1990 Illinois Turfgrass Research Report

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Foreword

This report presents the results of turfgrass research investigations conducted in Illinois during 1990. Contributors to the report include scientists from the Departments of Horticulture and Plant Pathology at the University of Illinois and the Department of Crop and Soil Sciences at Southern Illinois University.

We hope the information presented in this research report will aid turfgrass managers throughout Illinois when making management decisions. Nevertheless, information about products and procedures contained in this report are not intended as turfgrass management recommendations. All uses of pesticides must be registered by appropriate State and Federal agencies before they can be recommended. In addition, commercial companies are mentioned in this publication solely for the purpose of providing specific information. No endorsement of products is implied or intendend.

Turfgrass research in the state of Illinois would not be possible without the continuous and generous support of the Illinois turfgrass industry. Thanks and appreciation are due to all individuals, organizations and businesses that support and participate in our projects.

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Jean Haley, Editor

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UNDERSTANDING THE DATA

Most of the data presented in this report is subjected to statistical analysis. Statistical procedures are a combination of logic and arithmetic that allow us to interpret information gathered from experiments. We most frequently use Fisher's Least Significant Difference Test to explain our test data.

Fisher's Least Significant Difference Test is a statistical procedure that determines if the difference found between two treatments is due to the treatment or if the difference is simply due to random chance. For each set of data a value ($LSD_{0.05}$) is calculated at a chosen level of significance. If the difference between two treatment means is greater than this calculated value then it is said to be a 'significant difference' or *a difference* *__not__* *due to random chance*. For each set of data, a letter(s) is placed by each treatment mean to show its relationship to every other treatment mean. If two means have one or more letters in common, it is probable that any difference between them is not significant but is a result of random chance. The level of significance that we use is 0.05 ($LSD_{0.05}$). In other words, 95% of the time these treatments are compared this difference will occur. If no letters accompany the means and 'NS' is reported at the bottom of the column then no significant difference was found among the means in this group of data.

CULTIVAR EVALUATIONS AT THE UNIVERSITY OF ILLINOIS

J.E. Haley, T.B. Voigt, D.J. Wehner and T.W. Fermanian

Many years of research are needed to evaluate a turfgrass cultivar before it is placed on the market. A cultivar that thrives in the Pacific northwest might die during a hot and dry midwest summer. With this in mind, studies were established to evaluate the performance of Kentucky bluegrass, perennial ryegrass and, tall fescue, and creeping bentgrass cultivars under environmental conditions found in central Illinois.

Kentucky Bluegrass Cultivar Evaluations

Kentucky bluegrass (*Poa pratensis*) is the most widely used turfgrass in Illinois. Its fine texture, cold and drought tolerance, ability to form a dense sod and ability to adapt to a wide range of cultural programs make it suitable for home lawns, parks, athletic fields, golf courses or any area where a high quality turf is desired. The many available cultivars of Kentucky bluegrass differ considerably in quality, color, texture, stress tolerance, and resistance to pests. The purpose of this evaluation is to evaluate the response of 54 Kentucky bluegrass cultivars to the environment found in central Illinois. The cultivars are listed in Table 1.

Research Protocol - Kentucky Bluegrass Cultivar Evaluation

Established: September 13, 1988

Site Preparation:
- existing vegetation killed with Roundup
- rototilled, raked
- fertilized 1 lb N/M
- straw mulch following planting
- 11/13/89)

Seeding Rate: 2 lbs seed/M
Plot Size: 5 ft x 6 ft
Replications: 3

Turf Maintenance:

1989
- mowing height - 2.0 inches
- fertilization - 3 lbs N/M
- pesticides - pre & postemergence crab control
  Poa annua control -Prograss at 0.75 lb ai/A (10/10/89 &
- irrigation - as needed to prevent wilt

1990
- mowing height - 2.0 inches
- fertilization - 3 lbs N/M
- pesticides - preemergence crab control
- irrigation - as needed to prevent wilt

Thirty days after planting, cultivars that provided 60% or greater plot cover were Bronco, Dawn, Glade, Julia, Liberty and Midnight. Annual bluegrass (*Poa annua)* infestation was so great during 1989 that the cultivars were not evaluated. During 1990 cultivars were evaluated for turf quality, dollar spot infection and % annual bluegrass infestation. These ratings can be found in Table 1.

Cultivars exhibiting good to excellent quality (7.0-9.0) on both rating dates include Monopoly, Suffolk, Dawn, Bronco and Midnight. Cultivars with 20% or greater

Table 1. The evaluation of 54 Kentucky bluegrass cultivars during the 1990 growing season.[1]

Cultivar	Quality[2] 4/30	Quality[2] 6/27	% Annual Bluegrass[3] 5/09	Dollar Spot[4] 8/02	Cultivar	Quality 4/30	Quality 6/27	% Annual Bluegrass 5/09	Dollar Spot 8/02
Compact	6.0d-g	6.3c-g	3.7ab	6.3e-h	Dawn	7.0gh	7.0e-h	1.7a	5.7c-h
Haga	6.7f-h	7.0e-h	3.0ab	5.7c-h	Baron	5.0b-e	7.3f-h	11.7a-f	6.3e-h
Opal	5.3c-f	6.0b-f	4.0a-c	2.7ab	Georgetown	6.7f-h	6.7d-h	9.0a-e	4.0a-e
Sydsport	4.7a-d	6.0b-f	25.0fg	4.0a-e	Loft's 1757	5.3c-f	7.0e-h	11.7a-f	7.0gh
Amazon	4.3a-c	5.0a-c	9.3a-e	3.7a-d	Mystic	3.7ab	5.3a-d	61.7i	2.7ab
Destiny	6.0d-g	6.7d-h	19.3d-f	4.7b-g	Somerset	5.0b-e	7.3f-h	16.7b-f	5.3c-h
Freedom	6.7f-h	5.7a-e	25.3fg	5.3c-h	Aspen	6.0d-g	7.7g-i	5.7a-e	6.0d-h
229	6.0d-g	6.7d-h	10.3a-e	4.0a-e	Trenton	6.3e-h	6.3c-g	7.0a-e	4.0a-e
Adelphi	6.0d-g	6.3c-g	20.0ef	4.3a-f	Abbey	5.0b-e	7.3f-h	16.7b-f	4.7b-g
Cheri	7.0gh	6.7d-h	7.7a-e	5.7c-h	Bel 21	6.3e-h	6.7d-h	2.3ab	5.7c-h
Classic	6.7f-h	6.3c-g	4.7a-c	4.0a-e	Ba 70-242	5.3c-f	7.3f-h	11.7a-f	5.3c-h
Eclipse	6.3e-h	6.7d-h	11.7a-f	6.0d-h	Bristol	5.3c-f	6.7d-h	18.3c-f	5.0b-g
Fylking	4.7a-d	5.3a-d	16.7b-f	2.7ab	Chateau	6.3e-h	4.3a	6.0a-e	4.7b-g
84-403	7.0gh	6.7d-h	3.0ab	5.3c-h	Coventry	7.0gh	5.3a-d	1.0a	4.7b-g
Glade	6.0d-g	8.0hi	1.7a	6.3e-h	Estate	7.7hi	6.3c-g	1.0a	5.3c-h
H76-1034	7.0gh	6.3c-g	1.7a	5.7c-h	Victa	6.0d-g	6.7d-h	7.7a-e	6.7f-h
Huntsville	6.7f-h	6.3c-g	3.0ab	3.3a-c	Alpine	4.0a-c	7.3f-h	13.3a-f	4.0a-e
Ikone	7.3g-i	4.7ab	3.0ab	2.0a	America	6.3e-h	6.7d-h	12.0a-f	6.0d-h
Julia	8.7hi	5.3a-d	1.0a	2.7ab	Bronco	7.0gh	8.0hi	1.7a	7.0gh
Liberty	6.0d-g	7.0e-h	8.3a-e	4.7b-g	Merit	3.7ab	7.0e-h	12.7a-f	5.3c-h
Monopoly	7.3g-i	7.7g-i	2.3ab	4.7b-g	Gnome	3.7ab	5.7a-e	45.0h	3.3a-c
Nassau	3.3a	5.3a-d	36.7gh	4.3a-f	Tendos	4.7a-d	7.0e-h	6.3a-e	6.3e-h
Nutop	4.0a-c	5.7a-e	11.0a-f	4.3a-f	Blacksburg	6.7f-h	6.0b-f	2.3ab	4.0a-e
Ram I	6.3e-h	6.7d-h	5.3a-d	3.3a-c	CB1	7.0gh	6.0b-f	2.3ab	3.3a-c
S-21	5.0b-e	6.0b-f	4.0a-c	4.7b-g	Challenger	5.3c-f	7.3f-h	11.3a-f	5.0b-g
Suffolk	7.3g-i	7.0e-h	3.0ab	4.3a-f	Midnight	7.7hi	9.0i	3.0ab	7.7h
Wabash	6.3e-h	5.3a-d	1.7a	3.7a-d	Abel - 1	5.0b-e	6.3c-g	8.3a-e	4.7b-g

[1] All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Least Significant Difference test.

[2] Quality evaluations are made on a 1-9 scale where 9 = excellent turfgrass quality and 1 = very poor turfgrass quality.

[3] Percent annual bluegrass refers to a visual estimate of the percent area of the plot covered with annual bluegrass (*Poa annua*).

[4] Dollar spot evaluations are made on a scale of 1-9 where 9 = no disease visible and 1 = necrosis of the turf as a result of disease infection.

annual bluegrass infestation include Sydsport, Freedom, Adelphi, Nassau, Mystic, and Gnome. This infestation may be a result of contamination of the original seed source or may represent a cultivar that lacks aggression. Dollar spot was a problem for all cultivars during July and August. Loft's 1757, Bronco and Midnight exhibited good to excellent resistance to this disease.

A new Kentucky bluegrass evaluation was established at the University of Illinois campus during September 1990. This study is part of a national test examining 126 Kentucky bluegrass cultivars at locations throughout the country. Next year we hope to provide you with information concerning these cultivars.

USDA Perennial Ryegrass Cultivar Evaluation

In the past, perennial ryegrass has been included in seed mixtures as a temporary lawn or nursegrass. In Illinois, deterioration of the turf during the summer months has prevented perennial ryegrass from becoming an important permanent turfgrass. Improved cultivars with better color, density, mowing quality, and disease resistance have challenged the traditional image of perennial ryegrass. The turf program at the University of Illinois participated in a USDA national perennial ryegrass trial. This nationwide test evaluated the performance of perennial ryegrass cultivars under a broad range of climate and cultural programs. These cultivars are listed in Table 2.

Research Protocol - Perennial Ryegrass Cultivar Evaluation

Established: June 10, 1987

Site Preparation:
- existing vegetation killed with Roundup
- vertical mowed, raked
- fertilized 1 lb N/M
- Siduron application - 6 lbs ai/A
- straw mulch following planting

Seeding Rate: 4.5 lbs seed/M
Plot Size: 5 ft x 6 ft
Replications: 3

Turf Maintenance:

1989
- mowing height - 2.0 inches
- fertilization - 3 lbs N/M
- pesticides - pre & postemergence crab control; postemergence broadleaf control
- irrigation - as needed to prevent wilt

1990
- mowing height - 2.0 inches
- fertilization - 3 lbs N/M
- pesticides - preemergence crab control
- irrigation - as needed to prevent wilt

Few differences were observed in the establishment rates of the 65 ryegrass cultivars. During August, 1987, most cultivar quality was poor to fair. Turf quality improved during September and October. Cultivars that scored poorly on all three rating dates in 1987 included Delray, Regal and Linn.

During 1988, early spring quality ranged from poor to fair. By mid-spring turf quality had improved slightly. The cultivars Tara, PST-2PM, PST-259, Manhattan II, Barry, Repell, KWS-A1-2, Pick 600, ISI-851, Gator, Bar Lp 410, PST-250, PST 2H7, PST-M2E, Palmer, Manhattan, Pick 715 and Pick 647 had ratings of 7.0 (good) or higher. In spite of high summer temperatures turf quality remained fair to good for most ryegrass cultivars. In late July red thread (*Laetisaria fuciformis*) was a problem for several cultivars. Perennial ryegrass cultivars with an average red thread rating of 5.0 or lower (indicating susceptibility) were Diplomat, Manhattan, J207, Pavo and Linn. This did not seriously effect late October quality, with the exception of Linn which had very poor turf quality.

Table 2. The evaluation of perennial ryegrass during the 1990 growing season.[1]

	Quality[2]			Red Thread[3]		Quality			Red Thread
Cultivar	5/02	6/19	8/03	6/01	Cultivar	5/02	6/19	8/03	6/01
Barry	7.3c-e	5.7b-e	3.7b-f	7.3a-e	Ranger	7.0cd	5.7b-e	3.0b-d	7.7b-e
BAR Lp 454	7.7d-f	5.3b-d	3.3b-e	9.0e	ISI-K2	7.3c-e	5.7b-e	2.7a-c	7.3a-e
Tara	8.3fg	6.0c-e	4.3d-g	8.0b-e	Pennfine	6.7bc	6.3de	4.0c-g	7.7b-e
BAR Lp 410	6.7bc	5.7b-e	3.3b-e	8.0b-e	PSU-222	7.0cd	6.0c-e	3.0b-d	8.3c-e
Cowboy	7.3c-e	5.3b-d	3.7b-f	8.0b-e	PSU-333	7.7d-f	6.3de	4.0c-g	8.3c-e
Yorktown II	7.7d-f	5.3b-d	3.7b-f	7.3a-e	Nom Lp 763	7.0cd	5.3b-d	4.7e-h	9.0e
Prelude	7.7d-f	6.3de	4.3d-g	7.7b-e	Sheriff	7.0cd	5.3b-d	2.7a-c	8.7de
Palmer	7.7d-f	6.0c-e	5.3gh	8.3c-e	Birdie II	7.7d-f	5.7b-e	5.0f-h	7.0a-e
Diplomat	6.7bc	5.7b-e	3.3b-e	8.0b-e	Citation II	7.7d-f	6.7e	5.0f-h	7.7b-e
Pavo	6.0b	5.0bc	2.3ab	7.7b-e	Regency	6.7bc	5.7b-e	3.0b-d	9.0e
Ronja	7.0cd	6.3de	2.7a-c	8.3c-e	Manhattan II	7.7d-f	6.0c-e	3.3b-e	7.3a-e
Caliente	7.0cd	6.0c-e	3.7b-f	9.0e	PST-2PM	8.3fg	6.0c-e	4.0c-g	6.3a-c
Aquarius (KWS A1 2)	7.3c-e	5.3b-d	3.0b--d	7.7b-e	PST-2DD	7.7d-f	6.7e	2.7a-c	9.0e
Delray	6.7bc	6.0c-e	4.7e-h	8.0b-e	PST-2H7	8.0e-g	6.3de	4.7e-h	9.0e
Goalie	7.7d-f	6.0c-e	4.0c-g	8.7de	PST-250	8.0e-g	6.3de	3.0b-d	8.3c-e
Acrobat	6.7bc	5.7b-e	3.3b-e	8.0b-e	Vintage	7.0cd	5.3b-d	3.7b-f	7.0a-e
Rival	7.7d-f	6.3de	4.3d-g	7.3a-e	PST-259	8.0e-g	6.7e	4.7e-h	8.0b-e
Brenda	7.0cd	6.0c-e	3.7b-f	8.3c-e	PST-M2E	7.7d-f	6.3de	4.7e-h	6.7a-d
Derby	7.0cd	5.0bc	3.3b-e	6.0ab	Sunrye	8.0e-g	6.0c-e	4.7e-h	9.0e
Regal	6.0b	4.7b	3.7b-f	8.7de	Omega II	7.7d-f	6.3de	4.0c-g	7.7b-e
Gator	8.3fg	6.3de	3.7b-f	7.7b-e	PST-2HH	8.0e-g	6.0c-e	5.0f-h	7.0a-e
Patriot	8.0e-g	6.3de	4.7e-h	7.0a-e	ISI-851	8.0e-g	6.0c-e	4.0c-g	8.3c-e
Rodeo	7.7d-f	5.3b-d	3.0b-d	5.3a	NK 80389	7.7d-f	5.3b-d	3.0b-d	7.3a-e
Allaire	8.0e-g	6.0c-e	3.0b-d	7.7b-e	Manhattan	7.0cd	6.0c-e	4.0c-g	7.3a-e
Pick 300	7.7d-f	6.0c-e	3.0b-d	8.0b-e	Repell	8.3fg	6.3de	4.3d-g	8.0b-e
Pick 715	8.0e-g	6.3de	4.3d-g	7.3a-e	DEL 946	6.7bc	5.3b-d	4.3d-g	8.3c-e
Ovation	7.3c-e	6.3de	3.7b-f	7.0a-e	Belle	7.3c-e	6.7e	4.7e-h	8.7de
SR 4000	8.3fg	5.3b-d	3.7b-f	6.0ab	Pennant	8.0e-g	6.7e	5.0f-h	9.0e
SR 4031	8.0e-g	5.3b-d	4.3d-g	7.3a-e	J207	6.7bc	5.7b-e	4.3d-g	7.3a-e
SR 4100	8.7g	6.3de	6.0h	7.7b-e	J208	6.7bc	5.0bc	3.3b-e	6.0ab
Pick 233	8.0e-g	5.3b-d	4.0c-g	7.0a-e	Linn	2.3a	2.3a	1.3a	9.0e
Pick 647	8.0e-g	5.7b-e	4.3d-g	6.3a-c	Runaway	7.0cd	5.7b-e	3.7b-f	8.3c-e
Pick 600	8.3fg	6.3de	4.3d-g	7.3a-e					

[1] All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Proctected Least Significant Difference test.

[2] Quality evaluations are made on a 1-9 scale where 9 = excellent turfgrass quality and 1 = very poor turfgrass quality.

[3] Dollar spot evaluations are made on a scale of 1-9 where 9 = no disease visible and 1 = necrosis of the turf as a result of disease infection.

During the 1989 growing season quality was good to excellent in the spring and fall months for most perennial ryegrass cultivars. Due to a high instance of dollar spot (*Lanzia* and *Moellerodiscus* spp.) turf quality deteriorated during the summer months. Perennial ryegrass cultivars that obtained quality scores of 7.7 or greater (excellent quality) on at least two rating dates were Palmer, Pick 300, Pick 600, PST-2H7, PST-2PM and Rival. Cultivars that exhibited some resistance to dollar spot (a score of 5.7 or greater) included Goalie, MON LP 763, NK 80389, Pick 300, Pick 600, PST 259, and Regency.

During 1990 red thread was once again a problem for some perennial ryegrass cultivars (Table 2). Derby, Rodeo, SR 4000 and J208 all had red thread ratings of 6.0 or lower indicating disease susceptibility. These are not the same cultivars that showed a red thread problem in 1989.

All perennial ryegrass quality deteriorated during the summer. On the August rating date no cultivars had quality ratings of 7.0 or above (good to excellent quality). In September of 1990 this evaluation was replace with a new USDA national perennial ryegrass test. The new evaluation contains 122 cultivars and is replicated throughout the country by other universities and industries.

USDA Tall Fescue Cultivar Evaluation

In Illinois, tall fescue (*Festuca arundinacea*) is used primarily on low maintenance sites such as roadways and playgrounds. Tall fescue has excellent heat, drought and wear tolerance. A coarse texture prevents its use in areas where a high quality turf is desired. A bunch type growth habit prevents its use in mixtures with other turf species. In recent years, tall fescue breeders have bred and selected cultivars with finer texture, improved color, and better disease and cold resistance. The University of Illinois is one of 40 participants in a national test sponsored by the USDA that will examine some of the improved "turf" type tall fescue cultivars over a wide range of environments and cultural programs. These cultivars are listed in Table 3.

Research Protocol - Tall Fescue Cultivar Evaluation

Established: September 27, 1987

Site Preparation:
- existing vegetation killed with Roundup
- vertical mowed, rake
- fertilized 1 lb N/M
- straw mulch following planting

Seeding Rate: 3.7 lbs seed/M
Plot Size: 5 ft x 6 ft
Replications: 3

Turf Maintenance:

1989
- mowing height - 2.0 inches
- fertilization - 3 lbs N/M
- pesticides - pre & postemergence crab control; postemergence broadleaf control
- irrigation - as needed to prevent wilt

1990
- mowing height - 2.0 inches
- fertilization - 3 lbs N/M
- pesticides - preemergence crab control
- irrigation - as needed to prevent wilt

During 1988, early June quality was fair to good for most cultivars. In July quality remained high with only , Bel 86-2, JB-2, Ky-31, Syn Ga and Tip rating 6.0 (fair quality) or lower. August quality was slightly lower for most cultivars. By late October tall fescue cultivars had recovered from any stress suffered during the summer. Cultivars that consistently exhibited high quality were Apache, Bonanza, Hubbard 87, Jaguar, Normarc 25, Normarc 77, Olympic, PE-7E and PST-5HF.

Table 3. The evaluation of 65 tall fescue cultivars during the 1990 growing season.[1]

Cultivar	Quality[2] 4/30	Quality[2] 6/27	Cultivar	Quality 4/30	Quality 6/27
Adventure	6.7bc	7.0c-e	Trailblazer	7.3c-e	7.0c-e
BAR Fa 7851	7.3c-e	7.3d-f	PST-5D1	6.7bc	7.0c-e
Trident	7.0b-d	6.7b-d	PST-5AP	6.7bc	7.0c-e
Titan	6.7bc	7.0c-e	PST-5HF	7.7de	7.0c-e
Pick DDF	6.7bc	7.0c-e	Jaguar	7.0b-d	7.3d-f
Pick 127	7.0b-d	7.3d-f	PST-DBC	7.0b-d	7.0c-e
Pick 845PN	7.3c-e	7.7ef	Olympic	6.7bc	7.0c-e
Pick SLD	7.0b-d	6.7b-d	Jaguar II	6.3ab	7.0c-e
PE-7	7.3c-e	7.3d-f	Monarch	6.7bc	7.0c-e
PE-7E	7.0b-d	8.0f	Apache	7.0b-d	7.3d-f
Hubbard 87	8.0e	8.0f	PST-5DM	6.7bc	7.7ef
Syn Ga	6.3ab	6.7b-d	Pick DM	7.0b-d	7.3d-f
Legend	7.0b-d	7.0c-e	Normarc 99	7.0b-d	7.0c-e
Taurus	7.0b-d	6.7b-d	Pacer	7.0b-d	6.7b-d
Aztec	7.0b-d	7.3d-f	Carefree	7.0b-d	7.0c-e
Sundance	7.0b-d	6.7b-d	Richmond	7.0b-d	6.7b-d
Fatima	6.3ab	6.7b-d	Tip	7.0b-d	7.0c-e
Normarc 25	7.0b-d	7.3d-f	Ky-31	5.7a	5.3a
Normarc 77	7.0b-d	7.0c-e	Bel 86-1	6.7bc	7.0c-e
KWS-DUR	7.0b-d	7.3d-f	Bel 86-2	7.0b-d	7.3d-f
KWS-BG-6	6.7bc	6.7b-d	PST-5EN	7.0b-d	7.0c-e
Willamette	6.7bc	6.3bc	PST-5F2	7.3c-e	7.3d-f
Chieftan	7.7de	7.7ef	Finelawn 5GL	7.0b-d	7.0c-e
Pick GH6	7.3c-e	7.0c-e	Finelawn I	6.7bc	6.0ab
Thoroughbred	7.0b-d	7.7ef	Rebel	7.0b-d	6.3bc
Pick TF9	7.3c-e	7.3d-f	Rebel II	7.3c-e	7.3d-f
PST-50L	7.0b-d	7.0c-e	Tribute	7.0b-d	7.0c-e
PST-5D7	7.0b-d	7.7ef	Arid	7.3c-e	6.7b-d
Cimmaron	6.7bc	7.0c-e	Wrangler	8.0e	7.3d-f
Bonanza	7.3c-e	7.0c-e	Mesa	7.0b-d	7.3d-f
PST-5AG	7.3c-e	7.7ef	JB-2	7.3c-e	7.0c-e
PST-5BL	7.0b-d	7.0c-e	Falcon	7.0b-d	7.3d-f
PST-5MW	7.0b-d	7.0c-e			

[1]All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Proctected Least Significant Difference test.

