

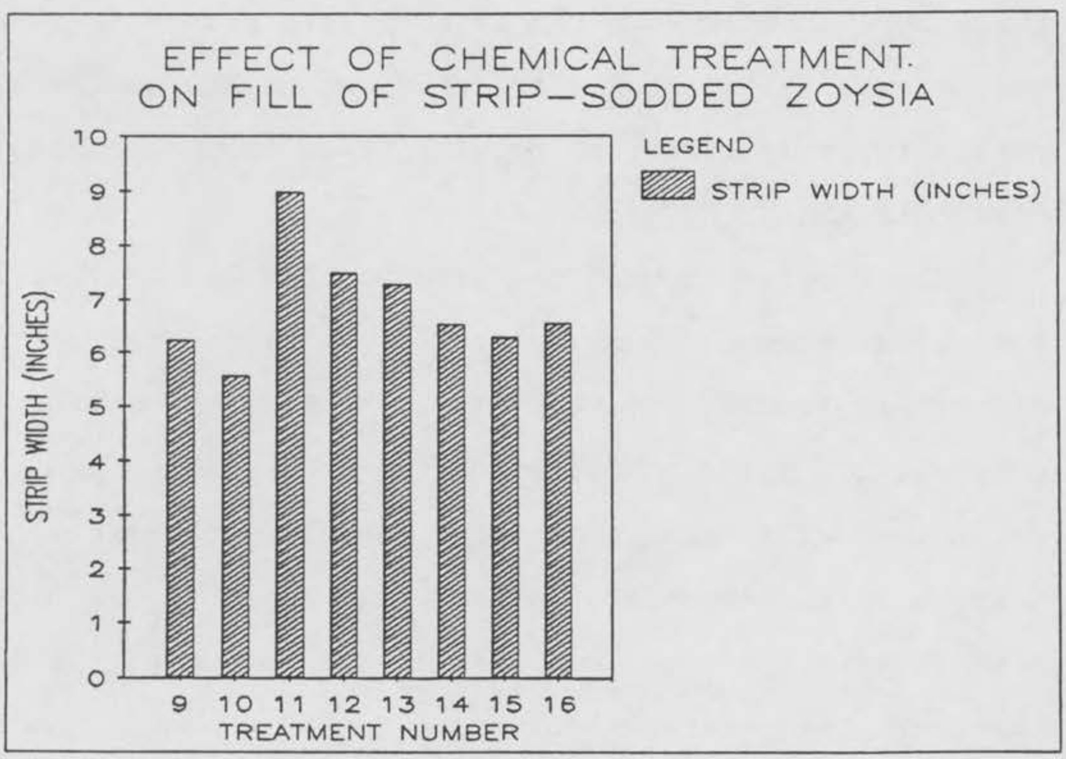


Figure 2. Evaluated on Feb 2, 1988

TITLE: Zoysia Winter Cover Study

OBJECTIVE: To test the efficacy of polyester and polyethylene covers for winter protection and spring green-up enhancement of 'Meyer' Zoysia.

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician
Kala Mahadeva, Turfgrass PhD candidate
Wes Ory, Turfgrass Student

INTRODUCTION:

The use of Zoysia for use in the transition zone is increasing because of its lower water use and fertility requirements compared to many cool season turf species, and it forms a dense high quality turf when closely mowed. Because Zoysia is a warm season turf species, it is slow to green-up in the spring and is often subject to extensive winterkill, especially if it is established on poorly drained sites. This experiment was initiated to test whether polyethylene or polyester winter covers can be effectively used to safely enhance spring green-up of Zoysia and thus extend the active growing period for this otherwise popular transition zone species.

MATERIALS AND METHODS:

The experiment utilized a Completely Randomized Block Design with 9 treatments, each replicated 4 times. Treatments included either spun-woven polyester (Trevira, Atlanta, GA) or 4-mil polyethylene sheeting placed on the 1 by 2 meter plots in the first week of December, January, February, or March. Type T thermocouples were placed at crown level in Zoysia plots covered with Trevira, polyethylene, and in the uncovered plots. Continuous temperature monitoring (every 2 hours) was done using a OM-271A data logger. Spring green-up and quality ratings were recorded for all treatments at the time of cover removal (April 1) and for several weeks following cover removal.

RESULTS:

Soil surface temperatures under polyethylene and polyester (Trevira) covers compared to uncovered plots are shown in Table 1. Polyethylene covered plots almost always exhibited the maximum temperatures by several degrees due to its greater "greenhouse effect" (Figure 4). However, polyethylene did not hold that heat well during the evening hours. Trevira covered plots exhibited higher mimimum temperatures than polyethylene covered plots. In fact, polyethylene covered plots exhibited lower minimum temperatures that uncovered plots (Table 1).

Putting covers on Zoysia much before 1 month prior to cover removal did not give any further enhancement of spring green up (Figure 1). At the time of cover removal (1st week of April), polyethylene covered plots looked exceptional. They were lush, green and growing rapidly. Trevira covered Zoysia was not nearly so developed, but much more than uncovered plots.

Eight days after cover removal, evaluations were performed again. Polyethylene covered plots were completely devasted by the cold weather following cover removal (Figure 2). Trevira covered plots were not set back nearly so much (Figure 2).

The severe set-back of polyethylene covered plots was still evident some 7 weeks following cover removal (Figure 3). After these 7 weeks, plots which received no cover at all were superior to those receiving either the polyethylene or Trevira covers (Figure 3).