[2]Quality evaluations are made on a 1-9 scale where 9 = excellent turfgrass quality and 1 = very poor turfgrass quality.

Trends in cultivar quality during the 1989 growing season were similar to the previous year. Observed quality for most cultivars during May and June was good to fair. No significant difference among cultivars was noted in August and in general quality ratings were low. Cultivars that consistently exhibited excellent quality (scores above 7.7 for two or more dates) were Bonanza, Hubbard 87, JB-2, KWS-DUR, Mesa, Normarc 25, Normarc 77, PE-7, PE-7E, Pick DDF, Pick TF9, Pick 127, Pick 845PN, PST 5AG,

PST-5AP, PST-5HF, PST-5MW, Rebel II, Thoroughbred, Trailblazer and Wrangler. Cultivars that had scores of 6.3 or lower (poor to fair quality) on at least 3 of the rating dates were Fatima, Ky-31 and Pick SLD.

Quality was rated on only 2 dates during 1990 (Table 3). Annual bluegrass infestation was so high that it was difficult to make accurate evaluations of tall fescue quality. Most cultivars exhibited good to excellent quality (6.7-9.0) on both dates. Tall fescue cultivars with ratings of 7.7 or higher on at least 1 date include Pick 845PN, PE-7, Hubbard 87, Chieftan, Thoroughbred, PST-5D7, PST-5AG, PST-5HF, PST-5DM and Wrangler.

USDA National Creeping Bentgrass Evaluation

Over the last few years, two factors have resulted in an increased interest in creeping bentgrass, use of creeping bentgrass for golf course fairways and increased construction of golf courses. Commercial and public breeders have responded to the increased interest in creeping bentgrass by developing new varieties. The purpose of this study is to evaluate some of these new varieties of creeping bentgrass for both use as fairway and putting green turfs. Two sets of varieties were established in the fall of 1990, one set will be mowed at putting green height while the other will be mowed at fairway height. The cultivars included in each study are listed below. Data collection on these tests will begin with the growing season in 1991.

Putting Green Study Creeping Bentgrass Cultivars	
Allure	Penncross
Bardot	Penneagle
BR1518	Pennlinks
Carmen	Providence
Cobra	Putter
Egmont	SR 1020
Emerald	Tracenta
Forbes 89-12	WVPB 89-D-15
National	88.CBE
Normarc 101	88.CBL

Fairway Study
Creeping Bentgrass Cultivars

Allure	Normarc 101
Bardot	Penncross
BR 1518	Penneagle
Carmen	Providence
Cobra	Putter
Egmont	SR 1020
Emerald	TAMU 88-1
Forbes 89-12	Tracenta
National	WVPB 89-D-15

BUFFALOGRASS RESEARCH AT THE UNIVERSITY OF ILLINOIS

T.B. Voigt, T.W. Fermanian, and J.E. Haley

What attributes would the perfect turfgrass for the 1990s possess? The perfect turfgrass would:

- be attractive with season-long, dark-green color, fine texture, low growing habit and high density;
- be adaptable to a variety of growth environments and sites;
- require few dollar or labor inputs to establish and maintain; and
- have few pest problems.

Unfortunately, no one turfgrass meets all of these criteria; all turfgrasses currently in use are compromises to some degree or another.

Researchers, however, have not given up searching for turfgrasses that come closer to meeting these criteria than what is currently available. One species currently receiving much attention is buffalograss (*Buchloe dactyloides*), a warm-season grass capable of forming a turf of low to moderate quality. It is a native to the short-grass prairie region in the western U. S., a rugged environment with great temperature fluctuations and limited precipitation.

Buffalograss is an attractive choice for research because it is not only tough and has a low water and nitrogen fertilization requirement, but also because it requires infrequent mowing, growing to an ultimate height of six to eight inches. In addition, it has limited pest problems. Finally, much variation exists in native buffalograss populations from which researchers can select individuals with the best, turf-like characteristics.

Accordingly, as with all turfgrasses, there are negatives to its use. Its appearance is probably the greatest stumbling block to its increased planting. In most of Illinois, buffalograss is a dull gray-green when actively growing and becomes brown when dormant, usually from mid October through late April . Another negative is the high cost of establishment which currently is much greater than for most cool-season turfgrasses. A final negative is its lack of shade tolerance.

Several universities are actively involved in buffalograss research. The Universities of Nebraska and California at Davis, along with Texas A. and M. University, are looking for desirable turf-type buffalograsses, evaluating management regimes, and investigating buffalograss physiology. Many new buffalograss cultivars will emerge from these programs and soon be ready for evaluation at other sites.

The University of Illinois planted a buffalograss area in 1984. In 1986 a study was conducted to examine the relationship of mowing frequency, nitrogen fertilization, and herbicide application on crabgrass populations. Although the results of the first year appeared promising (*1986 Illinois Turfgrass Research Report*), this work was not continued because the herbicide being used experimentally was not labelled for this use and would probably not receive one in the future.

A preliminary study, initiated in 1989, looked at five different methods of establishing buffalograss. Results after one year indicated that buffalograss establishment could be enhanced through the use of certain herbicides, but as before, the most promising herbicide was not labelled for this application.

In July, 1990, two buffalograss studies were initiated. The first study is an evaluation of cultivars obtained from the University of Nebraska along with one cultivar collected locally. The second study is designed to determine the possibility of combining buffalograss with sheep or hard fescue and seeded in differing ratios. The objective of this study is to determine which ratio of buffalograss and sheep or hard fescue, if any, produces the best long-term results for low-maintenance turf. The evaluation will examine the period of active growth, species composition ratios over time, and turf quality.

A complete program for buffalograss use in Illinois is needed. A program of this type will include recommendations regarding buffalograss selection, establishment, culture, and pest control. At this time, some work in each of these areas is complete, but there are knowledge gaps that remain to be filled before a complete program for buffalograss use is available. Another step toward making buffalograss cultivar selection recommendations will begin in 1991 when a national buffalograss cultivar evaluation will be planted at two Illinois sites. This study will replace the smaller study initiated in 1990 and evaluate new, turf-type cultivars. Additional studies, especially establishment and pest control tests, will be forthcoming. These studies will refine and enhance our knowledge of buffalograss and its uses.

Buffalograss is not perfect and will never replace popular cool-season grasses. It may, however, become more useful in low- to moderate-management sites, especially after new cultivars have been selected and an optimum management regime is defined.

1990 NCR-10 REGIONAL ALTERNATIVE TURFGRASS SPECIES EVALUATION

T.B. Voigt and J.E. Haley

Introduction

Turfgrasss benefits in athletic or aesthetic settings are obvious; turfgrasses provide safe, renewable surfaces for recreation and sports and can add to the landscape beauty of homes, businesses, and park areas. The benefits of turf used in roadsides, industrial settings, airports, and other low-management areas may not be as obvious. In these settings turfgrasses reduce noise, dust, and air pollution and, most importantly, reduce soil erosion. The turfgrasses planted in these areas must tolerate unfavorable environmental conditions and minimal maintenance.

A USDA-sponsored group of turf researchers from Midwestern universities, the NCR-10 research committee, has agreed to evaluate sixteen turfgrasses that are not often grown as turfgrass, or are used primarily as low-maintenance turfs. These turfgrasses are being evaluated at nine sites in the Midwest for turf quality under unirrigated conditions. They are maintained at three heights in an attempt to define appropriate mowing regimes.

Materials and Methods

Sixteen turfgrasses (Table 1) were planted into a firm, Flanagan silt loam seed bed 7 September 1988. Planting rates for the 3' x 10' plots, each replicated three times, are listed in Table 1. One pound of N/1000 sq ft was applied following seeding, and irrigation was supplied as needed during germination and establishment. The plots were not mulched. The buffalograss plugs were spread evenly over the plot areas.

During 1989 and 1990, maintenance has been minimal. Plots were mowed on an as-needed basis; each plot was split into three mowing heights (two inches, four inches, and unmowed) stripped across each replication. Following the October, 1990, evaluation, the unmowed plots were mowed at four inches in an attempt to reduce weed populations. No irrigation or fertilization has been supplied since planting. Plots were hand weeded once in August, 1989, and treated with a broad-spectrum, postemergence herbicide (Trimec) at label-recommended rate following the October, 1990, evaluation in an attempt to control broadleaf weeds.

Turf quality data was collected monthly during the growing season (April-Oct.). Turf quality is based on a 1-9 scale where 1=tan turf, bare soil, lowest quality, 6=minimal turfgrass quality, and 9=darkest green, very dense, highest quality.

Results

Ruff crested wheatgrass did not germinate and received quality ratings of 1 throughout the evaluation period. Both buffalograss selections were planted using plugs which resulted in low ratings (2-4) due to limited plot coverage. There were significant differences among turfgrass mowing heights at only the April and May evaluations; the two-inch and four-inch mowing heights received significantly higher quality ratings in those months. During the remaining rating dates no significant differences were noted.

There were significant quality differences among species at each monthly evaluation (Table 1). Finally, monthly mean ratings of the five most highly evaluated turfgrasses, Exeter colonial bentgrass; sheep fescue; Colt roughstalk bluegrass; Alta tall fescue; and Reubens Canada bluegrass, are shown in Figure 1. Note that none of these species provided season-long, high quality turf.

Quality ratings collected during 1990 reflect intense competition form white clover (*Trifolium repens*) infestations into the plots. Herbicide and mowing treatments supplied in October, 1990, were an attempt to reduce weed competition in following years.

It is important to note that these results represent only 1990 data collection. Compare these results with those of 1989, and keep in mind that this study will continue for a minimum of one more year. When considering one of these species, consult future Turfgrass Research Reports for evaluations based several year's data.

TiFig. 1. QUALITY RATING FOR SIX ALTERNATIVE TURFGRASSES (COMBINED RATING FOR ALL MOWING HEIGHTS)

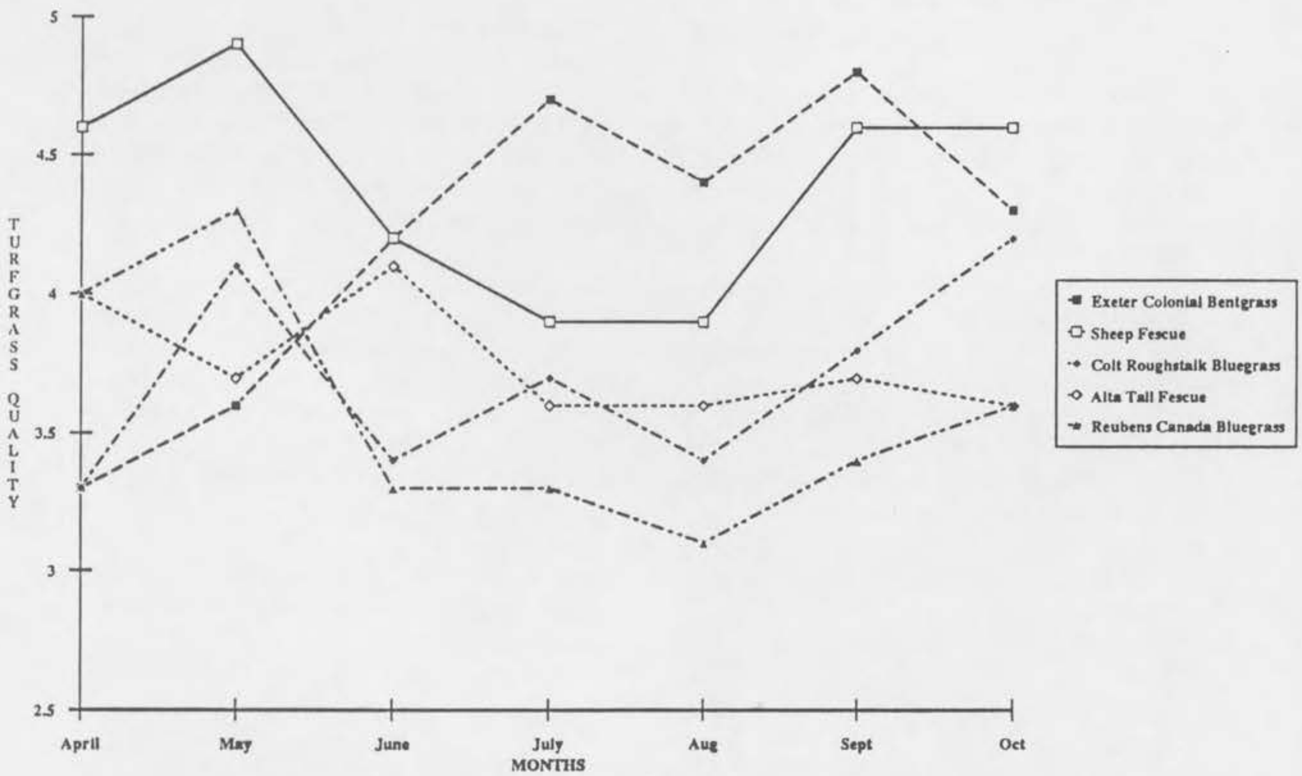

Table 1. The alternative turfgrasses, planting rates, and mean quality ratings for May, July and September, 1989.

Species	Planting Rate[1]	Mean Quality Rating[2] 5/90	7/90	9/90
Fairway Crested Wheatgrass *Agropyron cristatum*	4.3	3.8bcd	3.2cdef	3.1bcd
Emphraim Crested Wheatgrass *Agropyron desertorum* 'Emphraim'	4.2	3.4cd	3.0ef	3.2bcd
Ruff Crested Wheatgrass *Agropyron desertorum* 'Ruff'	6.2	1.0g	1.0g	1.0e
Sodar Streambank Wheatgrass *Agropyron riparium* 'Sodar'	4.2	3.1de	3.1def	3.3bcd
Reton Red Top *Agrostis alba* 'Reton'	4.0	3.8bcd	3.9b	3.8b
Exeter Colonial Bentgrass *Agrostis tenuis* 'Exeter'	3.8	3.6cd	4.7a	4.8a
NE 84-315 Buffalograss *Buchloe dactyloides* 'NE 84-315'	1 plug tray	2.0f	2.8f	3.1bcd
Texoka Buffalograss *Buchloe dactyloides* 'Texoka'	1 plug tray	2.0f	2.9ef	3.2bcd
Alta Tall Fescue *Festuca arundinacea* 'Alta'	4.5	3.7bcd	3.6bcd	3.7bc
Durar Hard Fescue *Festuca ovina* var. *duriuscula* 'Durar'	4.2	4.1bc	3.3cde	3.6bc
Sheep Fescue *Festuca ovina*	4.2	4.9a	3.9b	4.6a
Covar Sheep Fescue *Festuca ovina* 'Covar'	4.5	4.0bc	3.3cde	3.3bcd
Alpine Bluegrass *Poa alpina*	4.0	2.2f	2.8f	3.0cd
Bulbous Bluegrass *Poa bulbosa*	4.2	2.4ef	2.8f	2.8d
Reubens Canada Bluegrass *Poa compressa* 'Reubens'	4.3	4.3ab	3.3cde	3.4bcd
Colt Rough-stalked Bluegrass *Poa trivialis* 'Colt'	4.0	4.1bc	3.7bc	3.8b
$LSD_{0.05}$		0.7	0.5	0.8

[1] Planting rate is in pounds of seed per 1,000 square feet except for the two buffalograss selections which were planted at a rate of 278 plugs per 1,000 square feet.

[2] Mean quality rating is the mean of three replications (all mowing heights combined). Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

THE EVALUATION OF A TALL FESCUE BLEND AT 4 FERTILITY LEVELS AND 3 MOWING HEIGHTS

J.E. Haley and T.B. Voigt

The introduction of improved "turf type" tall fescue (*Festuca arundinacea* Schreb.) cultivars has led to increased tall fescue use where a higher quality turf is desired. These cultivars appear to have a finer texture, increased density and better tolerance to low mowing than the pasture-type tall fescues. Research indicates that the improved cultivars have retained all the good drought, heat and wear tolerance needed in a low maintenance turf. The purpose of this study is to evaluate the fertilizer needs and mowing height required to provide a high quality tall fescue turf. Quality evaluations and annual bluegrass (*Poa annua*) infestation are reported in Table 1.

Research Protocol - Tall Fescue Management

Turf: Triathalawn (blend of Bonanza, Olympia, and Apache tall fescues)

Treatments:
- Fertility Levels -
  - 0 lb N/M
  - 2 lbs N/M/Yr applied 1 lb in May & Sept
  - 4 lbs N/M/Yr applied 0.5 lb in June, July & 1 lb in May, Aug. Oct.
  - 6 lbs N/M/Yr applied 0.5 lb Apr, July & 1 lb in May, June, Aug. Sept, Oct.
  - Time applied: April 17, May 18, June 21, July 11, Sept. 13 & Oct. 19
- Mowing Heights -
  - 1 inch
  - 2 inches
  - 3 inches
  - A rotary mower was used and clippings were removed and discarded.

Replications: 3
Experimental Design: Strip Plot

Method of application: applied by hand.

Plot maintenance:
- Mowing - weekly as indicated above
- Irrigation - none
- Herbicides - none

Tall fescue quality was highest where the turf was fertilized with 4 or 6 lbs of nitrogen annually and when mowed at 2 or 3 inches in height. Annual bluegrass infestation appeared greatest where the tall fescue was mowed at 1 inch. At this mowing height the tall fescue, with its bunch type growth habit, is not competitive with annual bluegrass, which grows well under low mowing heights. Based on these preliminary results it appears that improved tall fescue cultivars benefit from nitrogen fertilization. To remain competitive improved tall fescue cultivars should be mowed at a height of 2 inches or higher.

Table 1. The evaluation of 4 fertility levels and 3 mowing heights when applied to a tall fescue turf blend during the 1990 growing season.[1]

	Quality[2]				% Annual Bluegrass[3]
Fertility Level[4]	4/23/90	5/22/90	6/13/90	8/20/90	4/23/90
0 lb	4.2a	5.3a	4.8a	4.8a	1.4
2 lbs	5.8b	6.6b	6.7b	5.4ab	4.2
4 lbs	7.0c	7.8c	7.3c	6.7b	4.2
6 lbs	7.7c	8.1c	7.4c	6.4b	4.8
					NS
Mowing Height					
1 inch	6.3b	5.8a	4.6a	4.0a	10.8b
2 inches	6.7c	7.4b	7.3b	6.7b	0.2a
3 inches	5.5a	7.6b	7.8c	6.8b	0.0a

[1]All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

[2]Quality evaluations are made on a1-9 scale where 9 = excellent turfgrass quality and 1 = very poor turfgrass quality.

[3]Percent Annual Bluegrass evaluations are made as a visual estimate of plot area covered with annual bluegrass (*Poa annua*).

[4]Fertility refers to the total amount of nitrogen in pounds per 1000 square feet applied annually.

CULTIVAR EVALUATIONS AT SOUTHERN ILLINOIS UNIVERSITY

K.L. Diesburg

USDA National Kentucky Bluegrass Cultivar Evaluation

Introduction

Kentucky bluegrass is the mainstay of turf throughout central to northern Illinois as well the rest of the upper midwest. In southern Illinois, however, this species has a tough time surviving in unmanaged situations. It persists to a limited extent and is usually dominated by tall fescue, zoysiagrass, or bermudagrass, whichever happens to be present. Kentucky bluegrass will persist and actually thrive, however, in this transition zone if it receives adequate supplemental nutrition, and timely irrigation. For this reason, the national trial of 72 cultivars has been established at Southern Illinois University. This is an excellent place to test the heat, drought, or poor soil tolerance of Kentucky bluegrass.

Materials and Methods

The trial contains two complete sets of entries, one managed at a high level and the other at a low level. The high management bluegrass receives six pounds N/1000 sq ft per year of Nitroform urea formaldehyde and sulfur-coated urea with a clipping height of 1 1/2" and irrigation to prevent drought stress. The low management bluegrass receives one pound N in September, only, with a clipping height of 2 1/4 inches and no irrigation. Pre-San and Dacthal were applied separately in April and June, respectively, to prevent weed seed germination. Turflon D was applied in November to kill broadleaf weeds that managed to escape the preemergent treatments. Ratings of turf quality were taken monthly to estimate the relative combinations of color, texture, and density among cultivars (Tables 1 and 2). The rating scale is from 1 to 9 with 9 being nearly perfect turf quality, 5 being unacceptable turf quality and 1 being dead turf.

Results

Many cultivars did better at either high or low management, but not in both. Whereas some cultivars managed to excel in both managements. Some major differences in ranking exist between 1989 and this year's results. Under high management, irrigation was skipped in June, causing damage to the less stress tolerant cultivars. Under low management, the milder summer of 1990 did not separate out the more stress tolerant cultivars. The pick of the lot for both managements in 1990 are Aspen and Wabash.

Table 1. Performance of Kentucky bluegrass cultivars under high management in southern Illinois

	Turf Quality Ratings, 9-best						
Cultivar	Mar	Apr	May	Jun	Jul	Aug	Avg
Aspen	7.3	8.0	7.3	6.2	8.7	8.3	7.6
Mystic	5.7	7.0	7.5	7.2	8.7	8.3	7.4
Cynthia	7.0	8.0	7.2	6.0	8.0	8.2	7.4
Trenton	8.0	8.2	6.2	6.0	8.0	7.8	7.4
NE 80-88	6.3	6.8	7.3	6.7	8.7	8.3	7.4
Georgetown	6.7	8.3	5.5	6.7	8.3	8.5	7.3
Challenger	7.3	7.0	6.5	5.7	9.0	8.3	7.3
Joy	8.3	7.7	5.0	7.0	8.0	7.2	7.2
Parade	7.0	8.5	6.0	5.7	8.0	7.8	7.2
Wabash	8.0	8.7	6.3	4.5	8.3	7.2	7.2
P-104	5.0	6.7	7.3	6.0	8.7	9.0	7.1
Dawn	7.3	7.7	7.2	5.3	8.0	7.2	7.1
Huntsville	7.3	7.8	5.8	6.0	8.0	7.5	7.1
Able I	5.3	7.2	7.0	6.8	7.7	8.2	7.0
Monopoly	7.0	8.3	6.3	5.0	7.3	8.2	7.0
WW AG 496	7.0	8.7	7.2	4.8	7.3	7.0	7.0
Kenblue	8.0	7.5	5.0	6.0	8.3	7.0	7.0
BA 69-82	4.7	8.2	6.5	6.5	8.3	7.5	6.9
Asset	5.3	7.2	6.8	6.5	8.0	7.8	6.9
Haga	5.7	7.7	6.2	6.5	7.7	7.8	6.9
F-1872	7.3	8.2	6.8	4.2	7.7	7.2	6.9
Rugby	7.3	8.0	5.8	4.7	7.3	7.7	6.8
Lofts 1757	6.3	7.7	6.2	5.0	7.7	8.0	6.8
Somerset	7.0	7.0	5.8	5.5	8.0	7.3	6.8
A-34	6.7	8.7	6.7	3.8	7.3	7.5	6.8
239	6.7	8.3	6.0	4.8	7.0	7.7	6.8
Classic	8.0	8.0	5.2	4.7	6.7	7.8	6.7
PST-CB1	8.3	8.8	5.5	4.2	6.3	7.0	6.7
WW AG-495	5.3	7.2	6.7	5.5	7.7	7.7	6.7
Liberty	6.0	7.7	6.3	4.8	7.3	7.7	6.6
K1-152	6.3	8.0	5.8	5.0	7.0	7.5	6.6
Merion	4.7	7.3	5.7	5.3	8.7	8.0	6.6
Harmony	6.7	7.8	6.0	4.8	7.0	7.2	6.6
America	4.3	7.2	6.2	5.5	7.3	8.7	6.5
BA 72-500	4.7	7.7	6.7	4.8	7.7	7.7	6.5
BAR VB 534	5.7	7.3	7.3	4.5	6.3	7.7	6.5
WW AG 491	4.7	8.0	7.0	5.3	7.0	6.8	6.5
Cheri	5.0	8.8	6.7	4.2	7.3	6.8	6.5
BA 70-242	4.7	7.7	6.0	5.3	7.3	7.7	6.4
Blacksburg	5.0	7.7	7.7	4.7	5.7	8.0	6.4
Midnight	4.7	7.0	7.7	4.7	5.7	8.8	6.4
Julia	5.7	8.3	6.3	4.0	5.7	8.5	6.4
Destiny	5.0	6.5	5.8	5.7	7.7	7.8	6.4
Bristol	5.0	6.2	5.5	5.0	8.0	8.7	6.4
Eclipse	5.7	7.0	7.5	4.3	6.0	7.7	6.4
Aquila	7.0	6.7	5.3	4.7	7.0	7.5	6.4
Nassau	5.7	7.5	5.3	5.0	6.7	8.0	6.4
Sydsport	4.3	7.2	5.7	5.5	7.7	7.8	6.4
Tendos	5.3	7.3	6.0	5.2	6.7	7.5	6.3
K3-178	7.3	8.3	4.7	4.7	6.3	6.7	6.3

Cultivar	Mar	Apr	May	Jun	Jul	Aug	Avg
BA 73-540	5.0	9.0	6.3	4.7	6.0	7.0	6.3
Compact	6.7	7.7	6.3	3.3	6.5	7.2	6.3
BA 70-139	5.0	7.7	6.0	4.3	6.7	7.8	6.3
Ikone	5.0	8.2	7.2	4.0	5.7	7.3	6.2
Merit	3.7	6.8	6.0	5.5	6.7	8.5	6.2
Welcome	4.7	6.2	6.2	5.5	7.3	7.2	6.2
South Dakota Cert.	8.0	7.2	5.0	4.3	5.7	6.5	6.1
Amazon	5.3	6.5	5.3	4.7	7.0	7.5	6.1
BA 73-626	3.3	7.2	6.0	5.0	7.3	7.3	6.0
BA 72-441	4.7	6.8	6.0	4.5	6.3	7.8	6.0
Barzan	5.0	6.7	5.5	4.7	6.5	7.8	6.0
BA 72-492	4.7	8.2	6.3	4.0	6.0	6.8	6.0
BAR VB 577	5.0	5.5	5.2	4.5	7.0	8.5	5.9
HV 97	4.3	6.5	5.0	5.0	7.3	7.5	5.9
Baron	4.3	6.8	6.0	4.5	6.0	7.8	5.9
WW AG 498	5.0	6.0	5.2	4.3	7.0	7.5	5.8
Glade	4.0	6.7	5.5	4.8	6.3	7.3	5.8
Conni	4.0	6.7	5.8	4.7	6.3	7.0	5.8
RAM-1	4.0	5.0	5.8	5.7	6.3	6.7	5.6
Annika	4.3	6.7	5.8	4.3	5.7	6.7	5.6
Gnome	3.7	5.8	4.0	6.2	6.7	7.0	5.6
Victa	3.3	6.3	5.0	4.5	6.3	7.2	5.4
LSD 0.05	1.8	1.3	1.4	1.8	2.1	1.2	0.9

Table 2. Performance of Kentucky bluegrass cultivars under low management in southern Illinois.

	Turf Quality Ratings, 9-best						
Cultivar	Mar	Apr	May	Jun	Jul	Aug	Avg
Blacksburg	5.7	9.0	9.0	5.7	8.0	9.0	7.7
Wabash	5.7	8.3	7.5	5.2	7.8	8.7	7.2
Monopoly	4.3	8.7	7.2	6.5	8.7	7.7	7.2
BA 70-139	4.3	9.0	7.2	6.3	8.0	7.8	7.1
BA 72-492	4.0	8.3	7.3	7.0	8.0	7.8	7.1
Huntsville	6.3	8.5	5.8	6.3	7.3	8.2	7.1
VICTA	3.3	7.7	6.2	7.8	8.7	8.5	7.0
BA 73-540	4.3	8.2	7.0	6.5	8.5	7.7	7.0
Compact	5.7	8.0	6.7	6.0	8.0	7.8	7.0
Harmony	4.3	8.8	7.3	6.3	7.7	7.5	7.0
BA 70-242	4.3	7.8	6.5	7.2	8.0	8.2	7.0
Rugby	6.0	8.3	5.2	6.2	8.3	7.8	7.0
Aspen	5.0	8.5	7.0	6.3	6.8	8.0	6.9
Merit	3.3	7.8	6.3	7.2	8.2	8.5	6.9
Amazon	4.7	7.7	6.8	6.3	8.0	7.7	6.9
WW Ag 496	5.0	8.0	7.2	5.5	7.3	8.0	6.8
BA 69-82	5.0	9.0	6.7	5.5	7.0	7.8	6.8
Julia	4.3	8.2	7.3	6.0	7.5	7.7	6.8
Able 1	4.3	7.5	6.8	7.0	7.8	7.5	6.8
PST-CB1	5.0	8.3	6.5	6.0	7.0	8.0	6.8
239	5.7	8.3	6.0	6.2	6.8	7.7	6.8
Aquila	4.7	7.2	7.0	6.2	7.3	8.2	6.8
Somerset	4.0	8.0	6.8	6.3	7.3	8.0	6.8
Gnome	4.7	8.3	6.3	5.8	7.0	8.3	6.8
Joy	5.3	7.3	5.8	6.5	7.7	7.5	6.7
Midnight	3.3	7.0	6.8	7.2	7.2	8.7	6.7
BA 72-500	3.7	8.8	7.2	6.0	7.0	7.5	6.7
Bristol	4.7	7.5	6.8	5.7	7.3	8.2	6.7
Eclipse	4.0	7.7	5.7	6.8	8.0	7.8	6.7
Glade	3.3	7.2	7.3	6.3	7.3	8.5	6.7
Lofts 1757	6.0	8.0	6.5	5.5	6.2	7.8	6.7
Baron	3.7	7.8	6.3	6.2	7.8	8.0	6.6
Liberty	5.0	8.0	6.0	6.0	6.8	8.0	6.6
America	4.7	8.2	6.5	5.3	6.3	8.7	6.6
Ikone	4.3	8.0	6.7	6.2	7.3	7.2	6.6
S. Dakota Cert.	6.3	7.7	5.7	5.7	7.5	6.8	6.6
K1-152	5.3	7.5	5.8	5.8	7.3	7.8	6.6
Cheri	3.7	8.3	6.7	5.7	7.3	8.0	6.6
Ba 73-626	3.7	7.5	5.8	6.3	8.0	8.2	6.6
Ba 72-441	2.7	8.0	6.7	6.7	7.5	8.0	6.6
P-104	4.3	7.0	7.3	5.8	7.3	7.7	6.6
Dawn	4.3	7.5	6.5	6.5	6.8	7.7	6.6
NE 80-88	5.0	7.0	6.2	6.5	7.0	7.5	6.5
Classic	5.3	7.5	5.0	6.2	7.3	7.7	6.5
Nassau	4.7	6.7	5.8	6.3	7.7	7.8	6.5
Cynthia	4.0	7.8	6.7	6.2	6.7	7.7	6.5
F-1872	5.7	8.2	6.0	5.3	6.0	7.7	6.5
WW Ag 468	4.0	7.7	6.8	5.7	6.8	7.8	6.5

Cultivar	Mar	Apr	May	Jun	Jul	Aug	Avg
HV 97	4.7	7.7	6.0	5.5	6.8	8.0	6.4
Haga	5.0	8.2	6.0	5.7	5.8	7.8	6.4
Tendos	3.3	7.3	6.5	6.0	7.5	7.8	6.4
Destiny	4.0	7.5	5.8	6.0	7.3	7.7	6.4
Trenton	4.3	8.2	6.2	5.7	6.7	7.3	6.4
Georgetown	5.3	8.2	5.7	5.5	6.0	7.7	6.4
Barzan	3.7	7.5	6.3	5.8	7.0	8.0	6.4
Parade	4.7	8.2	5.8	5.7	5.7	8.2	6.4
Welcome	3.7	6.8	6.2	6.0	7.3	8.0	6.3
Sydsport	4.0	8.3	6.5	4.8	6.2	8.0	6.3
K3-178	6.0	7.0	5.7	5.2	6.7	7.3	6.3
Challenger	3.7	7.2	6.7	5.5	6.7	8.2	6.3
Ram 1	5.0	6.8	6.2	5.7	5.8	8.2	6.3
WW Ag 491	2.7	7.5	6.0	6.5	7.3	7.7	6.3
Merion	4.0	8.0	6.0	5.2	7.3	7.2	6.3
Kenblue	5.0	6.8	5.8	6.5	6.7	6.7	6.3
Asset	4.0	7.2	6.7	5.8	6.7	7.2	6.3
BAR VB 577	4.7	7.3	5.8	5.3	6.2	7.8	6.2
BAR VB 534	4.3	7.5	6.3	4.8	6.3	7.7	6.2
WW Ag 495	3.3	7.3	6.3	5.8	6.5	7.5	6.1
A-34	5.3	7.8	6.2	4.2	6.3	7.0	6.1
Conni	4.3	6.2	5.8	6.0	6.3	8.0	6.1
Mystic	3.7	6.8	6.3	5.5	5.7	7.0	5.8
Annika	3.0	6.0	5.3	5.0	6.7	7.2	5.5
LSD 0.05	1.7	1.2	1.3	1.6	1.9	0.8	0.9

USDA National Perennial Ryegrass Cultivar Evaluation

Introduction

Perennial ryegrass has come a long way since 1961 when NK-100 was released as the first cultivar meant specifically for turf. The USDA initiated a national evaluation program of 47 entries in 1982. During the ensuing four years, there were enough releases of new cultivars to warrant the testing of this new set containing 65 entries in 1986. Perennial ryegrass does not persist well in the transition zone, but it is used extensively in species mixes as a nurse species for the slower establishing tall fescue and zoysia. It is also used as a pure stand in golf course tees, and collars or in any higher management situation where a high-quality cover is needed quickly.

Materials and Methods

Since its establishment in 1987, the trial has received 3 to 4 lb N/1000 sq ft per year. In 1989, Nitroform urea formaldehyde was the sole source of nitrogen. Clipping height was at 2 1/4 inches. Weeds were controlled with two applications of preemergent herbicide in April and June, Betasan and Dacthal, respectively, plus a single application of a broadleaf herbicide in November, Turflon D. Weekly irrigation or precipitation is necessary to assure persistence of the trial through June, July, August, and September. The ratings presented in the table are subjective, based upon color, texture, and density. There are two complete sets of entries. The high management set receives 5 lb N/1000 sq ft per year with a 1.5 inch clip, while the moderate management receives three lb N/1000 sq ft per year with a 2.25 inch clip.

Results and Discussion

There were no major disease or insect problems during the unusually mild summer of 1990. There was a period of stress during June, however when irrigation was neglected. The data in both tables reflect that with the lower ratings under the June heading. Ranking of cultivars is quite different between the two management levels. This demonstrates the importance of choosing a cultivar that is best suited for the particular management level you intend to have.

Table 1. Perennial ryegrass cultivar performance under moderate management.

	Ratings, 1-9(best)						
Cultivar	March	April	May	June	July	August	Avg
SR 4100	5.7	8.0	8.8	7.8	7.8	8.3	7.7
Goalie	6.7	7.5	8.3	7.5	8.5	7.7	7.7
Del 946	6.0	7.0	8.0	7.5	7.8	8.2	7.4
Riviera	7.0	7.7	8.5	6.2	7.8	6.8	7.3
Caliente	5.3	7.3	8.0	6.7	8.7	8.0	7.3
Pennant	5.0	7.3	8.7	6.5	8.7	7.8	7.3
Charger	6.7	8.2	8.3	5.3	7.7	7.5	7.3
Derby	5.7	7.8	8.2	6.7	8.2	7.0	7.2
Saturn	5.7	7.7	8.7	6.3	8.0	7.2	7.2
Commander	5.3	8.3	8.2	5.5	7.8	8.2	7.2
Nova	6.0	7.3	8.3	6.0	7.7	7.7	7.2
Prelude	5.7	7.0	7.5	6.5	8.0	8.3	7.2
SR4000	5.3	7.8	8.5	6.7	7.5	7.0	7.1
Blazer II	6.7	7.7	7.8	6.3	7.7	6.7	7.1
Repell	5.7	7.7	8.7	6.0	7.5	7.0	7.1
PSU-333	5.3	7.5	8.2	5.7	8.2	7.7	7.1
Regal	5.7	7.3	8.2	5.8	8.2	7.3	7.1
HE178	5.7	7.2	8.3	6.8	7.0	7.5	7.1
Citation II	6.0	7.8	8.2	5.3	7.3	7.5	7.0
Birdie	4.3	7.5	8.3	6.2	8.0	7.7	7.0
Manhattan II	6.0	7.7	8.0	5.5	7.3	7.5	7.0
PSI-2DD	5.7	7.3	8.3	5.5	7.3	7.8	7.0
Man II + Endo	6.3	7.7	7.8	5.5	7.0	7.5	7.0
Belle	6.7	7.0	7.5	6.2	7.2	7.2	6.9
Patriot	4.3	7.5	8.3	6.0	8.0	7.5	6.9
Dimension	6.7	7.0	7.7	5.0	7.3	7.8	6.9
Allaire	6.0	7.0	7.5	6.0	7.3	7.7	6.9
Runaway	6.7	7.2	8.3	5.2	6.7	7.3	6.9
Competitor	5.7	7.8	8.0	5.0	7.2	7.7	6.9
Vintage-SDF	5.0	7.0	8.2	6.3	7.3	7.2	6.8
Ronja	5.0	7.7	7.8	5.7	7.5	7.3	6.8
Delray	5.3	7.0	7.8	5.5	7.7	7.7	6.8
Fiesta II	7.0	7.8	7.5	5.2	6.7	6.8	6.8
Pennfine	6.3	7.2	7.5	5.8	6.8	7.0	6.8
Palmer	5.7	6.8	8.0	5.7	7.5	6.8	6.7
PSU-222	6.3	7.7	7.5	4.7	7.3	7.0	6.7
Ranger	5.7	7.2	8.2	5.3	7.2	6.8	6.7
Barrage	4.3	7.3	7.8	7.2	7.0	6.7	6.7
Diplomat	6.0	6.5	7.5	6.0	7.2	7.0	6.7
Lindsay	5.0	7.8	7.8	5.3	7.5	6.7	6.7
NK80389	6.0	7.3	7.3	5.2	6.8	7.5	6.7
Tara	5.3	7.0	8.2	5.7	6.8	6.8	6.6
Pick 715	5.7	7.5	6.5	5.3	7.3	7.3	6.6
J207	5.0	7.2	7.0	6.0	7.3	7.2	6.6
Barry	5.3	8.5	7.3	6.0	5.8	6.5	6.6
Yorktown II	5.0	6.0	7.8	6.2	7.2	7.3	6.6
Dasher II	6.0	7.0	7.3	4.7	7.3	7.2	6.6

Table 1. continued

Cultivar	March	April	May	June	July	August	Avg
Cowboy	4.0	7.2	7.5	6.0	7.8	7.0	6.6
Mom LP763	5.3	6.7	7.3	5.7	7.0	7.2	6.5
Linn	5.7	7.2	7.3	5.7	7.0	6.2	6.5
Rodeo	5.3	7.2	7.3	5.0	7.0	7.0	6.5
Dillon	5.3	7.2	7.5	5.5	7.0	6.3	6.5
Gator	5.7	7.3	7.7	4.8	6.8	6.5	6.5
Acrobat	5.3	6.7	6.8	5.0	7.3	7.7	6.5
Manhattan	6.0	7.3	7.5	5.0	6.3	6.3	6.4
Omega II	6.0	7.3	7.2	4.3	6.3	7.0	6.4
J208	5.7	6.8	6.8	5.0	6.3	7.3	6.3
Brenda	5.7	6.7	7.3	4.8	6.8	6.7	6.3
Pavo	4.7	7.3	7.3	4.2	7.3	7.0	6.3
Aquarius	4.7	7.5	8.3	5.3	6.0	6.0	6.3
Regency	6.0	6.5	6.5	4.5	6.7	7.0	6.2
Sheriff	5.3	6.8	6.7	4.2	6.8	7.0	6.1
Barcredo	4.3	7.7	7.7	4.8	5.7	6.3	6.1
Ovation	5.7	7.0	6.5	4.2	6.5	6.2	6.0
246	6.0	7.7	6.2	3.7	5.7	6.7	6.0
LSD 0.05	4.4	1.0	1.6	1.8	1.7	1.4	0.9

Table 2. Perennial ryegrass cultivar performance under high management.

	Ratings, 1-9 (best)						
Cultivar	March	April	May	June	July	August	Avg
Commander	6.3	7.8	7.3	6.3	8.0	8.0	7.3
Omega II	6.3	7.7	7.5	6.3	7.8	7.5	7.2
Prelude	6.7	7.5	7.2	6.3	7.2	7.5	7.1
Del 946	6.3	7.3	7.3	6.0	7.8	7.3	7.0
Cowboy	6.3	7.8	7.7	5.5	7.7	7.2	7.0
PSU-222	6.3	7.5	6.7	6.3	8.2	7.0	7.0
Runaway	6.0	7.0	6.7	6.5	8.0	7.7	7.0
Charger	6.3	7.8	7.3	6.0	7.8	6.8	7.0
Blazer II	6.7	7.7	7.3	6.0	7.7	6.3	6.9
Dasher II	5.7	7.5	7.8	6.0	7.3	7.2	6.9
Riviera	7.3	7.3	6.5	6.3	7.3	6.7	6.9
Nova	5.7	7.5	7.3	6.2	7.3	7.3	6.9
SR4100	5.7	7.7	7.2	6.9	7.3	6.0	6.8
Repell	6.0	8.0	7.5	6.3	6.5	6.3	6.8
Manhattan	7.3	7.5	6.8	5.0	7.3	6.7	6.8
SR 4000	5.3	7.5	7.2	6.3	7.0	7.2	6.7
Vintage 2DF	5.7	7.2	7.0	5.7	8.3	6.3	6.7
Yorktown II	5.3	7.0	7.8	6.0	7.3	6.7	6.7
NK 80389	6.3	7.5	7.8	6.5	6.3	5.7	6.7
Barrage	6.0	7.5	7.3	5.3	7.2	6.8	6.7
Pennfine	6.7	7.2	7.0	6.0	7.2	6.0	6.7
Pennant	6.0	7.0	7.0	6.8	7.0	6.2	6.7
Pick 715	6.3	7.3	7.0	6.0	6.3	7.0	6.7
Barry	6.0	6.7	7.2	5.8	7.0	7.3	6.7
Allaire	6.0	7.2	6.8	5.8	8.0	5.7	6.6
Manhattan II	6.3	7.5	7.2	6.0	7.0	5.5	6.6
Ronja	6.0	7.3	7.0	5.3	7.3	6.5	6.6
Man II + Endo	6.3	7.5	6.8	5.5	7.0	6.2	6.6
Diplomat	6.0	7.3	6.7	5.2	7.2	7.0	6.6
Linn	5.7	7.3	7.0	5.0	7.0	7.3	6.6
Citation II	6.0	7.6	7.0	5.3	7.0	6.3	6.6
Regency	6.7	7.2	7.2	5.5	7.0	5.8	6.6
Belle	6.3	7.5	6.7	6.2	6.2	6.5	6.6
Saturn	6.3	7.8	7.2	6.0	6.7	5.3	6.6
Tara	6.3	7.5	6.5	5.0	7.2	6.7	6.5
J207	6.3	7.2	7.2	5.2	6.7	6.7	6.5
Gator	5.3	7.0	7.0	5.7	7.0	7.2	6.5
Ovation	5.3	7.0	6.7	5.3	7.7	7.0	6.5
Ranger	5.3	7.3	6.3	5.3	7.7	7.0	6.5
Fiesta II	6.0	7.2	6.8	5.5	6.7	6.8	6.5
Brenda	5.3	7.3	7.5	5.0	7.5	6.3	6.5
Sheriff	5.7	7.5	6.5	4.5	7.3	7.5	6.5
J208	6.3	7.3	6.2	5.7	7.3	6.2	6.5
Acrobat	6.0	7.5	6.7	5.2	7.0	6.5	6.5
Mom LP 763	6.0	7.3	6.3	5.5	7.2	6.5	6.5
Derby	6.3	7.2	6.3	5.7	7.2	6.0	6.4
Rodeo	5.3	7.3	6.5	6.2	7.3	6.0	6.4

Table 2 continued

Cultivar	March	April	May	June	July	August	Avg
Barcredo	5.0	7.0	7.0	5.8	7.2	6.5	6.4
PST-2DD	6.3	7.5	7.0	5.0	7.2	5.5	6.4
Lindsay	5.7	7.8	6.8	5.8	6.0	6.3	6.4
Palmer	6.3	7.2	5.8	5.8	6.3	6.8	6.4
Goalie	6.7	7.0	5.8	5.7	7.0	6.0	6.4
Patriot	4.7	7.5	6.8	6.0	7.5	5.7	6.4
Rival	5.7	7.5	6.7	5.7	7.0	5.5	6.3
Dimension	6.0	7.3	6.7	5.3	5.8	6.8	6.3
PSU-333	6.0	7.0	6.5	5.5	7.0	6.0	6.3
Competitor	5.7	7.5	6.5	5.7	6.3	6.3	6.3
246	6.0	8.2	6.7	5.3	6.5	5.2	6.3
Delray	6.3	7.5	6.5	5.5	6.5	5.5	6.3
Aquarius	5.3	7.3	6.7	5.7	7.3	5.3	6.3
Paro	5.7	7.5	6.7	5.0	6.8	5.7	6.2
Caliente	5.0	7.3	6.5	5.8	6.5	5.8	6.2
Birdie II	4.7	7.2	6.8	5.5	6.5	6.2	6.1
Regal	5.7	7.2	6.7	6.0	6.0	5.2	6.1
Dillon	5.0	7.3	6.8	4.8	6.5	5.8	6.1
LSD 0.05	1.2	0.8	1.3	1.3	1.8	1.8	0.8

USDA National Fine Fescue Cultivar Trial

Introduction

The previous USDA fine fescue trial sent out in 1983 had 47 entries. This one has 92. This gives you an indication of the proliferation of cultivars in these species. The fine fescues are suited to very specific niches in the turfgrass environment. They can take a great deal of drought as long as it is not sunny. Thus they persist in southern Illinois within the drip-line areas of larger trees. They do not survive well on the north sides of buildings, here, as they do in upstate Illinois because moisture always lingers after rain. Moisture plus the high heat and humidity in southern Illinois stimulate rampant pathogen activity on these species.

Material and Methods

This trial was planted during fall 1989 on the top of a swell at the Horticulture Research Center with the intention of exposing the cultivars to maximum pressure from irradiance and heat. Additionally, irrigation was applied every other day throughout the hottest part of the summer to encourage disease. Only the toughest cultivars could survive this test. Four lb N/1000 sq ft was applied through the season. Clipping height was 2.25 inches.

Results

The most favorable environment for establishment through fall 1989 and late winter 1990 allowed over half the cultivars to excel by March. By April, however, many of them were already falling behind in performance, while others were moving up in the rankings. By May, the only two cultivars of the early best ones remaining in the top echelon were Valda and Frt-30149. By June, the cultivars that could persist in the heat were dominating in the trial. Several cultivars that had done well through the spring were also excelling through July: NK82492, Southport, JMB-89, Longfellow, Marker, and ERG 1143. In August, another round of diseases took its toll. Southport was the only cultivar to have made the higher rankings all the way through the season to that point. The best survivors into October were Salem, Southport, Capitol, PST-SHE, Jasper, LD 3485, HF 138, and Atlanta.