Soil Surface Temperatures Under Polyethylene or Polyester Covers

	Uncovered		Polyethylene		Trevira	
Date	Max	Min	Max	Min	Max	Min
JANUARY						
1	26.7	17.9	50.1	17.4	36.4	20.7
2	28.4	17.3	53.5	13.4	31.2	19.8
3	26.3	17.6	57.0	15.3	37.3	20.6
4	23.9	16.6	51.7	12.4	27.1	19.8
5	23.9	17.4	43.4	12.9	27.9	18.8
6	20.4	15.3	24.6	13.7	22.1	19.1
7	22.9	19.8	22.8	16.6	23.0	20.1
8	29.4	18.0	23.5	15.7	22.9	19.7
9	22.4	17.9	23.6	16.6	22.9	19.5
10	22.4	17.1	29.1	14.1	23.1	19.0
11	23.1	21.1	25.6	20.4	23.6	22.0
12	22.1	18.4	23.1	17.4	22.8	20.1
13	24.3	16.1	29.0	13.4	28.2	18.6
14	25.3	18.8	37.9	16.2	30.2	18.5
15	29.0	18.7	51.9	16.6	35.7	19.0
16	29.5	23.1	50.1	24.3	33.0	23.6
17	33.7	21.3	49.1	20.4	41.9	21.5
18	29.8	21.5	53.3	20.8	39.3	21.4
19	26.3	23.0	46.2	26.0	38.2	27.7
20	23.1	21.5	33.6	19.5	33.2	21.2
21	24.4	20.8	42.9	16.0	23.9	18.8
22	24.7	20.9	38.8	16.0	27.6	19.9
23	28.6	20.3	42.2	15.9	32.8	20.0
24	25.3	18.1	43.1	16.6	23.9	15.8
25	44.1	16.2	28.7	18.2	26.8	17.8
26	50.6	16.8	55.6	16.8	31.5	20.9
27	33.1	17.8	67.8	15.5	39.8	20.6
28	34.8	20.1	67.1	18.5	45.4	20.9
29	36.5	22.3	60.8	26.7	45.0	25.7
30	39.6	24.1	62.9	27.9	45.7	27.9
31	23.9	22.8	56.4	24.3	40.7	25.5
FEBRUARY						
1	30.9	19.6	59.1	15.1	41.8	21.0
2	23.4	22.6	26.2	20.2	25.3	21.2
3	23.6	21.7	26.2	20.3	24.7	20.9
4	23.4	19.8	25.1	18.1	23.6	18.7
5	23.3	19.3	24.4	14.3	23.3	20.2
6	23.3	21.7	24.9	19.1	23.2	22.1
7	26.0	21.8	30.2	19.6	25.3	22.4
8	30.9	21.9	66.6	20.5	36.1	21.1
9	22.4	19.3	41.1	15.7	22.9	18.3
10	23.3	18.8	56.1	13.8	30.7	19.6
11	29.0	20.1	67.5	17.6	37.7	19.5
12	30.3	21.2	80.8	17.6	44.6	20.8

Soil Surface Temperatures Under Polyethylene or Polyester Covers (cont)

	Uncovered		Polyethylene		Trevira	
Date	Max	Min	Max	Min	Max	Min
FEBRUARY						
13	23.4	21.8	31.5	19.0	26.5	20.8
14	29.0	21.3	75.8	16.0	38.9	21.4
15	34.7	23.3	77.4	23.3	46.2	25.1
16	37.1	31.3	88.1	19.7	50.0	21.4
17	32.4	21.2	80.8	17.1	45.0	21.6
18	38.2	22.5	87.3	23.1	48.3	24.1
19	34.9	22.4	70.6	22.3	42.8	24.2
20	46.1	24.9	96.6	29.3	55.2	28.1
21	41.3	24.2	95.4	23.6	50.4	27.5
22	37.3	20.7	67.3	24.2	44.3	23.0
23	38.9	20.9	94.5	18.0	48.7	23.1
24	45.9	20.2	101.4	17.6	53.9	21.3
25	53.1	21.3	105.3	20.5	60.8	22.4
26	55.3	24.1	108.1	24.7	61.3	26.4
27	53.7	22.5	104.9	23.7	58.7	25.4
28	52.1	22.7	108.9	28.3	53.6	25.4
29	56.2	21.1	105.4	21.8	61.2	21.6
MARCH						
1	54.8	23.0	80.3	23.1	58.9	24.0
2	37.4	26.4	64.1	30.0	42.4	29.1
3	41.8	19.5	82.6	20.2	49.7	24.0
4	50.6	18.4	100.0	15.6	56.4	21.7
5	41.1	22.4	65.5	25.5	44.3	26.0
6	57.5	27.6	103.1	30.1	62.4	30.0
7	54.5	26.2	85.8	27.8	57.4	29.2
8	49.5	26.6	66.2	28.5	53.4	30.1
9	62.2	24.3	110.5	25.6	66.6	28.3
10	57.4	23.3	106.1	24.1	61.8	27.2
11	58.8	23.6	100.7	28.0	53.5	29.2
12	43.1	17.5	67.5	13.5	48.8	24.1
13	46.1	16.4	46.7	16.7	53.1	17.8
14	50.3	14.2	98.3	15.0	56.1	21.3
15	55.3	16.4	100.9	14.4	59.3	21.1
16	42.9	17.6	65.8	18.1	44.7	23.0
17	28.2	27.0	32.6	17.1	29.4	26.1
18	39.6	20.9	95.4	16.4	42.9	22.4
19	53.8	21.1	104.6	15.5	61.4	21.1
20	66.9	24.0	108.7	27.1	71.0	27.2
21	74.2	27.1	113.2	25.1	76.1	29.0
22	74.7	31.0	109.0	31.3	74.3	32.7
23	69.9	36.0	97.8	31.0	72.4	38.2
24	77.4	55.0	104.8	35.5	74.0	38.7
25	73.1	25.9	103.4	24.4	72.3	31.2
26	73.8	28.2	88.8	31.4	68.8	35.1
27	76.0	26.7	99.0	30.5	71.9	32.6
28	47.3	37.2	67.3	39.6	50.3	39.9
29	61.8	23.3	84.6	31.8	61.5	32.1