Table. Fine fescue cultivar performance

Cultivar	Ratings 1-9(best) Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Avg
Southport	8.7	8.5	7.0	6.3	7.7	6.0	7.3	8.5	7.5
Capitol	7.3	7.8	7.7	6.3	6.0	6.3	7.0	8.3	7.1
PST-SHE	7.3	8.2	7.0	6.3	7.8	5.3	6.7	8.0	7.1
ERG 1143	8.3	7.8	8.3	6.7	6.0	5.0	6.0	7.2	6.9
Atlanta	8.3	8.2	7.7	6.7	5.8	4.7	6.3	7.3	6.9
Frt-30149	9.0	9.0	8.0	6.3	6.0	4.3	6.0	6.2	6.9
Salem	8.0	7.7	6.3	5.3	5.0	5.3	7.7	8.7	6.8
Estoril	8.0	9.0	8.0	5.3	7.0	4.3	5.7	6.5	6.7
LD 3485	8.0	7.3	6.7	6.3	6.7	5.0	6.3	7.5	6.7
Belmont	7.3	8.2	7.3	7.7	7.5	4.0	5.7	6.0	6.7
PSY-4FE	7.3	7.7	7.0	6.7	8.3	5.0	5.3	6.2	6.7
SR 5000	7.0	7.8	7.3	6.3	7.7	4.7	5.7	6.7	6.6
Epsom	6.0	7.5	8.0	6.3	7.5	4.7	6.0	6.8	6.6
Banner	7.3	7.5	6.0	6.7	6.8	4.3	6.0	7.2	6.6
PST-4CD	8.0	8.0	7.3	6.0	7.2	4.0	5.0	6.8	6.5
Rainbow	8.7	9.2	7.7	6.0	4.7	4.3	5.3	6.5	6.5
OFI 89-200	7.7	8.7	7.7	6.0	8.0	4.0	4.7	5.5	6.5
NK 82492	7.7	8.0	7.7	7.0	8.0	4.0	4.3	5.0	6.5
JMB-89	7.7	8.8	7.0	6.7	7.3	3.7	4.3	6.0	6.4
Koket	6.3	7.0	7.3	6.3	6.3	4.7	5.7	7.7	6.4
Enjoy	7.7	7.3	7.3	6.7	5.7	4.3	5.7	6.5	6.4
HF 138	7.0	7.8	7.0	6.0	5.0	5.0	6.0	7.3	6.4
Scarlet	7.3	7.7	8.3	6.7	5.7	4.3	5.3	5.7	6.4
Valda	7.7	8.8	7.3	5.0	5.3	4.7	5.3	6.7	6.4
PST-4C8	8.0	7.7	7.3	5.3	5.0	5.0	5.7	6.8	6.4
Bargreen	7.0	7.7	7.0	6.7	6.0	4.0	5.3	7.0	6.3
LD 3488	7.0	8.0	7.7	6.0	5.3	3.7	6.0	7.0	6.3
Jasper	7.0	7.7	6.7	5.7	5.0	4.3	6.3	7.8	6.3
Waldorf	6.3	7.8	7.0	5.3	5.8	4.7	6.0	7.3	6.3
PST-4R3	7.0	7.2	6.7	6.0	5.3	4.0	5.7	7.3	6.1
Longfellow	7.7	8.3	6.7	6.7	7.2	3.3	4.3	4.7	6.1
PST-43F	8.3	7.5	7.0	5.7	4.3	3.7	5.3	7.0	6.1
Raymond	8.0	8.2	7.0	4.7	5.3	4.0	5.0	6.7	6.1
PST-4NI	8.0	8.0	6.3	5.0	4.7	3.7	5.7	7.2	6.1
Jamestown	7.0	7.8	7.0	5.0	7.0	3.3	5.0	6.3	6.1
ZW 42-160	7.3	8.0	7.7	6.3	5.7	3.7	4.3	5.2	6.0
Shadow	7.7	7.5	6.0	5.7	6.2	3.7	5.0	6.3	6.0
Eureka	6.7	8.5	7.3	5.7	5.7	4.0	4.7	5.3	6.0
SRX 89-31	6.3	8.3	7.7	4.7	5.3	4.3	5.0	5.8	5.9
Cindy	8.3	8.2	7.0	7.0	6.0	3.0	3.7	4.3	5.9
Molinda	6.7	7.2	6.0	5.3	5.0	4.0	5.7	7.3	5.9
Vista	6.7	7.0	7.0	5.3	4.7	4.3	5.0	7.2	5.9
Herald	8.0	7.5	6.0	6.0	4.7	3.7	4.7	6.7	5.9
Dawson	7.3	7.8	8.3	5.0	5.0	3.3	4.7	5.3	5.9
BAR Fr 9F	6.7	7.3	7.3	6.3	5.0	3.7	4.7	5.7	5.8
Wilma	6.7	7.7	6.3	6.3	6.0	3.3	4.7	5.7	5.8
Mary	7.7	8.0	7.0	5.3	5.3	3.0	4.3	5.3	5.8
Shademaster	8.7	7.5	5.7	5.3	3.7	3.0	4.7	7.3	5.7
Marker	6.3	8.2	9.0	7.3	6.3	2.7	2.7	2.7	5.6

Cultivar	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Avg
Camaro	7.3	6.8	5.7	5.7	4.7	3.7	4.7	6.3	5.6
HF 102	8.0	7.2	7.7	5.0	4.7	2.7	4.7	4.8	5.6
Barcrown	4.7	6.7	7.7	6.7	5.7	3.3	4.3	5.7	5.6
Jamestown II	7.3	8.2	6.7	5.0	7.7	2.0	3.3	4.3	5.6
Barnica	8.0	7.2	6.0	5.7	4.7	3.0	4.3	5.5	5.5
SR 3000	6.3	7.5	7.7	4.7	4.7	3.7	4.7	5.0	5.5
Flyer	9.0	7.2	6.0	5.0	3.3	3.0	4.7	5.8	5.5
Puma	7.3	7.3	6.7	6.0	3.7	2.7	4.3	5.7	5.5
Fernando	4.7	7.0	7.7	5.0	5.3	4.0	4.3	5.5	5.4
Belvedere	6.7	7.0	6.0	4.0	3.7	4.0	5.3	6.7	5.4
WW Rs 130	7.0	7.2	7.0	5.0	3.7	3.0	4.3	5.7	5.4
Aurora	7.7	8.3	6.7	4.3	4.7	3.3	3.7	4.0	5.3
Attila	7.7	8.5	7.7	5.0	4.0	3.0	3.0	3.2	5.3
Melody	6.7	8.3	6.7	5.7	4.3	3.0	3.3	3.7	5.2
Reliant	7.3	7.5	7.0	4.7	4.0	3.0	3.7	4.5	5.2
NK 88001	5.0	7.0	7.0	4.3	3.0	3.3	5.0	6.5	5.1
Barreppo	6.7	7.8	8.2	5.0	3.7	2.3	3.3	4.2	5.1
BAR Fr8RC3	6.3	6.8	6.3	4.3	3.7	3.0	4.3	5.7	5.1
ZW 42-148	8.7	7.2	6.0	3.7	3.3	3.0	4.3	4.3	5.1
Ensylva	7.0	6.8	4.7	4.7	3.3	2.7	4.7	6.5	5.0
PST-AUE	7.0	8.0	6.3	5.0	4.3	2.3	3.0	4.0	5.0
Bargena	4.7	5.8	5.3	5.0	3.3	3.7	5.0	7.0	5.0
BAR Fr 9P	7.0	8.0	8.0	5.7	3.7	1.7	2.7	3.0	5.0
Biljart	7.3	8.5	7.3	5.0	4.0	2.3	2.7	2.3	4.9
Big horn	6.0	7.5	8.0	4.3	3.7	2.0	3.3	4.3	4.9
LD 3438	4.3	7.2	6.7	5.0	4.0	2.3	4.7	4.8	4.9
PST-4AG	7.7	7.7	7.0	4.3	3.7	2.0	2.7	3.3	4.8
LD 3414	4.0	6.8	6.0	4.3	3.7	3.0	4.7	5.8	4.8
WW Rs 138	7.3	7.0	5.7	3.7	2.7	2.3	4.0	5.5	4.8
Sylvester	6.3	7.3	6.3	3.7	2.7	2.3	3.7	5.3	4.7
PST-4HD	7.7	8.5	7.0	4.0	2.7	1.7	2.3	3.7	4.7
Reliant + Endo	4.3	6.8	7.0	4.7	4.0	2.7	3.3	4.3	4.6
Claudia	5.0	5.8	5.7	3.7	3.3	3.0	4.7	6.0	4.6
WW Rs 143	6.0	6.8	6.7	4.0	2.3	2.0	4.0	4.7	4.6
BAR Fo 9A2	8.0	8.2	7.0	4.3	3.0	1.3	2.0	2.2	4.5
Silvana	8.3	9.0	6.0	3.0	2.2	1.7	2.3	3.3	4.5
Mx 86	7.3	7.7	5.7	3.7	3.0	1.7	2.3	3.3	4.3
Boreal	6.0	6.7	5.3	3.3	2.3	2.3	3.3	5.0	4.3
Elanor	6.3	6.7	6.0	3.7	2.3	2.0	3.3	4.0	4.3
Scaldis	8.3	8.5	6.0	2.7	2.3	1.7	2.3	2.3	4.3
Serra	9.0	7.8	5.7	2.3	1.5	1.3	2.3	2.3	4.0
Barlotte	5.0	7.2	6.3	4.3	2.3	1.7	2.3	3.0	4.0
Franklin	6.0	7.0	5.3	4.0	1.7	1.3	2.7	4.0	4.0
LSD 0.05	1.8	0.9	1.3	1.7	2.0	2.4	2.3	2.5	1.1
Mean	7.1	7.7	6.9	5.3	4.9	3.4	4.6	5.6	5.7

USDA National Tall Fescue Trial

Introduction

Tall fescue is the dominant turfgrass species in southern Illinois. The combination of prolonged hot summer, poor soil, and periodic drought make the environment too harsh for Kentucky bluegrass in non-irrigated areas. There has been a proliferation of tall fescue cultivars with the advent of the turf-type material. This trial contains all but the more recent dwarf types which will most likely be included in the next assemblage by the USDA.

Materials and Methods

The trial was established in fall 1989 on a Hosmer clay loam. Through the 1990 growing season it received 3 lb N/1000 sq ft. Clipping height was 2.25 inch. Irrigation was supplied to prevent drought stress. Cultivars are in 5' x 5' plots in a randomized complete block design with three replications. Preemergence herbicides were applied twice, Pre-M in March, and Dacthal in June. Turflon-D was applied in March to eliminate broadleaf weeds which had established the previous fall and winter.

Results

There is a great deal of similarity among cultivars in overall turf quality. There are minor differences in texture, density, color, and leaf angle that can be detected with intensive observation. If you wanted a particular "look" to your tall fescue yard, you would have to pick your favorite cultivar from the experiment. Otherwise a choice of any one but the bottom fourth of cultivars in the table would give you a very satisfactory lawn, initially. Data from future seasons should show the better performers as the turf matures and goes through more stressful periods.

Table. Tall fescue cultivar performance.

Cultivar	Ratings 1-9(best)								
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Avg
Cochise	8.7	8.0	7.0	6.3	7.8	7.0	6.7	6.2	7.2
Normarc 99	8.0	7.8	6.8	6.3	7.7	7.0	6.3	6.3	7.0
Shenandoah	7.7	8.2	6.7	5.7	7.5	7.0	6.7	6.2	6.9
Aztec	7.3	8.0	6.8	4.0	7.7	7.8	6.7	6.8	6.9
Guardian	8.3	7.3	6.7	5.0	7.3	6.7	7.0	6.7	6.9
Hubbard 87	8.0	7.7	5.7	5.0	7.7	7.2	7.0	5.8	6.8
Crossfire	7.3	7.3	6.3	5.7	7.2	7.0	6.7	6.5	6.8
Monarch	7.3	7.7	6.3	5.7	7.3	7.2	6.7	5.7	6.7
Emperor	8.3	7.3	6.0	5.3	6.7	6.7	6.7	6.3	6.7
Avanti	7.7	7.5	6.5	4.7	7.5	7.2	6.3	6.0	6.7
Phoenix	7.0	7.7	5.8	5.7	7.0	7.0	6.7	6.3	6.6
Bonanza	7.3	8.2	6.0	5.0	6.8	7.0	6.7	5.8	6.6
Silverado	7.3	7.2	6.3	6.0	7.2	7.2	6.3	5.3	6.6
Adventure	6.3	7.3	5.7	6.7	6.8	7.0	6.7	6.0	6.6
Taurus	8.0	7.0	5.5	5.3	7.3	6.8	6.3	6.1	6.6
PST-5AP	6.7	7.8	6.0	5.0	6.9	7.3	6.3	6.3	6.5
Titan	6.3	7.8	6.0	6.0	7.3	6.5	6.3	5.7	6.5
Shortstop	8.7	7.5	7.0	5.0	6.3	5.5	5.7	6.3	6.5
Bel 86-1	8.0	7.8	5.3	5.7	7.2	6.3	6.7	5.0	6.5
Eldorado	7.0	7.3	6.8	6.0	6.7	5.8	6.0	6.0	6.5
PST 5AG	7.0	7.5	6.3	5.3	7.2	6.5	6.0	5.8	6.5
Legend	7.7	7.3	5.7	4.7	7.7	6.3	6.0	6.2	6.4
Maverick II	7.7	7.2	5.7	5.3	7.5	6.3	6.3	5.3	6.4
Chieftain	6.0	7.8	6.3	4.3	7.0	6.8	6.7	6.0	6.4
Olympic II	7.3	7.5	6.0	5.0	7.2	5.8	6.0	6.2	6.4
Wrangler	6.7	7.5	5.8	5.0	7.0	6.3	6.0	6.5	6.4
Tribute	7.0	6.8	5.8	5.3	7.2	7.0	6.0	5.5	6.3
Trailblazer	7.0	6.8	6.3	4.7	6.7	6.7	6.7	5.7	6.3
Sundance	7.3	7.5	5.5	5.7	6.8	6.5	5.7	5.5	6.3
Mesa	5.7	7.8	5.5	5.3	7.0	6.5	6.3	5.8	6.3
PST-5DM	7.3	7.3	5.8	4.0	7.0	6.8	6.3	5.3	6.3
JB-2	7.0	7.8	5.7	6.7	6.0	6.7	5.3	4.7	6.2
KWS-DUR	8.7	7.2	6.5	5.0	5.3	6.2	6.0	5.0	6.2
Carefree	6.3	7.3	5.7	6.0	6.5	6.7	5.7	5.3	6.2
Bet 86-2	6.3	7.8	6.3	3.7	5.5	7.3	6.7	5.8	6.2
Apache	6.3	7.8	5.5	4.3	6.7	6.5	6.3	5.5	6.1
Cimmaaron	6.3	7.8	5.3	5.3	6.2	6.8	6.0	5.0	6.1
Trident	6.0	6.3	5.7	6.7	6.3	6.8	5.7	5.3	6.1
Winchester	6.7	7.3	5.3	5.0	6.0	6.3	6.3	5.7	6.1
PE-7	7.0	7.2	5.5	5.0	6.7	5.8	6.0	5.0	6.0
Willamette	5.3	7.0	5.2	6.3	6.7	6.0	6.0	5.7	6.0
Arid	6.7	7.3	4.8	6.0	5.8	6.0	5.7	5.7	6.0
Murietta	7.3	7.3	6.0	5.0	5.8	6.7	5.0	4.8	6.0
PST-5MW	7.7	7.0	5.3	4.7	7.0	6.3	5.7	4.2	6.0
Olympic	7.0	7.2	5.0	5.0	6.8	6.2	5.7	4.8	6.0
PST-5EW	5.7	6.7	5.3	4.7	6.5	6.7	6.3	5.8	6.0
Pacer	6.3	7.2	5.0	6.0	5.8	6.0	6.0	5.3	6.0
Barnone	5.3	6.8	5.2	6.3	5.8	6.3	6.3	5.3	5.9

Cultivar	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Avg
PST-DBC	5.0	7.0	5.7	4.3	7.0	7.2	6.0	5.0	5.9
Rebel II	6.0	7.2	5.2	5.0	6.0	6.2	6.0	5.7	5.9
Jaguar II	6.7	6.7	4.7	5.0	5.3	6.5	6.3	5.5	5.8
Thoroghbred	6.0	7.3	5.3	5.3	6.5	5.3	5.3	5.0	5.8
Jaguar	4.7	7.3	5.2	4.7	6.0	6.7	6.0	5.5	5.8
Fatima	5.0	7.0	4.8	6.7	5.3	6.0	5.7	5.2	5.7
Rebel	4.3	7.3	5.2	5.0	6.2	6.5	5.7	4.8	5.6
Finelawn I	5.0	7.0	5.0	6.3	5.5	5.8	5.3	4.7	5.6
Amego	5.3	7.2	5.5	4.3	6.5	5.8	5.3	4.7	5.6
Richmond	6.3	7.3	4.7	4.3	5.7	5.8	5.3	4.3	5.5
KY-31	3.7	7.0	4.2	6.3	5.0	6.0	6.0	4.7	5.4
Finelawn 5GL	5.3	6.5	5.2	5.0	4.8	5.3	5.3	4.5	5.3
Tip	5.0	6.5	4.0	6.0	5.3	5.7	5.0	4.5	5.3
Aquara	6.3	5.5	3.5	6.7	5.0	5.0	5.3	4.7	5.3
Normarc 25	2.7	2.0	2.0	2.0	2.8	2.0	5.0	2.7	2.6
Twilight	2.7	2.2	2.3	2.0	2.8	3.0	2.7	2.3	2.5
LSD 0.05	1.9	1.4	1.4	2.0	2.0	2.0	1.8	1.8	1.3
Mean	6.6	7.2	5.6	5.2	6.5	6.4	6.0	5.4	6.1

USDA National Bentgrass Cultivar Trial

Introduction

This is the first national trial of bentgrass cultivars. There has been enough recent breeding activity with this species to warrant the need for this trial. The evaluation is, of course, for golf course green applications. The majority of older greens have been established on native soil. This is still the case for low-budget courses. Greens hold up much better if the root zone is modified to inhibit compaction. Green construction to incorporate drainage, irrigation, and root zone modification is expensive.

Materials and Methods

The trial was established in fall 1989 on native Hosmer clay loam soil. During 1990, urea was liquid applied three times at 1 lb/1000 sq ft. Sand topdressing was applied twice. No fungicides were applied throughout the year in order to assess disease resistance. Pink patch, dollar spot, and brown patch each took their turn during early spring, early summer, and late summer respectively. Data from the months of March, July, August, September, and October reflect disease incidence more than the usual turf quality traits of color, texture, and density. Data from the months of April, May, and June reflect disease-free turf quality.

Results

The top cultivars are those that were able to maintain good turf quality through all the diseases. There are several that started out with excellent turf quality, but fell apart when the dollar spot and brown patch proliferated during mid- to late summer.

Discussion

This data should be valuable to golf course superintendents intending to cut back on their fungicide applications. There are certainly some differences among bentgrass cultivars for disease resistance. The more resistant ones would be necessary if the reduction in fungicides was to be achieved. With the advent of legislation against pesticides, this is becoming more important.

Table 1. Turf quality ratings of bentgrass.[1]

Cultivar	Quality								
	March	April	May	June	July	August	Sept.	Oct.	Average
Putter	6.0	8.0	8.3	8.0	7.3	7.0	7.3	7.8	7.5
Forbes 89-12	9.0	8.5	7.0	7.3	6.2	6.3	6.7	7.9	7.4
88.CBL	8.7	8.8	7.0	6.3	8.0	5.0	5.7	7.2	7.1
Carmen	7.3	7.7	7.7	7.7	6.5	6.0	6.3	6.8	7.0
Emerald	6.0	7.0	7.0	7.0	7.7	6.0	6.7	8.6	7.0
Penncross	8.3	8.3	7.0	6.0	7.3	4.3	6.0	8.4	7.0
Pennlinks	7.0	8.5	7.7	6.7	5.8	5.0	6.0	7.6	6.9
Providence	9.0	8.8	7.7	8.0	7.2	3.7	4.7	6.1	6.9
SR1020	7.3	7.0	7.3	6.0	5.3	6.8	7.0	7.5	6.8
Cobra	8.7	8.3	8.0	7.0	7.2	2.8	4.7	6.5	6.6
National	6.3	7.8	6.7	7.3	6.5	5.5	5.7	7.0	6.6
88.CBE	8.3	8.2	7.0	6.3	6.5	3.7	5.3	7.2	6.6
Normarc 101	8.0	8.2	7.7	7.0	5.7	3.7	5.0	6.5	6.5
WVPB 89-D-15	7.7	7.7	6.3	6.3	5.8	4.3	5.0	6.3	6.2
MSCB 6	6.7	6.8	6.0	6.0	5.8	7.3	5.8	5.0	6.2
Sel 8	8.0	7.2	6.7	6.7	5.7	3.5	3.2	3.0	5.5
Tracenta	3.7	7.2	5.7	5.0	5.3	7.5	3.7	1.6	4.9
Allure	4.3	6.0	5.0	4.3	5.3	7.5	4.3	1.3	4.8
Egmont	3.3	4.7	3.3	3.0	5.2	6.3	6.0	5.2	4.6
Bardot	3.0	6.3	4.7	4.3	5.0	7.0	4.0	1.6	4.5
BR 1518	3.0	5.3	3.3	3.3	5.5	7.3	5.3	2.3	4.4
$LSD_{0.05}$	1.1	1.1	1.1	1.0	1.6	3.2	2.4	2.4	0.9

Winter Survival in the USDA National Bermudagrass Evaluation Program

Introduction

Cultivars identical to those tested at Carbondale are being tested at many other locations throughout the southern United States. This program is organized by the USDA, Beltsville, Maryland. Bermudagrass is not usually considered for turfgrass in Illinois. There are situations, however, in southern Illinois where it is the species of choice. These are areas where play is so intense that the superior stoloniferous growth rate of bermudagrass allows rapid recovery as long as seasonal temperatures are in the 60s or higher. Specifically, athletic fields and golf course tees are the sites for using bermudagrass. There is a rule-of-thumb that the bermudagrass will be winter-killed one year out of five, but the turfgrass manager considers that a lesser loss than losing the turf of some other species from intensive traffic every summer.

[1]9 = best quality.

Materials, Methods and Results

Forty-three cultivars and experimentals had been established in 1989 into a randomized complete block design with three replications. Establishment rates and color ratings were reported in the 1989 issue of this publication. The more vigorous cultivars had completely filled in their plots by the end of summer, while the less vigorous ones had barely filled half their plots. All but seven of the entries died through the winter and early spring of 1989-90. Spring recovery ratings of the survivors and a list of those that died are given below. The survivors plus Westwood were moved in early June to allow further establishment into 12' x 12' blocks. Experiments will be conducted on those blocks to determine the best management practice for winter survival in southern Illinois.

Table 1. Winter survival of bermudagrass cultivars in Southern Illinois.

Cultivar	Survival Rating[1]	Cultivar	Survival Rating
Vegetative		Vegetative	
U-3	2	419	0
E-29	0	Tifway	0
FB-119	0	MSB-10	0
A-29	0	Tifway II	0
Tiffine	0	328	0
RS-1	0	Audobon	0
NM-471	0		
C-53	5	Seeded	
A-22	0	NMCT	6
NM-507	0	NMC-1	0
MSB-30	0	NMC-2	0
Vamont	3	Cheyenne	0
MSB-20	0	Sahara	0
Tufcote	0	NMS-2	0
Texturf	0	NMS-3	0
Tifgreen	0	NMS-4	0
NM-72	0	NMS-5	0
NM-43	0	NMPx5	2
CT-23	0	Arizona Common	0
Westwood	0	Guymon	0
Midiron	0	CD 6.67	0
NM-375	0	CD 5.08	3
		CD-32	2

Discussion

The winter of 1989-90 was especially hard on bermudagrass. In addition to an extremely cold, sub-zero period during the Christmas holidays, there were two periods of extremely warm temperatures in the 80s during March and April interspersed with freezing temperatures. The bermudagrass was likely coming out of dormancy during the warm spells only to be frozen quickly by rapidly moving weather fronts from the north. The

[1]9 = best survival rating

degree of success in maintaining a bermudagrass cover on intensively used turf in southern Illinois could depend largely upon the cultivar used. It would seem that the faster growing cultivars would be more useful, not only in terms of rapid cover, but also in terms of winter survival. Indeed, the three surviving vegetative cultivars were among the more rapid establishers of 1989.