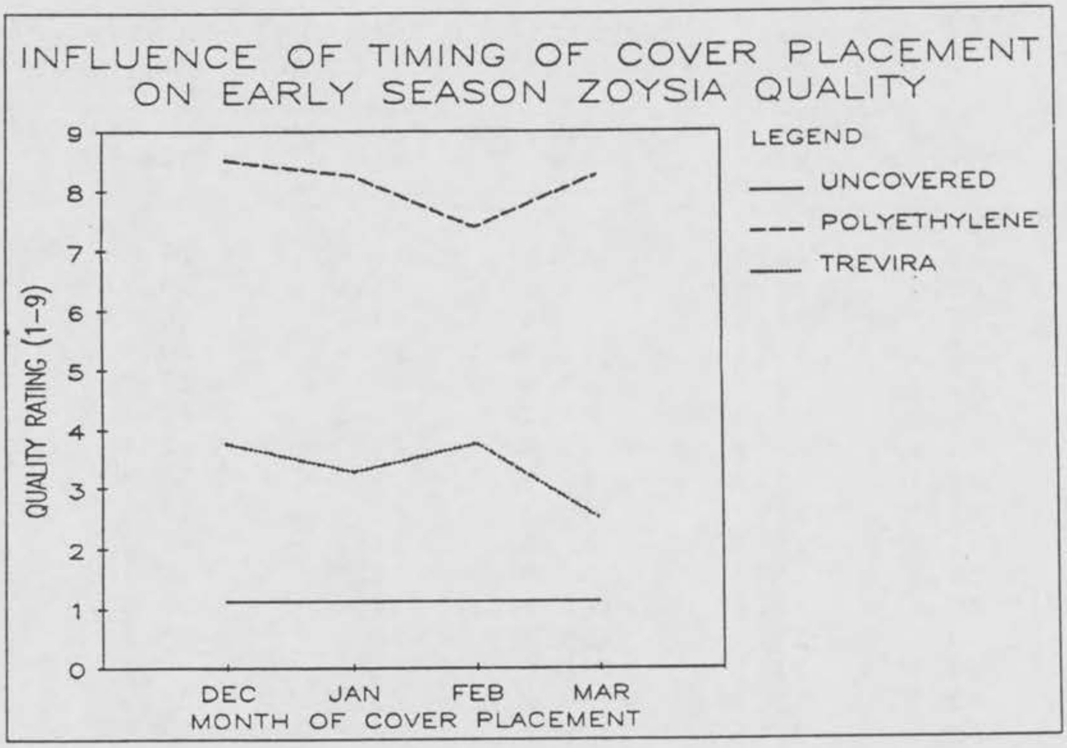


Figure 1. Taken at the time of cover removal.

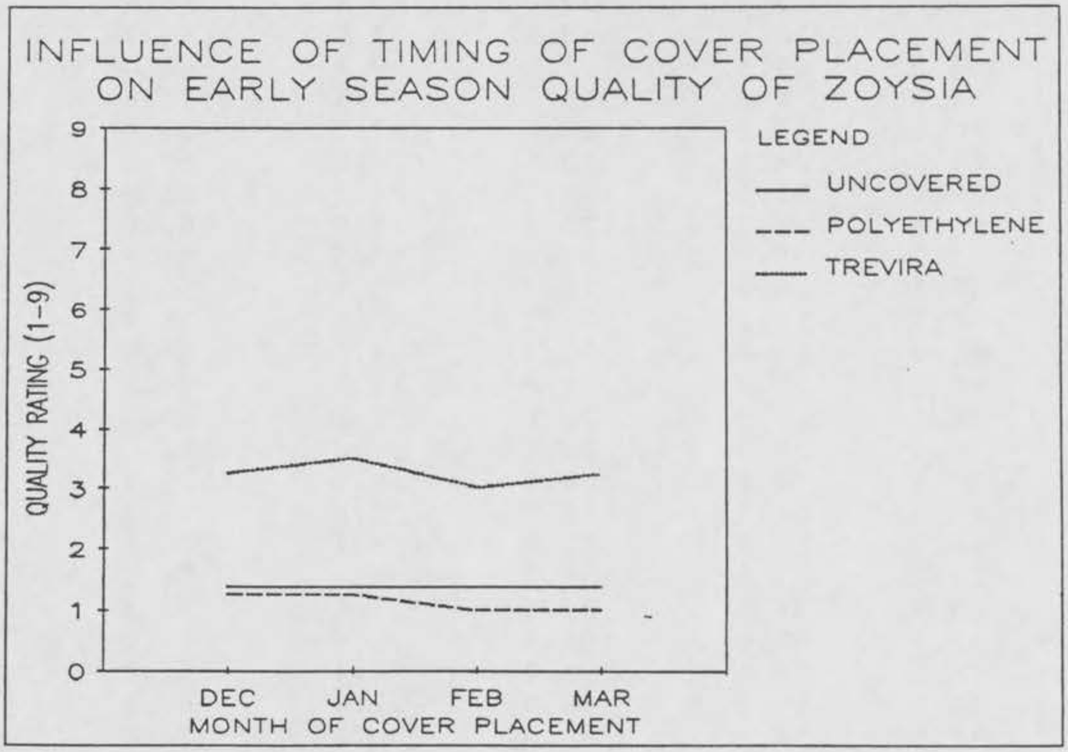


Figure 2. Taken 8 days after cover removal.

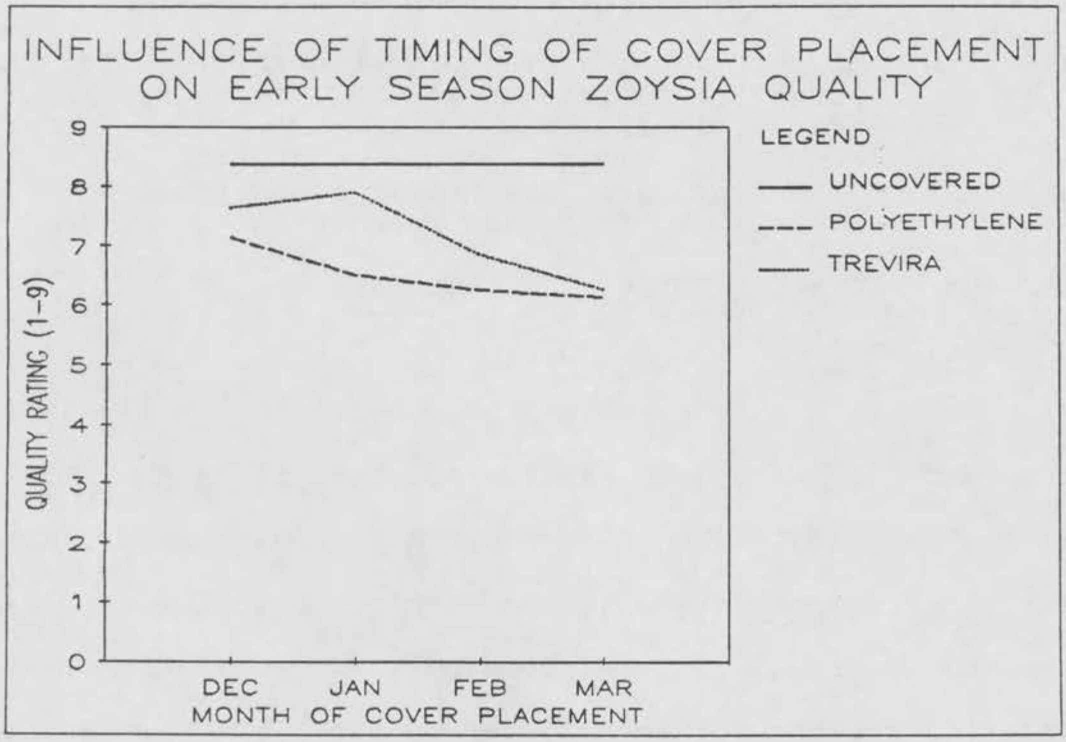


Figure 3. Taken 7 weeks after cover removal.

Figure 4.

TITLE: Effects of Various Preemergent Herbicides on the Establishment of Strip-Sodded Zoysia

OBJECTIVE: To test various preemergent herbicides for their potential inhibition of the lateral spread of Zoysia from strip sodding

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
Paul Haupt, Turfgrass Technician

FUNDING: Cranmer Nursery, Wichita, KS

INTRODUCTION:

Weed control is necessary when establishing Zoysia from a strip sodding operation. It is important to establish what chemical control is least harmful to Zoysia, however, since the lateral spread of Zoysia is slow taking up to three years for complete coverage. Several chemicals are available to the turfgrass manager for annual weed control, but they exhibit a range of growth inhibition to non-target species. This experiment was designed to determine which preemergent chemicals are least inhibitory to the lateral spread of Zoysia.

MATERIALS AND METHODS

Mature 'Meyer' Zoysia was obtained from Cranmer Nursery (Wichita) and cut into 3-inch wide strips. These strips were transplanted into bare soil on 12-inch centers. Sixteen treatments were applied 1 week after transplanting, including half label and full label rates of Dacthal, Ronstar, bensulide, Balan, pendamethalin, Tupersan, simazine, and two non-treated controls. The experiment utilizes a Randomized Complete Block Design with 16 treatments each replicated 3 times. It is located in Section III of the Rocky Ford Turfgrass Research Plots. Rate of fill will be recorded during the 1986 and 1987 growing seasons.

Table 1. Preemergent Weed Control Ratings for Strip Sodded Zoysia

Treatment	Rate kg a.i./ha	Rate lb a.i./A	Weed control
Simazine	1.12	1.0	9.0 a
Simazine	2.24	2.0	9.0 a
Ronstar (2G)	3.36	3.0	8.67 a
Ronstar	1.68	1.5	8.0 ab
Tupersan	13.44	12.0	7.67 ab
Pendimethalin	1.68	1.5	7.0 abc
Tupersan	6.72	6.0	7.0 abc
Pendimethalin	0.84	0.75	6.67 abc
Dacthal	11.76	10.5	6.67 abc
Dacthal	5.88	5.25	6.33 abc
Bensulide	11.2	10.0	5.33 bcd
Balan 2.56	2.24	2.0	5.0 bcd
Bensulide	5.6	5.0	4.0 cd
Balan 2.56	1.12	1.0	3.70 d
Control	--	--	2.67 d

Table 2. Preemergent Herbicide Effects on Strip Sodded Lateral Zoysia Growth

Treatment	Rate kg a.i./ha	Rate lbs a.i./A	Row width (cm)
Tupersan	6.72	6.0	157.67 a
Ronstar (2G)	3.36	3.0	156.00 ab
Simazine	1.12	1.0	155.33 ab
Pendimethalin	0.84	0.75	150.00 abc
Pendimethalin	1.68	1.5	148.33 abc
Dacthal	11.76	10.5	139.00 abcd
Tupersan	13.44	12.0	135.33 abcd
Dacthal	5.88	5.25	134.67 abcd
Simazine	2.24	2.0	127.00 abcd
Bensulide	5.60	5.0	125.33 cd
Ronstar	1.68	1.5	125.00 cd
Balan 2.56	2.24	2.0	120.33 cd
Balan 2.56	1.12	1.0	120.33 cd
Bensulide	11.20	10.0	116.00 d
Control			114.00 d

TITLE: Evaluation for Selective Control of Bermudagrass in Tall Fescue

OBJECTIVE: To determine the potential for utilizing Poast or Fusilade 2000 to selectively removed Bermudagrass from tall fescue. The focus of this initial study was to determine differences in rate responses between the two species.