NORTH CENTRAL REGION EVALUATION OF ALTERNATIVE SPECIES FOR LOW MANAGEMENT TURF AT SOUTHERN ILLINOIS UNIVERSITY, CARBONDALE

K.L. Diesburg

Introduction

The species of popular use for turf in the temperate zone of the United States are Kentucky bluegrass, perennial ryegrass, tall fescue, bentgrass and the fine fescues. There are, however, many other perennial grass species that persist in the same area, some of them native to North America. For well-managed turf, there is no question that the popular species cannot be matched, but for low management turf there has always been the question, that perhaps there are other, tougher species that might do better. This project, coordinated over ten upper Midwest states, was therefore conceived to pursue that question. Seed and propagules were distributed and planted in 1988. This is the first year of data regarding establishment and early performance.

Materials and Methods

The entries were planted on open ground, September 28, 1989. The seedlings and plugs, therefore, had the full autumn and spring seasons for establishment. The buffalograss failed to survive the 1989-90 winter, probably because that species requires a longer period of hot weather for establishment before going into the winter. New propagules of buffalograss were established during summer, 1990. Fertilizer is limited to one pound of nitrogen per thousand square feet per year with no supplemental irrigation.

Results

Over the past two years there has been a wide range of performance among the species. *Poa alpina* and the crested wheatgrasses have almost totally died out. The best overall performance throughout 1990 came from sheep fescue, tall fescue, and hard fescue. High quality turf cannot be expected in this trial. A rating of '7' indicates vigorous persistence without the ideal color and texture expected in a fine lawn. The trial receives a great deal of heat and moisture stress on a poor soil. This experiment is a true test of the durability of these species in low management.

Table 1. Performance of alternative turfgrass species under low management.

Species	Quality[1]					
	March	April	May	June	August	Average
Sheep Fescue	5.9	7.1	7.2	4.7	4.9	5.9
Tall Fescue	5.0	5.5	6.6	6.0	5.8	5.8
Hard Fescue	7.3	6.2	5.6	3.7	4.1	5.4
Canada Bluegrass	4.0	6.7	6.8	3.4	4.0	5.0
Buffalograss	5.0	5.0	5.0	5.0	4.8	5.0
Redtop	4.1	4.9	6.0	3.7	5.9	4.9
Colonial Bentgrass	3.9	4.6	5.7	3.6	6.3	4.8
Covar Sheep Fescue	5.2	6.5	4.3	3.0	2.2	4.3
Fairway Crested Wheatgrass	2.4	3.8	1.7	1.6	1.8	2.3
Bulbous Bluegrass	3.3	3.4	1.7	1.8	1.0	2.2
Poa trivialis	2.4	2.0	2.8	2.0	1.0	2.0
Ruff Crested Wheatgrass	1.4	3.3	1.1	1.7	2.3	2.0
Streambank Wheatgrass	2.0	2.2	1.8	2.0	1.2	1.8
Ephraim Crested Wheatgrass	1.7	1.9	1.0	1.0	1.2	1.4
Poa alpina	1.2	1.6	1.3	1.2	1.0	1.3
$LSD_{0.05}$	1.0	1.0	1.3	1.0	1.6	0.7
Mean	3.7	4.3	3.9	2.9	3.2	3.6

[1]9= best.

COMPARISON OF THE ESTABLISHMENT RATES OF SEEDED AND PLUGGED ZOYSIAGRASS CULTIVARS

K.L. Diesburg

Introduction

The popularity of zoysiagrass turf is gradually increasing in southern Illinois. Many questions arise in establishment and management of this species because of lack of familiarity with it. The first thing to recognize is that there are seeded and vegetatively propagated cultivars. A sound decision regarding which type to use depends upon knowledge of their respective establishment rates and methods. Zoysiagrass spreads with slow stoloniferous growth. This experiment is not only a demonstration comparing the two types of establishment, but it is also a comparison among cultivars within the two groups.

Materials and Methods

Presently, the only available seed for zoysiagrass is Korean Common. International Seeds Inc. and Jacklin Seed Co. have jointly released 'Sunrise' which is a brand name for Korean Common. Several experimentals are going through preliminary testing within turfgrass seed companies at this time. The only experimental being tested here is JM 107. The most popular vegetative type in the transition zone is Meyer. Other vegetative types that might be competitive were included in this experiment. The cultivars were seeded or plugged June, 1989. Plugs were place 2 feet apart. The seeding rate was 2 lb/1000 sq ft. Nitrogen was applied at 3 lb/1000 sq ft per year. Weeds were controlled with Dacthal preemergent and Trimec Plus postemergent. Irrigation was used only during early establishment after planting. Establishment progressed to the point where they should have survived the 1989-1990 winter. Two cultivars proved nonhardy, however. The winter survival of each cultivar and subsequent growth through 1990 are presented in the table. Data of percent cover were based upon visual rating.

Results

The seeded zoysiagrass certainly provided more rapid cover than any plugging (Table 1). It is clear that if the rate of establishment of plugging is to be comparable to that of seeding, the plugs must be placed much closer together; probably 6 inches. Although the germination of JM 107 was more vigorous, Korean Common and JM 107 were equal in establishment rate after germination. Among the vegetative types, Midwest, Belair, and Meyer had similar establishment rates. FZ 102 had a disadvantage from poor winter survival. El Toro and FZ 3435a barely survived the winter and made no significant recovery in 1990. Even though these two cultivars are less winter hardy than the others, it must be kept in mind that winter survival is usually less for a well established plug than for a solid stand of the same cultivar. It is important, therefore, to achieve close to full cover before winter arrives in order to assure survival through the winter. El Toro and FZ 3435a in solid stand survived that winter of 1989-90.

Table 1. Percent cover of zoysiagrass cultivars across months.

Cultivar	Percent Cover						
	March	April	May	June	July	August	Sept.
Korean Common	26.7	41.7	46.7	80.0	86.7	96.7	94.7
JM 107	45.0	58.3	56.7	75.7	81.0	92.3	91.3
Midwest	36.7	17.3	16.0	10.7	14.0	29.0	40.0
Belair	33.3	16.7	16.7	12.3	20.0	31.7	35.7
Meyer	38.3	11.7	12.0	8.0	11.3	21.0	29.3
FZ 102	11.7	3.3	4.7	3.0	4.0	9.3	11.7
El Toro	0.0	0.3	1.3	0.5	0.5	4.0	3.0
FZ 3435a	0.0	1.7	0.3	0.2	0.5	1.3	1.3
$LSD_{0.05}$	29.7	26.4	28.1	16.8	17.5	16.2	17.6

PERSISTENCE OF ZOYSIAGRASS GERMPLASM

K.L. Diesburg

Introduction

The bulk of material zoysiagrass germplasm collected in China, Japan, and Korea is not well adapted to southern Illinois. This report is a summary of the persistence of germplasm from several sources.

Materials and Methods

The collection was planted summer, 1987, by Drs. Portz and Pennucci. Nitrogen has been applied at 3 lb/1000 sq ft per year. Weed have been controlled with Roundup during zoysiagrass dormancy and Trimec Plus or Princep during the summer. Irrigation is never applied.

Results

Several entries have either died or are barely surviving (Table 1). These types are usually very fine-textured and slow-growing. Meyer is once again proving its superior persistence and spreading ability. Any of the genotypes with 75-100% cover in this experiment would be reliable.

Table 1. Persistence and spread of zoysiagrass genotypes.

	Greenup	% Cover			
Genotype	March	May	June	August	September
Z34-35B	5	20	85	85	100
KC-7	2	30	90	90	97
Meyer	7	69	91	91	93
R14-21(6)F	10	40	85	85	90
Midwest	2	30	60	70	85
Emerald	1	32	43	70	79
El-Toro	1	16	51	73	76
Z56-18	5	40	65	70	75
Z-102	1	2	20	70	70
Belair	6	22	44	61	64
USDAGT1-1	6	15	35	40	60
E2xM16	3	25	30	45	50
Korean Common	8	10	35	35	40
FZ-18	2	5	15	38	40
8508	1	5	11	28	30
Z34-35A	1	2	10	10	20
FZ-32	0	1	2	12	15
Z56-18	1	1	2	4	5
8516	2	1	1	1	1
8501	0	0	0	0	0
8502	0	0	0	0	0
$LSD_{0.05}$	2	14	24	25	26

EFFECTS OF TURF COLORANTS AND $FESO_4$ ON SPRING GREENUP OF ZOYSIAGRASS

K.L. Diesburg

Objective

The objective of this experiment is to determine the extent to which turf colorants stimulate natural spring greenup of zoysiagrass.

Materials and Methods

A mature stand of `Meyer' zoysiagrass was treated separately on April 12 before spring greenup had begun, with recommended rates of turf colorants, Instant Spring (1 cup/gallon), Greenzit (1/2 cup/gallon), and Auragreen (1/8 oz/gallon). Initial effects of the colorants upon spring greenup was assessed thirteen days after application, April 25. It was impossible to distinguish visually the difference between residual colorant and natural leaf color on that date, therefore, subjective ratings were done on the combination of colors within plots. To assess the color attributed to leaves, the number of leaves in one random 16-square-inch sample per plot was attempted as well as measurement of canopy height. Differences in greenup could be rated 26 days after application (May 8). Additionally, clipping weights were taken on that date. Long-term effects on turf quality were rated 52 days after application (May 24). All ratings were on a scale of 1 to 9 where 9 is best, 5 is unacceptable, and 1 is worst.

Results

There were differences in the shade of green of each colorant on the turf (Table 1) with Instant Spring providing the best color. The rates of colorant deterioration were also different. On the thirteenth day after treatment there was no trace of Auragreen remaining, while the other two colorants had deteriorated slightly, Greenzit slightly more than Instant Spring. The iron sulfate appears to have contributed to the deterioration of both Greenzit and Instant Spring. There were no great differences in leaf number on that day, but the colorants, as a group, appear to have increased the number of leaves per sample area. Instant Spring plus iron was the only treatment to increase canopy height over that of the control, by that date. On the 26th day after treatment, turf color was significantly better in the Instant Green and Greenzit plots than in the Auragreen or nontreated plots. The clipping weights taken on that day resulted in no consistent differences among treatments. The improved turf quality from Instant Spring and Greenzit carried over to the turf quality ratings on the 52nd day after treatment.

There appear to be no beneficial effects from using iron sulfate in this experiment. Iron sulfate frequently has little effect in the greening of turf on the more acid soils in this area.

Implications can be made from the correlations in Table 2. From the significant correlations of Day-13 Color with Day-13 Canopy Height, Day-26 Color, and Day-52 Turf

Quality, it can be inferred that the initial artificial color of Instant Spring and Greenzit caused the improved characteristics within those plots at the later dates. Day-13 Leaf Number was not highly correlated with any other variable, while Day-13 Canopy Height was significantly correlated with Color of both Days and Day-52 Turf Quality. This indicates that leaf elongation, rather than leaf number was the stronger determinant of the plot color and turf quality associated with Instant Spring and Greenzit. Since the rate of leaf elongation is highly dependent upon temperature, other factors being equal, it can be speculated that the darker color afforded by the two persistent turf colorants may have caused faster spring greenup.

Table 1. Effects of turf colorants on zoysiagrass turf during spring greenup.

Treatment	Color[1] Day 1	Color[1] Day 13	Color[1] Day 26	Leaf Number Day 13	Canopy Height[2] Day 13	Quality[3] Day 52
Instant Spring	9.0	8.0	8.3	114	1.7	9.0
Instant Spring + $FeSO_4$	9.0	6.8	8.0	102	2.0	8.8
Greenzit	7.0	5.5	7.0	109	1.7	7.8
Greenzit + $FeSO_4$	7.0	4.0	7.3	87	1.5	7.5
Auragreen	4.0	1.0	5.5	101	1.4	6.8
Untreated	1.0	1.0	5.3	84	1.5	6.3
$LSD_{0.05}$	1.0	1.1	0.8	30	0.3	0.8

Table 2. Correlation coefficients between effects of turf colorants on zoysiagrass turf during spring greenup.

	Day 13 Color	Day 13 Leaf Number	Day 13 Canopy Height	Day 26 Color	Day 52 Quality
Day 13 - Color		0.33	0.51*	0.87**	0.84**
Day 13 - Leaf Number			0.18	0.38***	0.32
Day 13 - Canopy Height				0.52**	0.52**
Day 26 - Color					0.89**

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[1]9 = best color.

[2]Height is given in inches.

[3]9 = best quality.

*0.05 level of signifcance.

**0.01 level of significance.

***0.10 level of significance.

EFFECTS OF TURF PAINTS ON SPRING GREENUP OF ZOYSIAGRASS

K.L. Diesburg

Some turfgrass managers have noticed that the use of turf paints on Kentucky bluegrass seems to cause faster spring greenup. If this were true with zoysiagrass, the drawback of winter dormancy would be lessened. In studying this phenomenon, the color of the turf paints interferes with color ratings. Other measures of spring greenup must, therefore, be attempted.

Materials and Methods

Turf plots of 'Meyer' were treated with turf paints and an antitranspirant (Clear Spray) at recommended rates on April 17 when initiation of growth from dormancy had begun but was not apparent. Initial artificial color ratings were taken the next day (Table 1). Enough growth had occurred by May 17 to record changes in turf quality and clipping weights.

Results

There were comparable improvements in both turf quality and clipping weights in response to all the turf paints. There was a significant correlation, 0.89, of turf quality with clipping weight. This indicates that there is a real stimulation of plant growth from the turf paints.

Table 1. Zoysiagrass response to turf paints and an antitranspirant.

Treatment	Turf Quality Day 1	Turf Quality Day 29	Clipping Weight Day 29
Instant Spring	6.5	8.0	118.3
Vitalon	7.5	7.5	103.3
Greenzit	7.5	7.5	94.2
Clear Spray	1.0	6.0	87.2
Nothing	1.3	4.8	79.1
$LSD_{0.05}$	0.9	0.6	38.7

CRABGRASS CONTROL RESEARCH AT THE UNIVERSITY OF ILLINOIS

J.E. Haley, T.W. Fermanian, and D.J. Wehner

Crabgrass (*Digitaria* spp.) is a common and persistant weed in Illinois turf. It germinates in late spring and throughout the summer on sunny, moist sites. Once established, crabgrasses, with their spreading growth habit crowd out desirable turf. This is especially a problem in spring plantings or areas where the turf is weakened by disease or poor maintenance. Crabgrass can be controlled by either an application of preemergence or postemergence herbicides.

Preemergence Crabgrass Control

Preemergence herbicides are the preferred crabgrass control method. They should be applied prior to weed germination in the spring. In central Illinois germination begins mid-April to mid-May. Sometimes a second application of preemergence herbicide is needed to insure season long control. Preemergence herbicides for control of crabgrass have been available to turfgrass managers for many years. Periodically, new herbicides or new turf formulations of field crop herbicides are developed. These herbicides need to be evaluated for crabgrass control and compared to the existing materials. The purpose of this research was to evaluate Dimension (dithiopyr, Monsanto Agricultural Co.), a new preemergence and early postemergence herbicide; Barricade (prodiamine, Sandoz Crop Protection), a dinitroanaline type preemergence herbicide; new formulations of oxadiazon (EXP03621B and EXP03621C, Rhone Poulenc); and a formulation of Team (benefin plus trifluralin, DowElanco) with fertilizers (19-4-6). Also included in this evaluation were Gallery (isoxaban, DowElanco), Lesco's PreM (pendimethalin, LESCO, Inc.), Team, Balan (benefin, DowElanco), and Ronstar (oxadiazon, Rhone-Poulenc). Herbicide rates are included in Table 1. An untreated plot was included with each replication.

Research Protocol - Preemergence Crabgrass Control

Turf : common Kentucky bluegrass

Time Applied
- all treatments - April 27, 1990
- 2nd application-
  - Balan - June 15, 1990
  - Team w/ fertilizer - July 3, 1990

Replications : 3, includes 1 untreated plot per rep.

Method of application
- liquid herbicides - CO_2 backpack sprayer,
  spray volume : 40 gpa
- granular herbicides - shaken on by hand

Plot Maintenance :
During June the turf was mowed at 0.5 inches in height and irrigated frequently to encourage crabgrass germination.

Table 1. The evaluation of herbicides applied 27 April 1990 for peremergence control of crabgrass in a common Kentucky bluegrass turf.[1]

Herbicide	Rate lb ai/A	% Crabgrass Control[2] 8/14 109 DAT[3]	8/30 125 DAT
Barricade 65WG	0.5	100.0	99.0
Barricade 65WG	0.65	98.3	98.0
Barricade 65WG	0.75	98.3	100.0
Barricade + Gallery	0.5 + 0.75	98.3	97.0
Gallery 75DF	0.75	96.7	100.0
Team 2G + Gallery	2.0 + 0.75	88.3	88.9
Team w/ fertilizer	2.0	95.0	93.9
Team w/ fertilizer	3.0	98.3	96.0
Team w/ fertilizer	1.5 / 1.5[4]	100.0	99.0
Ronstar 2G	2.0	98.3	97.0
Ronstar 2G	4.0	100.0	99.0
EXP03621B	2	75.0	81.8
EXP03621B	4.0	100.0	99.0
EXP03621C	2.0	90.0	89.9
EXP03621C	4.0	100.0	100.0
Dimension 1EC	0.38	83.3	79.8
Dimension 1EC	0.5	85.0	74.7
Dimension 1EC	0.75	83.3	82.8
Balan 2.5G	2.0 / 2.0[5]	91.7	89.9
Team 2G	3.0	95.0	93.9
Lesco's PreM 60DG	1.5	85.0	84.8
		NS[6]	NS

No significant difference in crabgrass control was found among the herbicide treatments on either of the rating dates (Table 1). This may have been the result of sporadic crabgrass germination throughout the test site. Poor germination was probably due to a cool, wet spring. Crabgrass control was good to excellent for all herbicides at all rates.

[1]All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

[2]Percent crabgrass control is determined by making a visual estimate of crabgrass cover in each treated plot and comparing this with the visual estimate found in the untreated plot. Crabgrass averaged 20% cover in the untreated plot on 8/14 and 33% cover on 8/30.

[3]DAT refers to days after treatment.

[4]The second application was made on 3 July 1990.

[5]The second application was made on 15 June 1990.

[6]NS indicates that no significant difference was found among the means in this group of data at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

Data suggests that lower rates of Dimension and EXP03621B did not supply season long control. No injury was observed with any of the herbicides.

Postemergence Crabgrass Control

If preemergence herbicides are not applied, fail to control crabgrass throughout the season, or are applied after some weed germination has occurred then postemergence herbicides are needed. In the past, organic arsenicals were the primary herbicides used for postemergence crabgrass control. In recent years fenoxaprop (Acclaim, Hoechst Roussel Agri-Vet), has been used on fine quality turf. Acclaim is generally thought to be less phytotoxic and more efficacious with a single application than the organic arsenicals. New herbicides have been developed that have both pre and post emergence control qualities. The purpose of this trial was to evaluate several new herbicides and compare them with available postemergence crabgrass control herbicides. Herbicides included in the trial are

Research Protocol - Postemergence Crabgrass Control

Turf : unknown Kentucky bluegrass blend

Time Applied
all treatments - July 24, 1990
2nd application-
Daconate 6 - August 1, 1990
BAS 514 - August 24, 1990

Replications : 3, includes 1 untreated plot per rep

Method of application
liquid herbicides - CO_2 backpack sprayer,
spray volume : 40 gpa
granular herbicides - shaken on by hand

Plot Maintenance :
During June & July the turf was mowed at 0.5 inches in height and irrigated frequently to encourage crabgrass germination.

Acclaim, Impact 75DF (quinclorac, BASF), HOE-360-18H 0.23EW (fenoxaprop, Hoechst Roussel Agri-Vet), HOE-360-05H 0.67EC (fenoxaprop, Hoechst Roussel Agri-Vet), Dimension (dithiopyr, Monsanto), Mon 15178 0.05G (dithiopyr, Monsanto), Mon 15181 0.1G (dithiopyr, Monsanto), Mon 15152 0.25G (dithiopyr, Monsanto), and Daconate 6 (MSMS, Fermenta Plant Protection). Rates and formulations are listed in Table 2.

Crabgrass germination was spotty throughout the growing season with crabgrass plants at various stages of growth when the herbicides were applied. Most plants were at the 3 leaf to 2 tiller stage of growth when the first application of herbicide was made. The best early weed control was seen with treatments containing Daconate 6, Acclaim, HOE-360-18H 0.23EW and HOE-360-05H 0.67EC. Fair to good control was observed with one application of BAS 514 at 0.75 and 1.0 lb ai/A and Dimension 1EC at all rates. The granular formulations of dithiopyr provided very poor crabgrass control as did BAS 514 at 0.375 and 0.5 lb ai/A. Additional applications of BAS 514 did not appear

Table 2. The evaluation of herbicides for postemergence control of crabgrass applied to a Kentucky bluegrass blend during the 1990 growing season.[1]

Herbicide[4]	Rate	% Crabgrass Control[2]			Phytotoxicity[3]	
	lb ai/A	8/14	8/22	8/30	8/03	8/06
BAS 514 75DF	0.75	71.4b-e	76.5c-f	88.6c-e	8.3de	8.3f-h
BAS 514 75DF	1.0	85.7de	88.2d-f	94.3e	8.0c-e	8.0f-h
BAS 514 75DF + surfactant[5]	0.75	57.2a-e	64.7b-f	82.9c-e	8.3de	8.7gh
BAS 514 / BAS 514 + surfactant	0.375/0.375	26.2ab	27.5ab	43.8ab	8.0c-e	8.3f-h
BAS 514 / BAS 514 + surfactant	0.5/0.5	38.1a-d	43.2a-d	55.2a-d	8.3de	8.7gh
BAS 514 / BAS 514 + surfactant	0.75/0.25	33.3a-c	37.3a-c	52.4a-c	7.3b-d	7.3ef
BAS 514 / BAS 514 + surfactant	0.75/0.375	66.7b-e	66.7b-f	71.4b-e	7.7cd	8.3f-h
BAS 514 / BAS 514 +surfactant	0.75/0.5	66.7b-e	70.6b-f	85.7c-e	8.0c-e	6.7de
BAS 514 / BAS 514 + surfactant	0.75/0.75	85.7de	88.2d-f	94.3e	8.0c-e	9.0h
Barricade+Acclaim	0.5+0.12	92.9e	94.1ef	97.1e	7.0a-c	6.7de
Barricade+Daconate 6	0.5+2.0	85.7de	88.2d-f	94.3e	8.3de	7.7e-g
Acclaim 1EC	0.18	92.9e	94.1ef	97.1e	6.0a	5.3bc
HOE-360-18H 0.23EW	0.045	92.9e	94.1ef	97.1e	7.3b-d	6.7de
HOE-360-18H 0.23EW	0.06	85.7de	88.2d-f	94.3e	6.0a	4.7ab
HOE-360-18H 0.23EW	0.075	100.0e	100.0f	100.0e	6.3ab	4.3ab
HOE-360-18H 0.23EW	0.09	100.0e	100.0f	100.0e	6.0a	4.0a
HOE-360-05H 0.67EC	0.06	92.9e	94.1ef	97.1e	7.0a-c	4.0a
HOE-360-05H 0.67EC	0.09	85.7de	88.2d-f	94.3e	6.0a	4.0a
Dimension 1EC	0.38	71.4b-e	76.5c-f	88.6c-e	7.7cd	8.3f-h
Dimension 1EC	0.5	85.7de	88.2d-f	94.3e	8.3de	8.7gh
Dimension 1EC	0.75	78.6c-e	82.4c-f	91.4de	8.0c-e	8.3f-h
Mon 15178 0.05G	0.092	11.9a	15.7a	38.1ab	7.7cd	7.7e-g
Mon 15181 0.1G	0.125	26.2ab	27.5ab	30.5a	7.7cd	8.0f-h
Mon 15181 0.1G	0.25	59.5a-e	64.7b-f	82.9c-e	8.3de	8.0f-h
Mon 15152 0.25G	0.38	66.7b-e	70.6b-f	85.7c-e	7.3b-d	7.7e-g
Mon 15152 0.25G	0.5	71.4b-e	76.5c-f	88.6c-e	8.0c-e	8.0f-h
Daconate 6/Daconate 6	2.0/2.0	92.9e	94.1ef	97.1e	7.0a-c	6.0cd
untreated	-	-	-	-	9.0e	9.0h

[1] All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

[2] Percent crabgrass control is determined by making a visual estimate of crabgrass cover in each treated plot and comparing this with the visual estimate found in the untreated plot.