PERSONNEL: Jeff Nus, Turfgrass Research and Teaching
David Hensley, Landscape Horticulture
Paul Haupt, Turfgrass Technician

INTRODUCTION:

Bermudagrass is a serious perennial weed in cool season turf throughout the transition zone. Several new chemicals selective for grasses have recently entered the turf and ornamental markets. At least one of these is labeled for selective removal of crabgrass from cool season turf. Some variation in species response has been noted with Poast and Fusilade 2000. With adequate research and background these compounds may have the potential to selectively remove perennial grassy weeds from established turf.

MATERIALS AND METHODS:

Poast (Sethoxydim) and Fusilade 2000 (Fluazifop-butyl) were applied a 1x, 0.5x and 0.25 label rates (Poast: 1.5, 0.75 and 0.375 pints/A and Fusilade 2000: 24, 12 and 6 oz./A) over 'Midiron' Bermudagrass and 'K-31' Tall Fescue. The test plants were established in 4 inch pots and mature at time of application. Herbicide applications were made on December 21 over the top of the plants with a CO_2 backpack sprayer. The blades of the grasses were clipped at 2 1/2 inches for the Tall Fescue and 1 1/2 inches for the Bermudagrass on January 2, 15, 26, and February 9, and dry weights determined. A subjective plant quality rating was made on a 1 to 9 scale on January 15, 26 and February 9. All data were compared to untreated controls.

RESULTS:

The results for the Poast application are presented in Table 1 (Bermudagrass) and 2 (Tall Fescue) and for Fusilade 2000 in Tables 3 (Bermudagrass') and 4 (Tall Fescue).

Poast retarded the top growth of both species and affected the clipping yield and quality of Tall Fescue more severely than Bermudagrass. There was a definite rate response with both species. Bermuda grass appeared to recover from lower rates of the material as exhibited by the increasing clipping weights and quality ratings in the later evaluations. Tall Fescue was unable to make as dramatic of a recovery as the Bermudagrass.

Fusilade 2000 reduced clipping weights of both species at all rates but Bermudagrass was affected to a much greater extent than Tall Fescue. Quality of the turf was also reduced but moreso with Bermudagrass than Tall Fescue. Normal growth and quality of Tall Fescue treated with the lower rates of the herbicide had returned by later evaluations. No growth was evident with Bermudagrass and the plants significantly poorer in quality than controls.

These results indicate the possibility for selectively removing Bermudagrass from Tall Fescue with Poast is remote. The Tall Fescue appeared more sensitive to the chemical than Bermudagrass. Selective removal with Fusilade 2000, however, may be a possibility. Further research on rates, timing and split applications must be conducted before this can be considered commercially.

Table 1. Effect of Poast on clipping dry weights (mg) and plant quality for 'Midiron' Bermudagrass.

Treatment	Clip 1	Clip 2	Clip 3	Clip 4	Qual 1	Qual 2	Qual 3
CONTROL	110.2 a[z]	68.0 a	216.6 a	819.0 a	7.9 a	9.5 a	8.9 a
CROP OIL	54.0 b	44.6 b	186.0 a	474.4 b	6.9 b	8.8 a	8.5 a
POAST 1X	0.0 c	0.0 c	0.0 b	0.0 d	5.8 c	5.2 b	4.6 b
POAST 0.5X	0.0 c	0.0 c	0.0 b	77.2 cd	5.8 c	5.9 c	5.3 b
POAST 0.25X	0.0 c	0.0 c	27.0 b	173.4 c	5.6 b	6.3 b	8.0 a

[z]Mean separations using Newman-Kuels (5%). Means within columns followed by the same letter are not significantly different.

Table 2. Effect of Poast on clipping dry weights (mg) and plant quality of 'K-31' Tall Fescue.

Treatment	Clip 1	Clip 2	Clip 3	Clip 4	Qual 1	Qual 2	Qual 3
CONTROL	78.4 a[z]	56.3 a	117.7 a	280.0 a	8.0 a	8.8 a	8.7 a
CROP OIL	71.8 a	50.0 a	85.6 a	166.2 b	7.1 b	7.8 a	7.5 a
POAST 1X	8.2 b	0.0 b	0.0 b	0.0 c	1.2 d	1.0 c	1.1 b
POAST 0.5X	19.2 b	0.0 b	0.0 b	0.0 c	1.6 c	1.5 bc	1.0 b
POAST 0.25X	17.4 b	0.0 b	1.2 b	26.6 c	2.8 c	2.9 b	2.4 b

[z]Mean separations using Newman-Kuels (5%). Means within columns followed by the same letter are not significantly different.

Table 3. Effect of Fusilade 2000 on clipping dry weights (mg) and plant quality of 'Midiron' Bermudagrass.

Treatment	Clip 1	Clip 2	Clip 3	Clip 4	Qual 1	Qual 2	Qual 3
CONTROL	110.2 a[z]	68.0 a	216.6 a	819.0 a	7.9 a	9.5 a	8.9 a
CROP OIL	54.2 b	44.6 b	186.0 a	474.4 b	6.9 b	8.8 a	8.5 a
FUSILADE 1X	0.0 c	0.0 c	0.0 b	0.0 c	4.2 d	3.7 b	3.1 b
FUSILADE 0.5X	0.0 c	0.0 c	0.0 b	0.0 c	5.2 c	4.5 b	4.2 b
FUSILADE 0.25X	0.0 c	0.0 c	0.0 b	0.0 c	5.2 c	4.9 b	5.0 b

[z] Mean separations using Newman-Kuels (5%). Means within columns followed by the same letter are not significantly different.

Table 4. Effect of Fusilade 2000 on clipping dry weights (mg) and plant quality for 'K-31" Tall Fescue.