[3] Phytotoxicity evaluations are made on a 1-9 scale where 9 = no visible injury and 1 = necrosis.

[4] All herbicide treatments were applied on 24 July 1990. Second applications of Daconate 6 were made on 1 August 1990. Second applications of BAS 514 75DF were made on 24 August 1990.

[5] Where a surfactant was use BAS 090 02S was included in the spray tank at 3 pt/A.

to improve control over single applications of 0.75 and 1.0 lb ai/A. Good postemergence control of white clover was also observed with applications of BAS 514.

Although good crabgrass control was observed with Daconate 6, Acclaim, HOE-360-18H 0.23EW and HOE-360-05H 0.67EC significant turf injury occurred with these products 9-12 days following application. Any visible injury found on turf treated with BAS 514, Dimension or any of the granular formulations of dithiopyr was within the acceptable range.

EVALUATION OF HERBICIDES FOR PREEMERGENT CONTROL OF WEEDS AND DAMAGE TO TALL FESCUE SEEDLINGS

K.L. Diesburg

Introduction

Siduron is presently the only herbicide registered for preemergent control of weeds when seeding turfgrasses. Other compounds used for preemergent control of weeds must be applied after the turf is four to six weeks old. They will otherwise damage the young turfgrass plants. Several chemicals have been released, recently, for preemergent control of weeds. It is timely to compare them with our usual preemergent herbicides on recently emerged seedlings. Tall fescue was chosen because it is one species that has potential for seed production in southern Illinois. This project serves the dual purpose addressing both turf and agricultural applications. Federal regulation is mandating the removal of highly erodible lands from row cropping. Tall fescue seed production could serve as an alternative crop. One planting will produce a crop for at least three years and as many as fifteen years without requiring disturbance of the soil.

Materials and Methods

"Era" tall fescue was planted September 27 in 16" rows at 5 lb/A into an Alford Silty Clay Loam with 4-6% slope. Treatments (Table 1) were applied three weeks later when seedlings were in the two-leaf stage. The experiment was fertilized three times with 23-9-12 between late September, 1989 and late May, 1990 totaling 120 lb N per acre. Treatments were replicated four times in a randomized complete block design. Plots were 6' x 50'. Crop quality ratings were recorded four weeks after treatment along with percent weed presence, shoot weights, and root weights. Crop quality ratings were again recorded in March the following spring along with weed presence. Seed yields were recorded at June harvest.

Table 1. Herbicides applied to 16 inch rows of tall fescue planted at 5 lbs/A.

Treatment	Rate (lb ai/A)	Treatment	Rate (lb ai/A)
Sethoxadim	0.19	Ethofumesate	1.5
Bentazon	1.38	MSMA	2.0
Isoxabin	2.0	DCPA	10.5
Metolachlor	3.41	Diuron	1.5
Pendimethalin	2.4	Alachlor	1.5
Quinclorac	1.0	Bensulide	12.0
Simazine	2.0	Dithiopyr	0.25
Benefin/Trifluralin	1.75	Dithiopyr	0.5

Results

The data in table two show the three controls toxic to perennial grasses, metolachlor (Pennant), sethoxydim (Poast), and Alachlor (Lasso). Several chemicals appeared to damage the young plants, but completely controlled weeds and allowed seed yield to be comparable to the nontreated control. Those materials were Dithiopyr (Dimension), Pendimethalin (Pre-M), Isoxabin (Gallery), Diuron (Karmex), Simazine (Princep), and Ethofumesate (Prograss). Chemicals that did not damage the seedlings and allowed seed yields comparable to the control, but also did not completely control weeds were MSMA (Daconate 6), Bensulide (Betasan), Siduron (Tupersan), and DCPA (Dacthal). Quinclorac (Impact) and Benefin/Trifluralin (Team), damaged the seedlings partially, causing lower seed yields while not completely controlling weeds. Bentazon (Basagran) was the only chemical to completely control weeds without damaging the crop.

Table 2. Tall fescue responses to preemergent herbicides.

	Quality		% Weeds		Yield
Treatment	Nov 89	March 90	Nov 89	March 90	(g)
MSMA	7.0	7.9	6.4	21.0	1875
Bentazon	5.5	7.4	0.2	0.8	1852
Siduron	6.7	7.2	21.6	34.5	1587
Control	6.5	7.1	12.6	31.9	1583
Bensulide	6.7	7.0	5.9	17.7	1394
DCPA	6.7	6.9	21.4	36.5	1465
Quinclorac	6.2	6.7	17.6	31.9	1028
Isoxabin	6.7	5.9	1.0	0.1	1476
Dithiopyr 1/4	6.2	5.9	0.7	0	1860
Dithiopyr 1/2	7.5	5.7	4.6	0	2210
Benefin/Trifluralin	6.2	5.6	8.2	22.5	1523
Simazine	6.5	5.2	0.4	0.1	1680
Ethofumesate	6.0	5.2	2.2	10.1	1773
Alachlor	5.0	5.1	9.1	26.4	761
Diuron	6.0	4.4	0	0	1665
Pendimethalin	7.5	4.2	0	0	1904
Sethoxydim	2.5	3.4	23.1	45.0	0
Metolachlor	4.5	1.0	0.4	0.5	0
LSD	1.6	1.2	12.6	14.4	383

The data in Table 3 and the correlations in Table 4 reveal that high shoot/root ratios were correlated with lower crop quality and seed yield. The high shoot/root ratios were a result of greater damage to roots than to shoots.

Discussion

This experiment demonstrates the damage most preemergent herbicides cause to turfgrass that is less than four to six weeks old. The efficacy and safety of bentazon is interesting to note. It will be looked at more closely for use on newly seeded lawns.

Table 3. Tall fescue responses to preemergent herbicides.

Treatment	Plant Dry Weights in grams			
	Total	Shoot	Root	Shoot/Root
Simazine	1.45	1.14	0.31	3.58
Control	1.44	1.18	0.24	3.58
Quinclorac	1.36	1.0	0.29	1.70
Isoxabin	1.27	0.91	0.36	3.56
Dithiopyr 1/2	1.19	0.93	0.25	3.64
Bensulide	1.12	0.89	0.20	4.97
DCPA	1.01	0.82	0.18	4.32
Ethofumesate	0.96	0.75	0.2	3.75
Dithiopyr 1/4	0.90	0.71	0.17	4.41
Pendimethalin	0.88	0.71	0.16	4.81
MSMA	0.86	0.69	0.16	5.79
Benefin/Trifluralin	0.86	0.69	0.15	4.36
Diuron	0.84	0.68	0.15	5.16
Siduron	0.81	0.62	0.18	3.25
Bentazon	0.77	0.57	0.25	3.02
Metolachlor	0.71	0.56	0.13	6.39
Alachlor	0.67	0.56	0.10	5.41
Sethoxydim	0.49	0.39	0.08	6.1
LSD	0.61	0.51	0.14	2.21

Table 4. Correlations of tall fescue responses to preemergent herbicides.

	Rt	Tot	S/R	Q Nv	Q Mr	%W N	%W M	Yld
Sht Wt	0.8*	1.0*	-0.4	0.6*	0.5	0	0	0.4
Root WT		0.8*	-0.7*	0.5	0.6	-0.2	0.2	0.4
Tot Wt			-0.5	0.6*	0.6	-0.1	0	0.4
Sht/Rt				-0.4	-0.6*	0	0.1	-0.6*
Qual Nov					0.8*	-0.3	-0.3	0.8*
Qual Mar						0	0	0.9*
% Wd Nov							0.9*	-0.3
% Wd Mar								-0.4

CONTROL OF BLACK MEDIC GERMINATION WITH RONSTAR

K.L. Diesburg

Materials and Methods

The Ronstar label does not presently include black medic (low hopclover) on its label. Seeds were harvested from indigenous plants during July. The seeds were placed in 400F for six weeks, scarified with sand paper, then planted in greenhouse pots containing a greenhouse soil mix. Ronstar was applied at 1/2x, 1x, and 2x rates immediately after planting. The treatments were replicated 4 times in a randomized complete block design.

Results

Complete control of germination was obtained from all rates of Ronstar. Germination of the black medic in the nontreated plots was slow but finally reached 90% at four weeks after planting.

Table 1. Germination of black medic.

Treatment	Days After Planting			
	Day 7	Day 14	Day 21	Day 28
Ronstar 1/2x	0	0	0	0
Ronstar 1x	0	0	0	0
Ronstar 2x	0	0	0	0
Untreated	0	21	35	90

ACCLAIM RESEARCH CONDUCTED AT THE UNIVERSITY OF ILLINOIS

J.E. Haley and D.J. Wehner

Acclaim 1EC (fenoxaprop, Hoechst Roussel Agri-Vet) is a postemergence control herbicide for control of crabgrass (*Digitaria* sp.) that can be applied to most cool season turf. With proper application, Acclaim is found to be safe on established stands of Kentucky bluegrass, perennial ryegrass, fine fescue, tall fescue, annual bluegrass and zoysiagrass.

Acclaim Applied to a Kentucky Bluegrass Blend

In an effort to evaluate potential phytotoxicity of new fenoxaprop formulations a trial was conducted on an improved Kentucky bluegrass turf. Rates of Acclaim, HOE 360-18H 0.23EW, and HOE 360-05H 0.67EC used in the evaluation are listed in Table 1.

Research Protocol
Acclaim on a Creeping Bentgrass Turf

Turf : improved Kentucky bluegrass blend

Time Applied
all treatments - July 18, 1990

Replications : 3, includes 1 untreated plot per rep.

Method of application
liquid herbicides - CO_2 backpack sprayer,
spray volume : 40 gpa

Plot Maintenance :
Mowing - 2 inches
Irrigation - as needed to prevent stress
Fertilization - 2 lb N/M/Yr
Herbicide - No additional herbicides applied

Significant injury was found 9 days after treatment with high rates of all fenoxaprop applications (Table 1). Turf injury was unacceptable 23 days after treatment with applications of Acclaim 1EC at 0.35 lb ai/A, HOE 360-18H 0.23EW at 0.125 and 0.18 lb ai/A, and HOE 360-05H 0.67EC at 0.125 lb ai/A. Injury observed with any of the treatments 33 days after treatment was within an acceptable range (7 - 9).

Acclaim Applied to a Creeping Bentgrass Turf Mowed at 0.25 Inch

Recently, Acclaim has been labeled for use on creeping bentgrass turf maintained at a minimum cutting height of at least 0.25 inch. It should not be applied to bentgrass putting greens and past research has indicated that serious injury will result. The purpose of this research is to evaluate the phytotoxic effects of Acclaim and HOE 360-18H 0.23EW, a new formulation of Acclaim, when applied to a Penneagle creeping bentgrass (*Agrostis palustris*) turf maintained at 0.25 inch mowing height. Rates are listed in Table 2.

Table 1. The evaluation of Acclaim applied to a Kentucky bluegrass blend.[1]

Treatment	Rate lb ai/A	Phytotoxicity[2] 7/27/90 9 DAT[3]	8/10/90 23 DAT	8/20/90 33 DAT
Acclaim 1EC	0.18	8.3de	7.3c-e	9.0d
Acclaim 1EC	0.25	7.0bc	6.7c	8.7cd
Acclaim 1EC	0.35	7.0bc	5.7b	8.3bc
HOE 360-18H 0.23EW	0.045	8.7e	8.7fg	9.0d
HOE 360-18H 0.23EW	0.06	8.3de	8.0ef	9.0d
HOE 360-18H 0.23EW	0.09	7.3cd	7.0cd	9.0d
HOE 360-18H 0.23EW	0.125	6.0ab	5.0ab	8.0b
HOE 360-18H 0.23EW	0.18	5.0a	4.3a	7.0a
HOE 360-05H 0.67EC	0.06	8.3de	7.7de	9.0d
HOE 360-05H 0.67EC	0.125	6.3bc	5.7b	8.0b
untreated	-	9.0e	9.0g	9.0d

[1]All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

[2]Phytotoxicity evaluations are made on a 1-9 scale where 9 = no visible turf injury and 1= necrosis.

[3]DAT refers to days after treatment.

Research Protocol
Acclaim on a Creeping Bentgrass Turf

Turf : Creeping Bentgrass

Time Applied
all treatments - July 18, 1990
2nd application - August 9, 1990

Replications : 3, includes 1 untreated plot per rep

Method of application
liquid herbicides - CO_2 backpack sprayer,
spray volume : 40 gpa

Plot Maintenance :
Mowing - 0.25 inches
Irrigation - as needed to prevent stress
Fertilization - 5 lb N/M/Yr
Disease Control - as needed for prevention and control

At these herbicide rates significant injury to the turf was observed on only one rating date (Table 2). Five days following the second application (14 August 1990) unacceptable injury was observed on all of the treated plots. The authors do not know if more injury would occur in a golf course setting where foot and mechanical traffic would be greater. It is also unknown if these rates of Acclaim are sufficient to control crabgrass or if higher rates and more applications are needed for acceptable control.

Table 2. The evaluation of Acclaim applied to a creeping bentgrass turf mowed at 0.25 inch in height[1]

Herbicide	Rate (lb ai/A)	Phytotoxicity[2] 8/7/90	8/14/90	8/21/90
Acclaim 1EC	0.031	7.3	6.7a	9.0
Acclaim 1EC	0.04	6.3	6.3a	8.7
Acclaim 1EC	0.047	7.0	6.7a	8.7
HOE 360-18H 0.23EW	0.015	8.3	6.7a	8.7
untreated	-	9.0	9.0b	9.0
		NS		NS

[1] All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

[2] Phytotoxicity evaluations are made on a 1-9 scale where 9 = no visible turf injury and 1 = necrosis.

THE EVALUATION OF TOUGH ON A KENTUCKY BLUEGRASS TURF

J.E. Haley and T.W. Fermanian

Tough 3.75EC (pyridate, Agrolinz, Inc) is a new compound used for selective weed control in field crops. Some crops that are tolerant to Tough include maize, cereals, peanuts, lucerne and brassicas. Many turfgrass species have shown an indication of tolerence to Tough. The purpose of this research was to evaluate the safety of Tough applied to a mature Kentucky bluegrass turf. Rates of application and phytotoxicity ratings are listed in Table 1.

Research Protocol
Tough Applied to a Kentucky BluegrassTurf

Turf : improved Kentucky bluegrass blend

Time Applied
- all treatments - July 18, 1990
- 2nd application where noted - August 1, 1990

Replications : 3, includes 1 untreated plot per rep.

Method of application
- liquid herbicides - CO_2 backpack sprayer, spray volume : 40 gpa

Plot Maintenance :
- Mowing - 2 inches
- Irrigation - as needed to prevent stress
- Fertilization - 2 lb N/M/Yr
- Herbicide - No additional herbicides applied

Tough appeared to be safe at rates of 0.45 and 0.9 lb ai/A 10 days following application (Table 1). At this time, unacceptable turf injury was observed with the rate of 1.8 lb ai/A. Turfgrass injury was visible 5 days following a second application of Tough at 0.9 lb ai/A. This evaluation indicates that Kentucky bluegrass shows some tolerance to Tough at rates of 0.45 and 0.9 lb ai/A. It is not known if these rates will control targeted weed species and more research is needed to determine Tough safety and efficacy.

Table 1. The evaluation of Tough on a Kentucky bluegrass turf.[1]

Treatment[3]	Rate lb ai/A	Phytotoxicity[2] 7/27/90 10 DAT[4]	8/6/90 24 DAT	8/10/90 34 DAT
Tough EC	0.45	9.0c	9.0c	9.0b
Tough EC	0.9	9.0c	9.0c	9.0b
Tough EC	1.8	6.3a	8.7c	9.0b
Tough EC/Tough EC	0.9 / 0.9	8.3b	7.0b	8.0a
Tough EC/Tough EC + surfactant [5]	0.9 / 0.9 + 0.5 v/v	8.3b	6.0a[3]	8.3a
untreated	--	9.0c	9.0c	9.0b

[1] All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

[2] Phytotoxicity evaluations are made on a 1-9 scale where 9 = no visible injury and 1 = necrosis.

[3] All treatments were applied on 18 July 1990. If a second application is indicated, the treatment was applied 1 August 1990.

[4] DAT refers to days after treatment.

[5] The surfactant XM12 was used.

THE EVALUATION OF HERBICIDES FOR POSTEMERGENCE BROADLEAF WEED CONTROL IN A KENTUCKY BLUEGRASS / TALL FESCUE TURF

J.E. Haley and D.J. Wehner

Broadleaf weeds compete with turfgrass for water, light, space and nutrients. They reduce the esthetic quality of the turf and are often symptomatic of an underlying problem (soil compaction, poor nutrition etc.). Many of the available postemergence control herbicides will kill a varity of broadleaf weeds. These herbicides are often a combination of several chemicals and are found in a variety of formulations. The purpose of this research was to evaluate several postemergence control herbicides applied at a high spray volume similar to the spray volume used by lawn care companies. Herbicide formulations can be found in Table 1 and herbicide rates and weed control results can be found in Table 2.

Research Protocol
Postemergence Broadleaf Weed Control

Turf : common Kentucky bluegrass / tall fescue

Time Applied
all treatments - June 4, 1990

Replications : 3, includes 1 untreated plot per rep

Method of application
liquid herbicides - CO_2 backpack sprayer,
spray volume : 152 gpa

Plot Maintenance :
Mowing - 3 inches
Irrigation - none
Fertilization - none
Herbicide - No additional herbicides applied

Table 1. Herbicides evaluated for postemergence control of broadleaf weeds.

Product Name	Active Ingredients
XRM 5202	2,4-D; triclopyr; and clopyralid
Tuflon II Amine	2, 4-D amine; triclopyr amine
Tuflon D	2, 4-D; triclopyr
Confront	triclopyr; clopyralid
Trimec	2,4-D; MCPP; and dicamba
HRB. 1	undisclosed

The best clover control was found with Confront, Trimec at 4.0 lb ai/A and XRM 5202 at 3.0 and 4.0 lb ai/A. Early plantain (both broadleaf and buckhorn) control was good with all herbicides except Turflon D at 3.0 lb ai/A and Confront at 1.0 lb ai/A. Later (56 days after application), the best broadleaf plantain control was found with XRM 5202 at 4.0 lb ai/A. Buckhorn plantain was best controlled with XRM 5202 at all rates, Turflon D at 3.0 lb ai/A, Trimec at 3.0 and 4.0 lb ai/A and with HRB 1. In general, overall weed control was not as as good as expected. This may have been a result of high rainfall throughout the test period. It is not possible to determine if poor weed control is a result of inadequate herbicide performance, excessive weed seed germination or other environmental and test conditions.

Table 2. The evaluation of herbicides for postemergence control of broadleaf weeds.[1]

Herbicide	Rate pt cf /A	Clover Control[2] 7/9 35 DAT[3]	Clover Control[2] 7/30 56 DAT	Plantain Control 7/9 35 DAT	Broadleaf Plantain Control 7/30 56 DAT	Buckhorn Plantain Control 7/30 56 DAT
XRM 5202	2.0	4.0de	7.7de	2.7ab	3.0ab	2.3a
XRM 5202	3.0	2.7b-d	4.3bc	2.3a	2.3ab	1.7a
XRM 5202	4.0	1.3ab	2.7ab	1.7a	2.0a	1.7a
Turflon II Amine	3.0	5.0e	6.7c-e	2.7ab	4.0ab	4.0ab
Turflon D	3.0	4.0de	6.0cd	4.0c	3.0ab	2.3a
Confront	1.0	2.0a-c	3.0ab	4.3c	4.3ab	3.0ab
Confront	1.5	1.3ab	1.0a	2.7ab	4.7ab	5.3b
Confront	2.0	1.0a	1.0a	2.7ab	4.7ab	3.7ab
Trimec	3.0	4.0de	5.7cd	3.7bc	5.0b	2.7a
Trimec	4.0	1.7ab	3.0ab	2.7ab	3.0ab	2.3a
HRB 1	4.0	3.3cd	4.7bc	2.0a	4.0ab	2.3a
Untreated Check		9.0f	9.0e	9.0d	9.0c	9.0c

[1] All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

[2] All weed control evaluations are made on a scale of 1-9, where 9 = no control of the weed species indicated and 1 = no weeds present.

[3] DAT refers to days after treatment.

THE EVALUATION OF PLANT GROWTH RETARDANTS ON AN IMPROVED KENTUCKY BLUEGRASS BLEND

J.E. Haley and T.W. Fermanian

Plant growth retardants (pgrs) are use primarily to reduce mowing on roadsides, steep slopes or around trees and to reduce seedhead production. Because of occasional problems associated with pgrs, turf managers are reluctant to apply them to high quality turf. The timing of the pgr application is critical in order to effectively reduce the number of mowings as well as the development of seedheads. The window of application may be as narrow as 7 days or as wide as 20 days. Serious injury can result if improperly applied. Even with careful application, pgrs can temporarily discolor turf and reduce turf quality. Turf recovery from disease or environmental stress is reduced when treated with pgrs. Plant growth retardants that reduce the number of mowings without the problems normally associated with pgrs could be very useful to professional lawn care managers. The purpose of this research was to evaluate two new pgrs and compare them with those commercially available.

Research Protocol
PGR's Applied to a Kentucky Bluegrass Turf

Turf : improved Kentucky bluegrass blend

Time Applied
- all treatments - May 1, 1990
- 2nd application of Cutless - August 31, 1990

Replications : 3, includes 1 untreated plot per rep.
Experimental Design: split plot

Method of application
- liquid herbicides - CO_2 backpack sprayer,
- spray volume : 40 gpa

Plot Maintenance :
- Mowing - 2 inches and unmowed
- Irrigation - as needed to prevent stress
- Fertilization -none
- Herbicide - No additional herbicides applied

PGRs that were applied include PGR 1 (undisclosed), CGA163935 2EC (undisclosed, Ciba-Geigy), Cutless 50WP (flurprimidol, DowElanco), Limit 4F (amidochlor, Monsanto) and Embark (mefluidide, PBI Gorden). The rates at which they were applied are listed in Table 1. Evaluations were made on both mowed and unmowed plots. Data was recorded for turfgrass quality (Table 1), seedhead production and clipping weights (Table 2) and turfgrass height (Table 3).