Treatment	Clip 1	Clip 2	Clip 3	Clip 4	Qual 1	Qual 2	Qual 3
CONTROL	78.3 a[z]	56.3 a	117.7 a	280.0 a	8.0 a	8.8 a	8.7 a
CROP OIL	71.8 a	50.0 a	85.6 a	166.2 ab	7.1 b	7.8 a	7.5 ab
FUSILADE 1X	25.0 a	0.0 b	0.0 c	12.8 c	2.3 e	2.3 c	1.5 c
FUSILADE 0.5X	30.0 a	4.8 b	29.0 bc	102.4 bc	3.0 d	4.8 b	5.7 b
FUSILADE 0.25X	43.8 a	8.6 b	84.6 ab	248.2 a	6.1 c	7.3 a	7.2 ab

[z] Mean separations using Newman-Kuels (5%). Means within columns followed by the same letter are not significantly different.

TITLE: Lilly's Preemergence Herbicide Study

OBJECTIVE: To determine herbicide efficacy and turf tolerance when Gallery is applied alone and in combination with Team and Pre-M for broad spectrum weed control in turf

PERSONNEL: Ron Campbell, Turfgrass Research

FUNDING: Lilly Research Laboratories

INTRODUCTION:

A weedy species has growth characteristics that permit it to invade a turf area rapidly when even the smallest of openings occur. Turfgrass stands thinned by environmental stress, pest attacks or human traffic are the most likely to be invaded by weeds. Weeds may be disseminated by seed, vegetatively, or both, depending on the particular species involved. Many weeds have a strong dormancy factor which permits them to persist in the soil for an extended period until conditions are favorable for germination and emergence. Most weed species are prolific seed producers, especially the annuals. For example, a single prostrate spurge plant may produce several diseased seeds.

Maximum effectiveness of herbicides in weed control is achieved when the seed is most susceptible to kill. In relation to weed control, the term "preemergent" refers to control prior to emergence or evidence of weed growth above the soil surface. The application of an herbicide before weed plant emergence is the most important consideration. Control is obtained as the weed seed germinates and begins to develop its primary root system or as emergence of the first leaf occurs. Control is obtained either through root uptake or through absorption by the first leaf or shoot.

Generally, when preemergent weed control in turf is discussed it is in reference to the selective control of annual grasses in perennial grass. However, some current herbicide selectively prevent growth of annual broadleaf weeds in perennial grasses also. Some examples of broadleaf weeds that may be selectively controlled include: spotted and prostate spurge, redroot pigweed, lambsquarter, and henbit.

The herbicide Gallery EL-107 has shown promise in providing season long control of a number of annual broadleaf weeds commonly found in turf. In 1987 the chemical provided excellent results when tested against 12 broadleaf species in a controlled study.

This experiment was initiated to study the herbicide efficacy and turf tolerance of Gallery when applied alone and in combination with Team (Benefin G + Trifluralin G) and Pre-M (pendimethalin) for broad-spectrum weed control in turf.

MATERIALS AND METHODS:

A field type compressed air plot sprayer equipped with 4 ft. boom was used to treat bluegrass and tall fescue polystand. Single applications of Gallery and tank mixes with Pre-M and Team were made. Gallery rates used were 0.75 and 1.0 lb./acre; Pre-M was applied at 3.0 and Team 3.0 lb./acre. Team was applied with a fertilizer application in split applications, 1.5 lb. on May 4 and 1.5 lb. 10 weeks later. Effort was made to make applications prior to weed germination. The plots were oversprayed with trimec to control existing broadleaf species prior to applying Gallery.

The experimental area was cored and overseeded May 4, prior to herbicide applications with the following broadleaf species: broadleaf plantain Plantago major, purslane Partulaca oleracea, carpetweed Mallugo verticillato, wild carrot Daucus carota, common ragweed Ambrosia artemisiifolia, pigweed Amaranthus Retroflexus, lambsquarter Chenopodium album and shepherd's purse Capsellabursa pastoris.

Species growing on the site include dandelion, clover, black medic, horseweed, pigweed, knotweed, lambsquarter, and common crabgrass.

RESULTS:

Results of the herbicide application are presented in Table 1. Very good control of broadleaf weeds was obtained from all Gallery treatments. Also the Gallery treatments plus the preemergence herbicide Team and Pre-M provide good control of grassy weeds. These plots will be evaluated later in the year to determine season-long control. There was no injury observed from any of the herbicide treatments. The perennials, dandelion and black medic, persisted in some of the plots in spite of the pre-treatment spray with dicamba.

Based on these results it appears that combination treatments of Gallery with Team and/or Pre-M will provide acceptable control of annual broadleaf and grassy weeds.

Table 1. Herbicide efficacy of Gallery applied alone and in combination with Team and Pre-M in control of annual broadleaf and grassy weeds

Herbicide	Rate	Control - 7/11/88	
		Broadleaf	Grasses
	(lbs/acre)	------------- %	---------------
Gallery	0.75	96 a	91 a
Gallery	1.0	98 a	52 b
Gallery +	0.75 3.0	98 a	97 a
Gallery + Pre-M	0.75 3.0	96 a	92 a
Control	--	0 b (36)**	0 b (10.5)**

*Means followed by the same letter are not significantly at the 0.05 level according to Duncan's Multiple Range.

**Value in parenthesis indicate percent weed cover.

TITLE: National Prairie Wildflower Test

OBJECTIVE: To evaluate 50 annual and 50 perennial wildflower species for the performance under east/central Kansas conditions and supply that information for national compilation.