Among pgr treatments there was no difference in turfgrass quality and on the average, quality was good throughout the test period. Reduced turf quality was observed on unmowed plots. Turf treated with Limit and Embark produced significantly fewer seedheads than turf treated with other pgrs. All pgr treatments reduced the total amount of fresh turfgrass clippings removed. The fewest clippings were collected from plots treated with Cutless and Embark. All the pgrs reduced turfgrass height on the unmowed plots. PGR 1 at 0.7 lb ai/A, CGA163935 at 0.45 lb ai/A, Limit and Embark provided good vertical growth control at 17 to 28 days after application. At 31 to 63 days after application, vertical growth was best controlled with Cutless, Limit and Embark. Unseasonable cool, wet weather provided excellent turfgrass growing conditions throughout the test period. More research is needed to determine how these pgrs will perform in dryer and warmer conditions frequently found in central Illinois during May and June

Table 1. The evaluation of quality on a Kentucky bluegrass turf treated with pgrs.[1]

		Quality[2]				
	Rate	5/24/90	5/31/90	6/12/90	6/19/90	Average
PGR	lb ai/A	23 DAT[3]	30 DAT	42 DAT	49 DAT	
PGR 1	0.3	7.3	7.0	7.0	7.0ab	7.1
PGR 1	0.5	7.0	7.0	7.0	7.0ab	7.0
PGR 1	0.7	6.3	6.8	7.2	7.2ab	6.8
CGA163935 + surfactant [4]	0.18	6.7	6.5	7.2	7.3b	6.8
CGA163935	0.18	7.0	6.8	7.0	7.2ab	6.9
CGA163935	0.27	7.0	6.8	7.2	7.0ab	7.0
CGA163935	0.45	6.8	6.8	7.0	7.2ab	6.9
Cutless/Cutless	1.0/1.5	6.7	7.2	7.2	6.8a	7.0
Limit	2.5	6.7	6.3	7.2	7.8c	6.7
Embark	0.25	6.5	6.8	7.5	7.8c	6.9
Untreated	-	7.2	7.0	7.0	7.0ab	7.1
		NS	NS	NS		NS
unmowed		5.9a	5.4a	5.7a	5.6a	5.7a
mowed		7.8b	8.2b	8.6b	8.8b	8.2b

[1]All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

[2]Quality evaluations are made on a 1-9 scale where 9 = excellent turfgrass quality and 1 = very poor turfgrass quality. Quality was evaluated on both mowed and unmowed turf.

[3]DAT refers to days after treatment.

[4]The surfactant used was XM12 at 0.5%v/v.

Table 2. The evaluation of seedhead production and total fresh clippings weights.[1]

PGR	Rate	Seedheads[2]		Total Clippings Removed[4]
		5/22/90	5/30/90	
	lb ai/A	21 DAT[3]	29 DAT	
PGR 1	0.3	1.3c	1.8	37.9c
PGR 1	0.5	1.2c	1.5	32.0a-c
PGR 1	0.7	1.0c	1.2	30.0ab
CGA163935 + surfactant [5]	0.18	1.1c	1.3	33.1bc
CGA163935	0.18	1.2c	1.1	34.0bc
CGA163935	0.27	1.2c	1.3	30.1ab
CGA163935	0.45	0.9bc	1.3	30.4ab
Cutless/Cutless	1.0/1.5	1.1c	1.6	25.7a
Limit	2.5	0.5a	0.6	26.1a
Embark	0.25	0.5ab	0.8	28.3ab
Untreated	-	1.2c	1.2	46.2d
			NS	

Table 3. Recorded height of an unmowed Kentucky bluegrass turf treated with pgrs.[5]

PGR	Rate	Height[6]				
		5/18/90	5/29/90	6/1/90	6/28/90	7/3/90
	lb ai/A	17 DAT[7]	28 DAT	31 DAT	58 DAT	63 DAT
PGR 1	0.3	7.0ab	11.9b	20.9f	20.5e	17.7e
PGR 1	0.5	7.3ab	11.1ab	17.4c-e	17.7c-e	15.4c-e
PGR 1	0.7	6.2a	10.6ab	16.1cd	16.3b-d	15.9de
CGA163935 + surfactant [9]	0.18	7.6b	10.4ab	15.4c	15.1a-c	13.6b-d
CGA163935	0.18	8.2b-d	12.4b	19.9ef	19.4de	17.0e
CGA163935	0.27	7.2ab	11.0ab	18.4d-f	18.5c-e	15.1c-e
CGA163935	0.45	7.2ab	9.1a	14.9bc	15.9b-d	13.2bc
Cutless/Cutless	1.0/1.5	8.8cd	11.0ab	12.1ab	12.1a	13.0bc
Limit	2.5	7.7bc	9.1a	9.9a	13.0ab	10.1a
Embark	0.25	7.0ab	8.9a	9.7a	13.7ab	10.9ab
Untreated	-	9.1d	18.1c	24.2g	24.8f	22.6f

[1] All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

[2] Refers to the number of seedheads per square inche.

[3] DAT refers to days after treatment.

[4] Total clippings removed refers to the average fresh weight in grams of turfgrass clippings removed per square foot.

[5] The surfactant used was XM12 at 0.5%v/v.

[6] Height refers to the average height in cm of the turfgrass.

EFFECTS OF PLANT GROWTH REGULATORS ON KENTUCKY BLUEGRASS TURF QUALITY AND CANOPY HEIGHT

K.L. Diesburg

Introduction

Development of turfgrass growth retardants has progressed significantly since the 1950s when maleic hydrazide was the predominantly used compound. The products available today; Limit, Embark, Cutless, and TGR, are far less toxic and can be used in a broad range of turfgrass managements. There remains, however, much improvement to be made in terms of actually regulating turfgrass growth rather than inhibiting growth throughout the plant. The objective should be to cause turfgrass plants to shift their growth away from leaf elongation and toward greater leaf number, tiller number, and root growth. Ciba-Geigy and Abbot Labs each have a plant growth regulator that is being investigated for use with turfgrass. The objective of this initial experiment is to compare their effects upon Kentucky bluegrass turf canopy height and turf quality as compared to three other compounds, Cutless (EL500, flurprimidol), Ethrel (ethephon), and TGR (PP333, paclobutrazol) that are known to change the growth habit of Kentucky bluegrass. Embark and Limit were not included because they are not growth regulators and space was limited. Space limitations also prevented treatment with CGA 163935 or ABG 3115 at two additional concentrations.

Materials and Methods

Treatments were applied June 4 onto Baron Kentucky bluegrass in a Hosmer silt loam soil. Concentrations were applied as follows:

Cutless 50W	0.75 lb ai/A
Ethrel 21.7% ai	4.00 lb ai/A
CGA 163936 25% ai	0.62 lb ai/A
ABG 3115 31% ai	0.64 lb ai/A
TGR 0.42% ai	0.13 lb ai/A

The area received no precipitation for three days, then the plots were irrigated to incorporate the soil-active compounds. The turf had been maintained at 5 lb N per 1000 square feet per year. A hand-held boom with attached pressurized CO_2 was used to apply the chemicals. Preemergent herbicide, Dacthal, was applied April 20 and July 3. Trimec was applied during November, 1989. No irrigation was needed to prevent drought stress. The experimental design was strip-plot with no clip and a weekly two inch clip as whole plots and the chemical treatments as subplots. Turf quality in the clipped strip and canopy height in the unclipped strip were recorded each week. Turf quality ratings were subjective, based upon 10=best to 1=worst. Canopy heights were estimated by noting the average leaf tip height from the soil at three locations in a given plot. Plot size was 4 X 6 feet.

Results

The data in Tables 1 and 2 correspond with Figures 1 and 2, respectively. CGA 163935 and Ethrel caused the leaves to have a dull or dusty appearance by 14 Days After Treatment (DAT), which lowered turf quality (Figure 1 and Table 1). This discoloration disappeared by 28 DAT. Discoloration from TGR and Florel beginning by 25 DAT looked more like senescence or burn in that it was buff-colored dead tissue. This damage continued to increase to 56 DAT. The same type of damage was becoming evident with Cutless by 56 DAT. ABG 3115 caused no damage to the turf at any time.

ABG 3115 appears to have been stimulating the increase in canopy height by 50 DAT (Figure 1 and Table 2). CGA 193935 and Ethrel were inhibiting the increase in canopy height approximately the same amount of time and to approximately the same extent. TGR continued to be highly effective past 56 DAT. Effectiveness from Cutless was beginning by 42 DAT and was significant by 49 DAT.

Table 1. Quality of Kentucky bluegrass turf in response to pgrs.[1]

	Days After Treatment							
Treatments	7	14	21	28	35	42	49	56
Cutless	8.5	8.5	8.5	8.7	8.7	8.7	8.0	7.1
Florel	8.6	7.5	7.8	8.0	8.0	7.2	6.8	4.5
CGA163936	7.4	6.2	6.9	8.3	9.3	9.0	8.6	8.2
TGR	8.5	8.5	8.2	8.1	7.8	7.5	7.0	6.2
ABG3115	8.5	8.5	8.5	8.3	8.0	8.2	8.2	8.2
Control	8.3	8.2	8.3	8.4	8.5	8.4	8.4	8.4
$LSD_{0.05}$	0.6	0.7	0.8	NS	1.0	1.0	1.2	0.9

Table 2. Canopy heights of Kentucky bluegrass turf in response to pgrs.

	Unclipped Days After Treatment								Unclipped
Treatments	7	14	21	28	35	42	49	56	56
Cutless	6.0	6.2	6.9	7.4	8.3	9.3	11.2	12.5	6.7
Florel	5.8	6.1	6.2	6.2	6.3	7.1	10.4	13.0	5.1
CGA163936	5.8	5.8	5.8	5.8	5.8	6.5	8.9	13.7	6.9
TGR	5.9	6.0	6.2	6.3	6.4	6.9	7.1	7.7	4.7
ABG3115	6.5	7.5	8.2	8.8	9.6	12.2	16.9	21.0	7.2
Control	6.6	7.4	8.1	9.0	9.9	11.9	14.2	18.0	7.6
$LSD_{0.05}$	NS	0.8	1.0	1.3	1.4	1.7	2.2	3.2	0.9

[1]Ratings based upon a scale of 1 to 10, where 10 = best quality.

Discussion

Kentucky bluegrass reactions to Ethrel, TGR, and Cutless were typical of what I have seen in the past. They each affect hormonal control of cell growth in different ways, and their effects become evident slowly into the third week after treatment and are strongest from the fourth to tenth week after treatment. It is interesting to note that CGA 163935 was as effective as Ethrel in restricting the increase in canopy height, but did not cause reduction in turf quality past 21 DAT. The reduction in turf quality from Ethrel is due to the clipping off of healthy, green, very short leaves, exposing the nonphotosynthetic, elongating crown. Elongation of crown internodes is stimulated by Ethrel. It looks as if CGA 163935 has some potential as a marketable turfgrass growth regulator. It would have been nice to have had either Embark or Limit in this experiment for comparison. Effectiveness of both of them usually lasts approximately four weeks. The effectiveness of CGA 163935 appears to last somewhat longer.

This winter I intend to conduct greenhouse experiments where plant morphogenesis is looked at in more detail. It will be interesting to record how these experimentals affect plant growth habit. I will use a range of concentrations with each experimental compound. If time permits I will look at leaf elongation, tiller number, leaves per tiller, crown internode elongation, and root growth. These methods will allow more precise detection of any growth reducing or regulation activity.

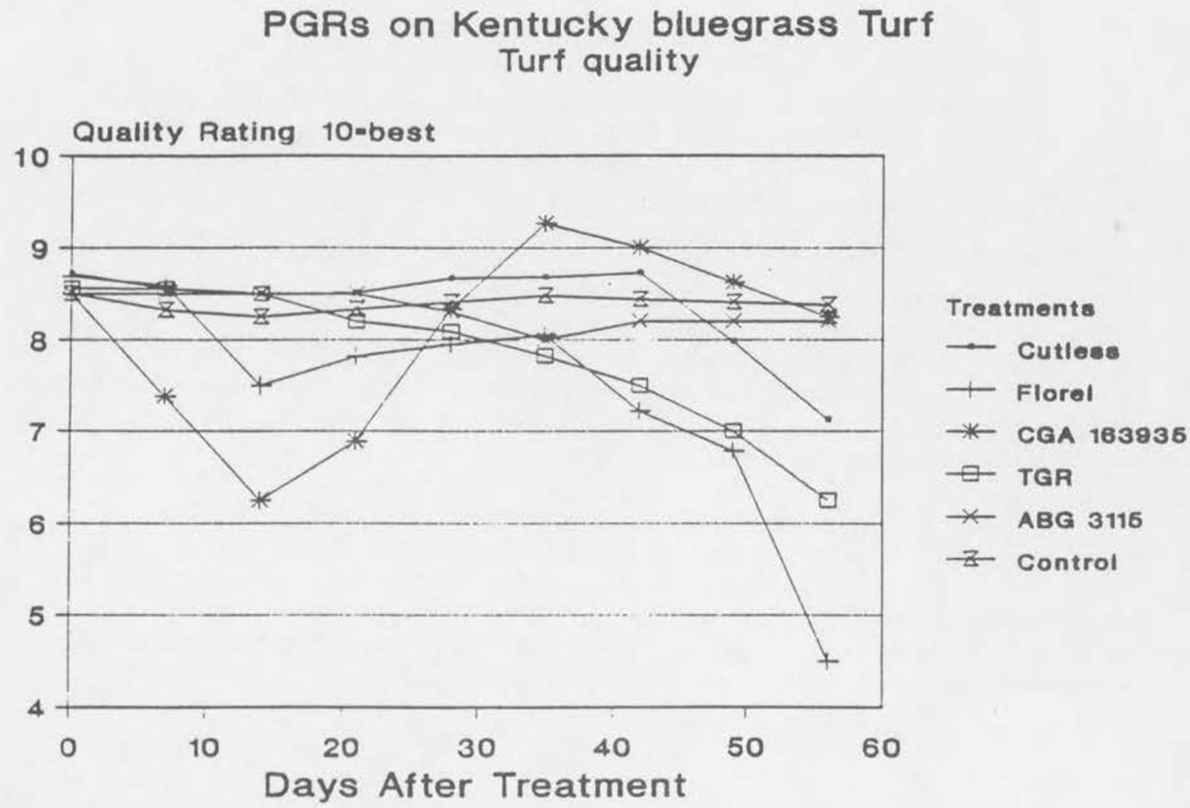

Figure 1

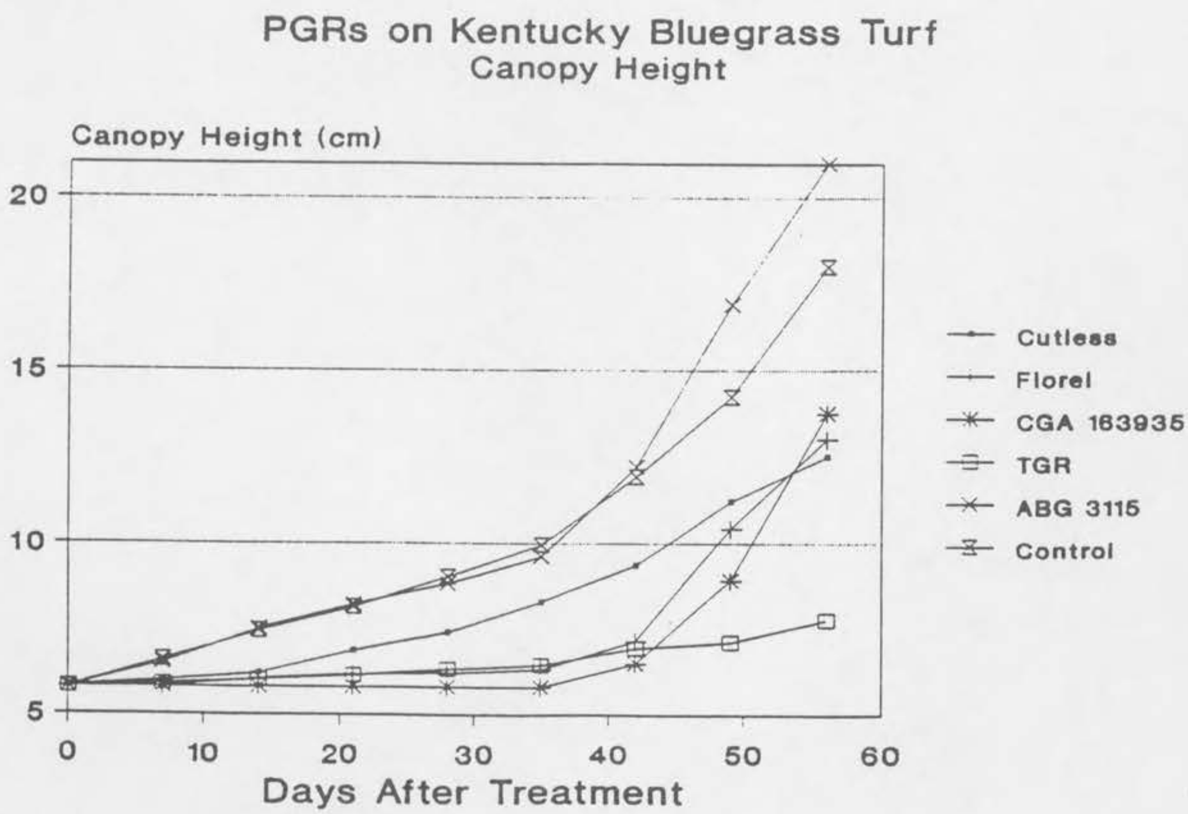

Figure 2

LATE FALL FERTILIZATION TIMING

D.J. Wehner and J.E. Haley

The fertilization of cool season turfgrasses in the late fall is becoming a common practice in Illinois. Late fall fertilization results in excellent early spring green-up and reduces the need for an early spring fertilization with nitrogen. However, questions still remain regarding the optimum timing of fertilization. The purpose of this experiment is to evaluate the timing of application of late fall fertilization treatments. Treatments are being applied in October, November, December, and January to determine what exists in application date.

Research Protocol - Late Fall Fertilization Timing

Starting Date for Experiment: Fall 1988.

Turf: blend of Glade, Parade, Adelphi, and Rugby Kentucky bluegrasses.

Treatments: Milorganite (6-2-0), Urea (45-0-0), and SCU (36-0-0).
Applied to provide either 1 or 2 pounds of N/M in mid-October, November, December, or January.
Additional treatments as indicated in Table 1.

Time applied: October 11 and November 21, 1989; January 3 and January 29,1990.

Replications: 3
Experimental Design: RCB

Method of application: applied by hand.

Plot maintenance:
Mowing - at 1.5 inches, clippings collected
Irrigation - as needed to prevent stress
Fertilization - additional nitrogen (urea, 46-0-0) applied to all plots at 1 lb N/M in June and September, and at 0.75 lb N/M in July
Herbicides - preemergence crabgrass control applied in the spring

The color ratings and clipping weights taken in the spring of 1990 are presented in Tables 1 and 2, respectively. Similar trends are apparent with both sets of data. As expected, color ratings for turf fertilized at the 2 pounds of N application rate received higher color ratings than turf fertilized at the 1 pound of N rate. However, given the concern for nitrate loss during cold weather, the 2 pound N rate is generally not recommended for late fall fertilization. There were some slight differences in spring color ratings for turf fertilized during different months. These differences varied between N sources. The spring color of turf fertilized at the 1 pound N rate from urea in December was slightly better than when the urea was applied in October, November, or January. With SCU, the turf fertilized in November received somewhat higher color ratings than turf fertilized with SCU in the other months. For Milorganite, there was also a slight advantage to fertilizing in November compared to the other months.

Past research has indicated that an application of urea in November followed by an application of 0.5 pounds of N from urea in April gave good results in early spring and carried the turf into the May-June period when turf receiving only a late fall application started to lose color. The data for this study supports this earlier observation. It appears that in Central Illinois, it is necessary to supplement the late fall application of a fertilizer with an application of N in the spring.

Table 1. The effect of late fall fertilization on the color of an improved Kentucky bluegrass turf blend during the 1990 growing season.[1]

	Rate	Month	Color[2]						
Source	lb N/M	Applied[3]	3/12	4/12	4/23	4/30	5/07	5/24	6/01
Urea	0.5	Apr	2.7h-g	5.0hi	6.3d-f	7.0b-d	6.7c-e	7.3ab	7.0b
Urea	1.0	Apr	2.3hi	4.3i	6.0e-g	8.0a	8.0a	8.0a	8.0a
Urea	0.5/1.0	Apr/Nov	4.0c-e	6.7c-e	7.7ab	8.0a	7.7ab	6.7b-d	7.0b
Urea	1.0	Oct	3.0h-f	5.3gh	6.0e-g	5.7fg	6.0e-g	5.7ef	6.0cd
Urea	2.0	Oct	3.0h-f	7.0b-d	7.0b-d	6.3d-f	7.0b-d	5.3f	5.3d
Urea	1.0	Nov	3.3e-f	6.0e-g	6.3d-f	6.0ef	6.3d-f	6.3c-e	6.3bc
Urea	2.0	Nov	5.7b	7.3a-c	7.7ab	7.3a-c	7.7ab	5.3f	6.3bc
Urea	1.0	Dec	4.7c	6.7c-e	6.3d-f	6.7c-e	7.0b-d	6.0d-f	6.0cd
Urea	2.0	Dec	6.7a	7.7ab	7.7ab	7.7ab	7.7ab	5.7ef	6.3bc
Urea	1.0	Jan	4.7c	6.3d-f	6.7c-e	7.0b-d	7.0b-d	6.3c-e	6.0cd
Urea	2.0	Jan	7.0a	8.0a	8.0a	7.7ab	8.0a	5.7ef	6.7bc
Milorganite	1.0	Oct	2.0i	5.3gh	5.3g	6.0ef	5.3g	6.7b-d	6.7bc
Milorganite	2.0	Oct	3.3e-f	6.0e-g	6.3d-f	7.0b-d	7.0b-d	6.0d-f	6.0cd
Milorganite	1.0	Nov	2.7h-g	5.7f-h	6.3d-f	6.0ef	5.7fg	7.0bc	6.0cd
Milorganite	2.0	Nov	4.3cd	6.7c-e	7.0b-d	6.7c-e	7.0b-d	6.3c-e	6.7bc
Milorganite	1.0	Dec	2.0i	5.0hi	6.0e-g	5.0g	5.3g	6.7b-d	6.3bc
Milorganite	2.0	Dec	4.0c-e	6.7c-e	7.0b-d	7.0b-d	6.7c-e	6.3c-e	6.7bc
Milorganite	1.0	Jan	2.0i	5.3gh	6.0e-g	6.0ef	6.0e-g	6.3c-e	6.7bc
Milorganite	2.0	Jan	2.7h-g	6.3d-f	7.0b-d	7.0b-d	7.0b-d	6.7b-d	7.0b
SCU	1.0	Oct	2.0i	5.0hi	5.7fg	6.7c-e	6.0e-g	6.0d-f	6.7bc
SCU	2.0	Oct	2.3hi	6.0e-g	6.7c-e	7.3a-c	7.0b-d	6.3c-e	6.7bc
SCU	1.0	Nov	3.0h-f	5.7f-h	6.7c-e	6.7c-e	6.7c-e	6.3c-e	6.0cd
SCU	2.0	Nov	3.7d-f	6.3d-f	7.3a-c	8.0a	7.7ab	6.0d-f	7.0b
SCU	1.0	Dec	2.0i	5.3gh	6.3d-f	6.0ef	6.3d-f	6.7b-d	6.7bc
SCU	2.0	Dec	4.7c	6.3d-f	7.0b-d	7.3a-c	7.3a-c	6.3c-e	6.3bc
SCU	1.0	Jan	2.7h-g	5.3gh	6.3d-f	6.7c-e	6.3d-f	6.0d-f	6.3bc
SCU	2.0	Jan	4.3cd	6.0e-g	7.0b-d	7.3a-c	8.0a	7.3ab	6.7bc

[1] All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

[2] Color evaluations are made on a scale of 1-9, where 9 = very dark green and 1 = straw color.

[3] April applications were made 17 April 90; October applications were made 18 October 90; November applications were made 19 November 90; December applications were made 17 December 90; and January applications were made 15 January 91. All test plots were fertilized with urea (46-0-0) at 1 lb N/M on 21 June 90 and 13 September 90 and at 0.75 lb N/M on 21 July 90.