PERSONNEL: Ann Nus, Turfgrass Technician
Jeff Nus, Turfgrass Research and Teaching

INTRODUCTION:

According to Crystal Rose-Fricker of Pure Seed Testing, Inc. of Hubbard, Oregon, wildflowers are gaining popularity across the United States for uses in parks, along roadsides, and in background areas of golf courses. Unfortunately, much information concerning species survival, performance, and maintenance is lacking. Since the federal government has initiated a program where roadside budgets must include wildflowers to help reduce mowing requirements and costs, it is necessary to establish basic survival, maintenance, and performance data annual and perennial wildflower species that may be used in such settings.

MATERIALS AND METHODS:

Seeds of 50 annual and 50 perennial wildflower species were supplied to the Kansas State turfgrass program by Pure Seed Testing, Inc. of Hubbard, Oregon. Table 1 lists these species by common and scientific names. Both annuals and perennials were planted in late April. Data on emergence, blooming period, and most serious weed pests are being recorded.

RESULTS:

Wildflower performance ratings is listed in Table 2. Annuals which show promise for Kansas conditions include African Daisy, Mountain Garland, Mountain Phlox, Scarlet Flax, Spurred Snapdragon, California Poppy, Blue Bells, and Birds Eyes. Perennials with Kansan potential include Creeping Zinnia, Forget-Me-Nots, Roman Chamomile, Tall Evening Primrose, and White Yarrow.

Date of emergence, date of bloom start and end, along with brief comments are listed in Table 3.

Table 1. List of Annual and Perennial Species Used in the Wildflower Trial.

Common Nam	Scientific Name
ANNUALS	
1. African Daisy	Dimorphotheca aurantiaca
2. Baby's Breath	Gypsophila elegans
3. Catchfly	Silene armeria
4. Corn Poppy	Papaver rhoeas
5. Dwarf Cornflower	Centaurea cyanus dwf.
6. Globe Gilia	Gilia capitata
7. Mountain Garland	Clarkia unguiculata
8. Mountain Phlox	Linanthus grandiflorus
9. Pimpernel	Anagallis arvensis
10. Rocket Larkspur	Delphinium ajacis
11. Scarlet Flax	Linum grandiflorum rubrum
12. Spurred Snapdragon	Linaria maroccana
13. Sweet Alyssum	Lobularia maritima
14. Tall Plains Coreopsis	Coreopsis tinctoria
15. Lemon Mint	Monarda citriodora
16. Cosmos	Cosmos bipinnatus
17. Starflower	Scabiosa stellta
18. California Poppy	Eschscholzia californica
19. Baby Blue Eyes	Nemophila menziessi
20. Garland Chrysanthemum	Chrysanthemum coronarium
21. Blue Bells	Phacelia campanularia
22. Tidy Tips	Layia platglossa
23. Annual Indian Blanket	Gallardia pulchella
24. Birds Eyes	Gilia tricolor
25. Tall Godetia	Clarkia amoena
PERENNIALS	
26. Black-Eyed Susan	Rudbeckia hirta
27. Blue Flax	Linum perenne lewisii
28. Dwarf Columbine	Aquilegia vulgaris
29. Johnny Jump-Up	Viola cornuta
30. Dwarf Lance-Lvd. Coreopsis	Coreopsis lanceolata dwf.
31. Maiden Pinks	Dianthus deltoides
32. Missouri Primrose	Oenothera missouriensis
33. Prairie Coneflower	Ratibida columnifera
34. Purple Coneflower	Echinacea purpurea
35. Siberian Wallflwoer	Cheiranthus allionii
36. Sweet William	Dianthus barbatus
37. Soapwort	Saponaria ocymoides
38. Snow in Summer	Cerastium biebersteinii
39. White Yarrow	Achillea millefolium
40. Dames Rocket	Hesperis matronalis
41. Forget-me-not	Myosotis sylvatica
42. Creeping Zinia	Sanvitalia procumbens
43. Tall Evening Primrose	Oenothera lamarkiana
44. Small Burnet	Sanguisorba minor
45. Red Yarrow	Achillea millefolium rubra
46. Gilia	Ipomopsis Rubra
47. Wilt Thyme	Thymus serphylum
48. English Wallflower	Cheiranthus cheiri

Table 2. 1988 Wildflower Trials
0-5 (none to excellent coverage & growth)

	June		July		
	Rep 1	Rep 2	Rep 1	Rep 2	Mean
ANNUALS					
African Daisy	4	3.5	4	5	4.1
Baby's Breath	3	1	2	2	2
Catchfly	2	1.5	2	2	1.9
Corn Poppy	2	3.5	1.5	2	2.25
Dwf. Cornflower	4	3.5	5	5	4.4
Globe Gilia	4	3	5	4	4
Mountain Carland	5	5	3	2	3.75
Mountain Phlox	3	2.5	4	4	3.4
Pimpernel	1.5	1.5	2.5	1.5	1.75
Rocket Larkspur	2	3.5	3	5	3.4
Scarlet Flax	4	5	4	5	4.5
Spurred Snapdragon	5	4.5	5	4	4.6
Sweet Alyssum	0.5	1	0.5	0.5	0.6
Tall Plains Coreopsis	3.5	4	5	4	4.1
Lemon Mint	2	2	5	3	3
Cosmos	5	5	5	5	5
Starflower	2	2.5	3	4	2.9
California Poppy	4	4	5	5	4.5
Baby Blue Eyes	2.5	2.5	0.5	1	1.6
Garland Chrysanthemum	5	5	5	5	5
Blue Bells	4	5	2	1.5	3.1
Tidy Tips	0.5	0.5	0	0	0.25
Annual Indian Blanket	0.5	0.5	1.5	1	0.9
Birds Eyses	3.5	3.5	5	4	4
Tall Godetia	1	2.5	3	3	2.4
PERENNIALS					
Black Eyed Susan	1	0	2	0	0.75
Blue Flax	2	1	2	1	1.5
Dwf. Columbine	2.5	3	5	1.5	1.9
Johnny Jump-Up	2	2.5	2	2	2.1
Dwf Lance-Lvd Coreopsis	0.5	2	2	1.5	1.5
Maiden Pinks	0.5	1	1	2	1.1
Missouri Primrose	1	1	2.5	0.5	1.25
Prairie Coneflower	0.5	0.5	1.5	0	0.6
Purple Coneflower	1.5	1	2.5	0	1.25
Siberian Wallflower	1	0	2.5	0	0.9
Sweet William	2.5	1.5	3	2	2.25
Soapwort	2	2.5	3	3	2.6
Snow In Summer	0.5	0	0.5	0	0.25
White Yarrow	2.5	2.5	3.5	2.5	2.25
Dames Rocket	1.5	1.5	3	2.5	2.1
Forget-Me-Not	2.5	2.5	4	3	3
Creeping Zinnia	1	1.5	3	3.5	2.25
Tall Evening Primrose	2.5	2.5	5	3.5	3.4
Small Burnet	1.5	2	2.5	2.5	2.1
Red Yarrow	1.5	0	2	0	0.9
Gilia	3.5	2	2	1	2.1
Wild Thyme	0	0	0	0	0
Rocky Mnt. Penstemon	1	1	0.5	1	0.9
English Wallflower	0	0	0	0	0
Roman Chamomile	3.5	3.5	3.5	4	3.6

Table 3. Date of Emergence and Blooming of ANnual and Perennial Wildflowers

	Emergence	Bloom Start	Bloom Stop	Comments
ANNUALS				
1. African Daisy	5/2	6/29		Compact, sturdy plant
2. Baby's Breath	5/2	6/10		
3. Catchfly	5/2	6/30		
4. Corn Poppy	5/2	6/23		Doesn't like heat
5. Dwf. Cornflower	5/2	6/20		Nice blue, vigorous
6. Globe Gilia	5/2	6/23		
7. Mountain Garland	4/27	6/13	6/30	Heavy blomer, short time, not heat tol.
8. Mountain Phlox	5/2	7/1		
9. Pimpernel	5/2	7/5		
10. Rocket Larkspur	4/27	6/25		Very pretty spikes of blue, pink, white
11. Scarlet Flax	5/2			
12. Spurred Snapdragon	5/2	6/2		Cute little flowers
13. Sweet Alyssum	4/27			
14. Tall Plains Coreopsis	5/2	6/23		Attractive flowers/ foliage
15. Lemon Mint	5/10			
16. Cosmos	4/27	6/15		Very vigorous, large
17. Starflower	5/4			
18. California Poppy	5/2	6/5		Vigorous, good bloomer
19. Baby Blue Eyes	5/2	6/20		Died in June heat
20. Garland Chrysanthemum	5/2	6/25		Strong plant
21. Blue Bells	5/2	6/2		Good early bloomer
22. Tidy Tips	4/27			
23. Annual Indian Blanket	5/10			
24. Birds Eyes	4/27	6/13		
25. Tall Godetia	5/2			
PERENNIALS				
26. Black-Eyed Susan	5/17			
27. Blue Flax	5/10			
28. Dwf. Columbine	5/15			
29. Johnny Jump-Up	5/10	6/20		
30. Dwf. Lance Lvd Coreop.	5/10			
31. Maiden Pinks	5/2			
32. Missouri Primrose	5/10			
33. Prairie Coneflower	5/10			
34. Purple Coneflower	5/10			
35. Siberian Wallflower	5/4			
36. Sweet William	5/10			
37. Soapwort	5/15			
38. Snow In Summer	5/17			
39. White Yarrow	5/4			
40. Dames Rocket	5/10			
41. Forget-me-not	5/4			
42. Creeping Zinia	5/2	6/15		
43. Tall Evening Primrose	5/4	7/1		
44. Small Burnet	5/4			
45. Red Yarrow	5/4			
46. Gilia	5/10			
47. Wild Thyme	-			
48. Rocky Mt. Penstemon	5/10			
49. English Wallflower	-			
50. Roman Chamomile	5/4	7/1		

TITLE: Evaluation of Weed Barrier Materials in Plant Establishment and Growth

OBJECTIVE: To determine the influence of weed barrier materials on weed control and establishment and growth of ornamentals.

PERSONNEL: David Hensley, Department of Horticulture, Landscape Management

INTRODUCTION:

Weeds in new ornamental plantings are typically controlled mechanically with various mulch materials, or with herbicides. Black plastic has been utilized under mulch as a physical barrier to weed growth. Plant problems associated with reduced water penetration and soil oxygen levels have curtailed its general usage.

Several woven and spun polyethylene products have been introduced as weed mats or barriers during the past few years. These are porous to water and air and impervious to most weeds. The purpose of this study was to examine the influence of two fabric weed barriers on plant growth and to compare them to mulch alone, mulch with herbicide, and mulch with black plastic.

MATERIAL AND METHODS:

An area at the Rocky Ford Turf Research Area was plowed, disked, and tilled thoroughly. The area contained numerous annual and perennial weeds the previous year. Two pounds N per 1,000 sq. ft. was worked into the area before planting. Bare-root Bloodtwig Dogwood (Cornus sanguinea), 1-gallon, container-grown Andorra Juniper (Juniperus horizontalis 'Plumosa') and Manhattan Euonymus (Euonymus kiautschovicus 'Manhattan') were planted April 29. Plots were 5' x 5' and covered with Warren's

Weed Arrest, Dewitt Weed Barrier, or black plastic (1.5 mil) before planting.

All areas were mulched with 3" of sawdust material from the K-State bull barns on May 16. Controls consisted of mulch only and mulch with Ronstar applied after mulching.

RESULTS:

The Warren's fabric was the most difficult to cut and work with. To date there have been no obvious differences in growth or weed control.

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Agricultural Experiment Station, Kansas State University, Manhattan 66506
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