Table 2. The effect of late fall fertilization on the fresh clipping weight of an improved Kentucky bluegrass turf blend during the 1990 growing season.[1]

Source	Rate lb N/M	Month Applied[3]	Weight[2] 4/24	5/06	5/25	5/30
Urea	0.5	Apr	84.9g-i	159.7f-j	198.3f-j	100.8c-g
Urea	1.0	Apr	53.0i	179.5d-h	227.5b-h	105.4b-e
Urea	0.5/1.0	Apr/Nov	167.1d-f	208.1c-g	238.5a-g	105.4b-e
Urea	1.0	Oct	122.3e-i	144.6h-k	185.9h-k	82.4f-h
Urea	2.0	Oct	295.7b	217.0c-f	225.6c-h	101.7b-g
Urea	1.0	Nov	139.8e-h	153.2g-j	165.5jk	89.7d-h
Urea	2.0	Nov	297.3b	233.5b-d	242.6a-f	102.7b-f
Urea	1.0	Dec	172.5d-f	167.6e-i	190.1h-k	83.3f-h
Urea	2.0	Dec	399.0a	281.7ab	260.2a-d	99.8c-g
Urea	1.0	Jan	146.0e-h	167.5e-i	195.0f-k	80.4gh
Urea	2.0	Jan	442.7a	310.5a	281.9a	107.6b-d
Milorganite	1.0	Oct	77.0hi	112.9i-k	175.8i-k	89.2d-h
Milorganite	2.0	Oct	191.9c-e	201.5c-h	222.7c-i	105.4b-e
Milorganite	1.0	Nov	54.1i	91.3k	149.0k	82.6f-h
Milorganite	2.0	Nov	159.8d-g	178.6d-h	216.3d-i	105.8b-e
Milorganite	1.0	Dec	58.4i	106.3jk	149.7k	75.4h
Milorganite	2.0	Dec	254.6bc	251.4bc	269.4a-c	118.6a-c
Milorganite	1.0	Jan	76.2hi	114.7i-k	181.2h-k	96.9c-h
Milorganite	2.0	Jan	167.1d-f	191.1d-h	240.8a-g	110.9b-d
SCU	1.0	Oct	146.8e-h	154.9g-j	194.8f-k	84.9e-h
SCU	2.0	Oct	171.2d-f	186.1d-h	238.6a-g	110.5b-d
SCU	1.0	Nov	105.2f-i	156.3g-j	206.0e-i	99.5c-g
SCU	2.0	Nov	167.2d-f	201.3c-h	250.8a-e	107.1b-d
SCU	1.0	Dec	116.1e-i	144.5h-k	193.8g-k	90.1d-h
SCU	2.0	Dec	232.7b-d	223.0c-e	274.5ab	133.0a
SCU	1.0	Jan	121.9e-i	158.0g-j	202.6f-j	97.2c-h
SCU	2.0	Jan	168.9d-f	195.0c-h	266.8a-c	123.4ab

[1] All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference test.

[2] Weight refers to the fresh weight in grams of turfgrass clippings per 17.9 sq ft.

[3] April applications were made 17 April 90; October applications were made 18 October 90; November applications were made 19 November 90; December applications were made 17 December 90; and January applications were made 15 January 91. All test plots were fertilized with urea (46-0-0) at 1 lb N/M on 21 June 90 and 13 September 90 and at 0.75 lb N/M on 21 July 90.

EVALUATION OF RESIN COATED UREA

D.J. Wehner and J.E. Haley

The purpose of this study is to evaluate turfgrass response to fertilization with a resin coated urea in comparison to fertilization with sulfur coated urea (SCU) and isobutylidene diurea (IBDU). The resin coated urea is marketed by Grace/Sierra under the trade name of "Once". "Once" is a blend of coated and uncoated fertilizers. Seventy percent of the product is coated, and the coated fraction is further divided into 3 - 4 month resin coated urea and 8 - 9 month resin coated urea with 15% of the product as uncoated urea. Potassium sulfate is the K source.

Research Protocol - Resin Coated Urea

Turf: blend of Parade, Adelphi, Glade, and Rugby Kentucky bluegrasses

Treatments: IBDU (31-0-0, coarse grade), SCU (36-0-0), and resin coated urea, RCU (Once, 34-0-7)
Potassium equivalent to that in RCU added to IBDU and SCU treatments
Single application of 4 pound N in spring, single application in fall, and split 2 + 2 application in spring and fall.

Time Applied: Spring applications - May 18, 1990
Fall applications - September 13, 1990.

Replications: 3, includes a non-fertilized plot per replication
Field Design: randomized complete block

Method of application: fertilizers applied by hand.

Plot maintenance:
Mowing - weekly at 1.5 inches, clippings collected and weighed
Irrigation - as needed to prevent stress
Herbicide - preemergence crabgrass control applied in spring

The results from 1990 represent the second year of this study which was started in May of 1989. The single fall applications of 4 pounds of nitrogen were first applied in September of 1989 so that the first results from these treatments were recorded in spring of 1990. The weekly color ratings for turf treated with the three N sources are listed in Table 1. The single fall application of all three N sources resulted in excellent spring color, however, the color did not last very long into the growing season. The color ratings for turf treated with the single fall application of any of the sources were only slightly higher than the untreated turf starting in late May. These results indicate that a single large application of N in the fall is not an efficient way to fertilize.

The color ratings for turf receiving a single spring application of fertilizer paralleled the ratings collected from these treatments in 1989. The initial response from SCU and RCU was greater than that from IBDU. The IBDU fertilized turf received color ratings equivalent to turf fertilized with the SCU and RCU starting 26 June (Table 1.). After that date, all of the spring applied treatments resulted in equivalent color ratings. Turf fertilized with the single spring application started to lose color in mid-September.

As might be expected, the split application (2+2) treatments resulted in a more uniform turf appearance during the growing season than the single application treatments. The SCU fertilized turf received slightly higher color ratings than turf receiving the split applications of IBDU or RCU the first few weeks after application.

Table 1. The effect of resin coated urea on the color of an improved Kentucky bluegrass turf blend during the 1990 growing season [1].

		Rate	Color[2]					
Source	Time Applied[3]	lb N/M	4/30	5/07	5/21	5/29	6/05	6/11
IBDU	spring	4	4.3a	4.3a	6.3bc	5.7b	5.3a	7.0c
SCU	spring	4	4.7a	4.3a	6.0ab	9.0e	9.0e	9.0e
RCU	spring	4	4.0a	4.0a	6.7cd	8.0d	8.0d	8.3d
IBDU	spring & fall	2 & 2	7.0bc	7.0bc	7.0d	6.0b	6.0b	6.0b
SCU	spring & fall	2 & 2	6.7b	6.7b	7.7e	8.3d	8.0d	8.0d
RCU	spring & fall	2 & 2	7.0bc	7.3c	8.0e	7.0c	7.0c	7.0c
IBDU	fall	4	8.3de	8.0d	8.0e	5.7b	5.3a	5.3a
SCU	fall	4	7.7cd	8.0d	8.0e	6.0b	6.0b	6.0b
RCU	fall	4	9.0e	8.0d	8.0e	6.0b	5.0a	6.0b
untreated		--	4.3a	4.0a	5.7a	5.0b	5.0a	5.3a

(continued)

Table 1. The effect of resin coated urea on the color of an improved Kentucky bluegrass turf blend during the 1990 growing season (continued)[1]

		Rate	Color[2]					
Source	Time Applied[3]	lb N/M	6/18	6/26	7/02	7/17	7/24	8/01
IBDU	spring	4	7.0c	9.0e	9.0d	8.7e	9.0f	9.0e
SCU	spring	4	9.0e	9.0e	9.0d	8.0d	8.3e	8.7e
RCU	spring	4	8.3d	9.0e	9.0d	8.3de	9.0f	9.0e
IBDU	spring & fall	2 & 2	7.0c	8.0d	7.7c	7.0c	7.0c	7.0c
SCU	spring & fall	2 & 2	8.0d	7.7d	8.0c	7.0c	7.7d	7.7d
RCU	spring & fall	2 & 2	7.3c	7.0c	7.3c	6.7c	7.7d	7.7d
IBDU	fall	4	5.3a	5.3a	5.0ab	6.0b	5.7b	6.0b
SCU	fall	4	6.0b	6.0b	5.7b	6.0b	6.0b	6.3b
RCU	fall	4	6.0b	6.0b	5.7b	6.0b	6.0b	6.0b
untreated		--	5.0a	5.3a	4.3a	5.0a	5.0a	5.0a

(continued)

[1] All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference.

[2] Color evaluations are made on a scale of 1-9, where 9 = very dark green and 1 = straw color.

[3] Spring applications were made 18 May 1990 and fall applications were made 13 September 1990.

Table 1. The effect of resin coated urea on the color of an improved Kentucky bluegrass turf blend during the 1990 growing season (continued)[1].

Source	Time Applied[3]	Rate lb N/M	Color[2] 8/09	8/14	8/22	8/29	9/05	9/12
IBDU	spring	4	9.0d	9.0e	9.0f	8.7e	9.0e	8.7f
SCU	spring	4	8.7d	8.7e	8.7f	8.7e	8.7e	8.3ef
RCU	spring	4	9.0d	9.0e	9.0f	9.0e	9.0e	8.7f
IBDU	spring & fall	2 & 2	7.3c	7.3cd	7.3d	7.0cd	7.7cd	7.0cd
SCU	spring & fall	2 & 2	7.3c	7.7d	8.0e	7.7d	8.3de	7.3d
RCU	spring & fall	2 & 2	7.3c	7.0c	8.0e	7.3d	7.0bc	7.7d
IBDU	fall	4	6.0ab	5.3a	6.3bc	5.3a	6.3b	5.7ab
SCU	fall	4	6.7bc	6.0b	6.7c	6.3bc	6.3b	7.0cd
RCU	fall	4	6.0ab	6.0b	6.0b	5.7ab	6.7b	6.3bc
untreated		--	5.3a	5.0a	5.0a	5.0a	5.0a	5.0a

(continued)

Table 1. The effect of resin coated urea on the color of an improved Kentucky bluegrass turf blend during the 1990 growing season (continued)[1].

Source	Time Applied[3]	Rate lb N/M	Color[2] 9/20	9/26	10/05	10/19	11/01	Dollar Spot[4] 7/18
IBDU	spring	4	7.3d	6.7cd	6.0b	6.0bc	5.0b	9.0d
SCU	spring	4	7.0cd	6.0b	6.0b	5.7b	5.0b	9.0d
RCU	spring	4	7.7d	6.7cd	6.0b	5.7b	5.0b	9.0d
IBDU	spring & fall	2 & 2	6.0bc	6.0b	6.7bc	7.0d	6.7c	7.3c
SCU	spring & fall	2 & 2	8.0d	9.0f	8.0de	9.0f	7.7d	7.7c
RCU	spring & fall	2 & 2	7.3d	7.0d	7.0c	6.7cd	7.7d	7.0c
IBDU	fall	4	5.7b	6.3bc	7.3cd	8.0e	7.3cd	4.7b
SCU	fall	4	7.3d	8.7f	8.7e	8.7ef	8.0d	5.7b
RCU	fall	4	7.7d	8.0e	8.3e	8.3ef	8.0d	5.7b
untreated		--	4.3a	5.0a	4.7a	4.0a	3.7a	3.3a

[1] All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference.

[2] Color evaluations are made on a scale of 1-9, where 9 = very dark green and 1 = straw color.

[3] Spring applications were made 18 May 1990 and fall applications were made 13 September 1990.

[4] Dollar spot evaluations are made on a 1-9 scale where 9 = no visible disease and 1 = necrosis of the turf as a result of disease infection.

The clipping weights for turf fertilized with the three N sources are presented in Table 2. The same trends evident in the color ratings were also demonstrated by the clipping weights. Particularly evident was the large amount of spring growth resulting from the single fall application of the fertilizers at the rate of 4 pounds of N per 1000 square feet.

Table 2. The effect of resin coated urea on the fresh clipping weight of an improved Kentucky bluegrass turf blend during the 1990 growing season[1].

		Rate	Weight[2]				
Source	Time Applied[3]	lb N/M	4/23	5/09	5/25	5/29	6/06
IBDU	spring	4	38.2a	69.3a	106.4a	99.0a	46.6a
SCU	spring	4	44.4a	80.5a	111.4a	204.4d	129.6e
RCU	spring	4	53.4a	78.2a	117.7a	167.7bc	85.5cd
IBDU	spring & fall	2 & 2	209.2c	213.4c	205.8b	148.6b	67.1b
SCU	spring & fall	2 & 2	109.4b	153.6b	195.2b	206.2d	97.2d
RCU	spring & fall	2 & 2	128.7b	202.1bc	218.8b	172.2c	85.1cd
IBDU	fall	4	401.5e	389.9e	320.5d	168.9bc	70.4bc
SCU	fall	4	179.4c	280.7d	274.8c	169.0bc	70.9bc
RCU	fall	4	306.2d	371.0e	307.0cd	175.3c	71.0bc
untreated		--	25.4a	55.9a	86.8a	87.1a	30.8a

(continued)

Table 2. The effect of resin coated urea on the fresh clipping weight of an improved Kentucky bluegrass turf blend during the 1990 growing season (continued)[1].

		Rate	Weight[2]				
Source	Time Applied[3]	lb N/M	6/11	6/18	6/26	7/02	7/17
IBDU	spring	4	53.5b	124.1b	147.0d	58.6e	225.0d
SCU	spring	4	145.5f	235.1d	169.1e	39.9d	147.8c
RCU	spring	4	89.2de	152.5bc	140.1d	44.7d	220.1d
IBDU	spring & fall	2 & 2	67.8bc	155.4bc	112.7c	30.5c	137.6c
SCU	spring & fall	2 & 2	101.8e	162.3c	97.7c	16.0b	89.9b
RCU	spring & fall	2 & 2	81.6cd	152.4bc	94.7c	22.3b	135.8c
IBDU	fall	4	61.6b	129.3bc	54.1b	5.4a	59.1ab
SCU	fall	4	57.9b	137.2bc	58.3b	7.9a	63.3ab
RCU	fall	4	66.1bc	124.9b	59.2b	7.9a	66.4ab
untreated		--	31.9a	76.4a	19.4a	2.5a	30.7a

(continued)

[1]All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference.

[2]Weight refers to the fresh weight in grams of turfgrass clippings per 17.9 sq ft.

[3]Spring applications were made 18 May 1990 and fall applications were made 13 September 1990.

Table 2. The effect of resin coated urea on the fresh clipping weight of an improved Kentucky bluegrass turf blend during the 1990 growing season (continued)[1].

Source	Time Applied[3]	Rate lb N/M	Weight[2] 7/24	8/01	8/09	8/14	8/22	8/29
IBDU	spring	4	165.7d	101.2e	63.1d	45.7f	83.5d	82.2de
SCU	spring	4	119.7c	86.0de	58.9cd	39.8d-f	67.2c	73.9c-e
RCU	spring	4	159.5d	122.1f	68.6d	47.6f	86.8d	84.4e
IBDU	spring & fall	2 & 2	112.3c	81.7d	49.6bc	36.4c-e	68.5c	71.3cd
SCU	spring & fall	2 & 2	85.6b	74.1cd	46.6bc	32.7cd	66.9c	71.4cd
RCU	spring & fall	2 & 2	121.3c	91.0de	66.6d	44.1ef	89.4d	80.2de
IBDU	fall	4	67.0b	54.7b	37.7b	30.0bc	57.4bc	57.9b
SCU	fall	4	70.2b	58.6bc	37.5b	30.6bc	63.5c	67.2bc
RCU	fall	4	69.9b	54.6b	37.2b	24.5b	47.4ab	55.9b
untreated		--	39.8a	32.5a	20.9a	14.7a	35.3a	37.9a

(continued)

Table 2. The effect of resin coated urea on the fresh clipping weight of an improved Kentucky bluegrass turf blend during the 1990 growing season (continued)[1].

Source	Time Applied[3]	Rate lb N/M	Weight[2] 9/05	9/12	9/20	9/26	10/05	10/19
IBDU	spring	4	37.6bc	36.5	39.9bc	14.1a-c	51.1b-d	56.1b
SCU	spring	4	44.1c	37.3	37.0bc	12.3ab	37.5b	42.3ab
RCU	spring	4	44.2c	37.3	43.1c	19.6bc	45.7bc	47.7ab
IBDU	spring & fall	2 & 2	43.5c	39.2	36.8bc	15.6a-c	46.2bc	109.1c
SCU	spring & fall	2 & 2	37.2bc	35.0	54.4d	60.9e	144.1f	161.9d
RCU	spring & fall	2 & 2	43.0c	38.0	39.7bc	22.8c	55.3cd	96.1c
IBDU	fall	4	34.3b	32.1	30.8ab	19.0bc	60.6d	139.8d
SCU	fall	4	40.5bc	38.4	52.7d	71.6f	217.6g	251.8e
RCU	fall	4	38.6bc	33.6	43.0c	36.4d	94.0e	156.7d
untreated		--	25.5a	25.2	21.7a	7.4a	22.6a	25.5a
				NS				

[1]All values represent the mean of 3 replications. Means in the same column with the same letter are not significantly different at the 0.05 level as determined by Fisher's Protected Least Significant Difference.

[2]Weight refers to the fresh weight in grams of turfgrass clippings per 17.9 sq ft.

[3]Spring applications were made 18 May 1990 and fall applications were made 13 September 1990.

EVALUATION OF BROWN PATCH MANAGEMENT IN TALL FESCUE

K.L. Diesburg

Introduction

Brown Patch (*Rhizoctonia solani*) is becoming a more frequent problem in tall fescue lawns for three reasons: 1) increased use of tall fescue for turf, 2) lack of resistance in the slower growing turf-types, and 3) higher management levels due to the association of turf-type tall fescues with higher quality turf. The organism is expected to proliferate during the summer when day temperatures are in the eighties to nineties and night temperatures are in seventies to eighties. The disease is somewhat unpredictable as to which lawns will be severely damaged. This project has been conceived to determine which management regimes encourage disease severity the most. The objective of this first experiment was to see if some combination of nitrogen source and clipping height would stimulate disease incidence above a nontreated control in immature turf.

Material and Methods

Monarch tall fescue was seeded May 8. On June 7, the two clipping managements were initiated while four nitrogen sources (urea, IBDU, Ringer 10-2-6, and sulfur-coated urea) were applied separately into a split-plot design with 1" and 3" clipping heights as whole plots and nitrogen sources as subplots. Five check plots were also established; no treatment, Clear Spray antitranspirant, and fungicides Thiram, Chipco 26019, and Banner. Disease incidence was recorded 1, 2, and 3 months after treatment.

Results

Sulfur-coated urea and no treatment appeared to cause the greatest severity of the disease overall (Table 1), while IBDU and Thiram appeared to limit the disease the most. On July 5, Banner, urea, IBDU, and Thiram had lowest disease incidence. On August 2, Clear Spray and Chipco had lowest disease incidence. By August 30, the hottest part of the summer had passed and there were no differences in the low disease levels. The differences in disease incidence across the four replications were so erratic between clipping heights that no significant interactions could be determined.

Discussion

Disease incidence was quite erratic. Severity was limited by one of the mildest summers on record. Even though differences among plots could be seen, they could not be called significantly different within the statistical limits of the experiment. The differences noted in RESULTS, above, are inconclusive and the experiment will be repeated in 1991.

Table 1. Percent incidence of brown patch in immature tall fescue turf.

Treatment	Percent Incidence			
	July 5	August 2	August 30	Average
Sulfur coated urea	19.5	11.6	7.6	12.9
Untreated	15.6	11.6	7.4	11.5
Ringer 10-2-6	19.5	6.4	6.9	10.9
Banner	4.4	16.6	7.0	9.3
Clear Spray	16.2	3.0	7.4	8.9
Chipco	17.7	2.0	6.6	8.8
Urea	1.5	13.0	6.8	7.1
IBDU	0.8	9.9	6.7	5.8
Thiram	0.3	9.6	7.2	5.7
$LSD_{0.05}$	14.6	9.8	0.9	6.1

FINAL REPORT FOR FUNGICIDE EFFICACY TRIALS CONDUCTED AT THE UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN AND URBANA, IL, 19900

H.T. Wilkinson, R.W. Kane, M.C. Shurtleff

Fungicide Trials for the Control of Dollar Spot on Bentgrass

Dollar spot continues to develop on creeping bentgrass, bluegrass, ryegrass and several other minor grasses. During the 1990 growing season, this disease was very severe and difficult to manage. In addition, resistance to the fungicides by the fungal pathogens that cause this disease is a continuing threat.

Testing the efficacy of new chemical fungicides and continued evaluation of registered fungicides was conducted in the research plots during 1990. Also tested this year was the integration of fungicides with nitrogen fertilizer. Listed below is the background information about the conditions of bentgrass culture. All tests for control of dollar spot were conducted on creeping bentgrass at the Urbana site.

BACKGROUND INFORMATION:

1. Grass species: *Agrostis palustris* cv. Penncross.
2. Height of cut: 0.63 cm, every-other-day.
3. Total nitrogen/M/yr: 2.5 Kg.
4. Insecticides and herbicides: applied as needed, additional information upon request.
5. Topdressing: bimonthly; 80:20 sand/soil mixture.
6. Fungicide treatments: applied in 18 L water/M, unit test areas = 1.2 m x 1.5 m (more specific information on following page).
7. Treatments applied after dollar spot symptoms were observed: July 10, 1990.
8. Inoculum of the pathogens: natural inoculum, no artificial inoculum applied.
9. Irrigation: natural rainfall plus 2.5 cm/week.
10. Disease severity ratings: July 10, July 22, August 3, August 9, August 24, August 26, September 14. Percentage of turf area with disease symptoms.

TEST PARAMETERS (DOLLAR SPOT/BROWN PATCH)

1. Plot size: $(1.2 \times 1.5)m^2$
2. Soil type: Drummer Silt loam
3. % O.M.: 2.5
4. pH: 7.0
5. Type of Equip: Back-Pack sprayer
6. Nozzle Type: Brass, flat-fan
7. Nozzle Size: E101
8. Pressure Rate: 35 psi
9. Gals/Acre: 215
10. Ground Speed: 0.85 mph
11. Air Temp: 80-98 F
12. % RH: 70-95
13. Soil Temp: 79-93
14. Plant Stage of Growth at Applic: mid-summer - Fall
15. Disease, Weed, or Insect Stage of Growth at Applic: About 10-20% disease
16. Amount of First Rainfall after Applic: Plots receive about 1"/wk
17. Amount of Irrigation after Applic: See #16

Table 1

University of Illinois

Dollar Spot Trials: 1990

Trt. No.	Company	Chem A	Chem B	(Oz.Form)/M A	(Oz.Form)/M B	I
1	Dow. El.	Rubigan 1AS	------	0.75	-----	14
2	Dow. El.	Rubigan 1AS	------	1.50	-----	14
3	Mobay	Lynx 1.2 EC	------	1.67	-----	28
4	Mobay	Bayleton 25 T/O	Urea	0.25	0.25 #	14
5	Mobay	Bayleton 25 T/O	Urea	0.50	0.25 #	14
6	Mobay	Bayleton 25 T/O	Urea	1.0	0.25 #	14
7	San Doz	Cyproconazole	------	0.125	-----	21
8	San Doz	Cyproconazole	------	0.167	-----	21
9	San Doz	Cyproconazole	------	0.25	-----	28
10	Rohm & Haus	RH-3866 2E	------	1.0	-----	14
11	Rohm & Haus	RH-3866 2E	------	1.0	-----	28
12	Rohm & Haus	RH-3866 2E	------	2.0	-----	28
13	W.A. Cleary	Cleary 1-2-3	------	3.0	-----	14
14	Ciba-Geigy	Banner 1.1 E	------	0.25	-----	14
15	Ciba-Geigy	Banner 1.1 E	------	0.50	-----	14
16	Ciba-Geigy	Banner 1.1 E	------	1.0	-----	14

University of Illinois

Dollar Spot Trials: 1990

Trt. No.	Company	Chem A	Chem B	(Oz.Form)/M A	(Oz.Form)/M B	I
17	Ciba-Geigy	Banner 1.1 E	Urea	0.25	0.25	14
18	Ciba-Geigy	Banner 1.1 E	Urea	0.50	0.25	14
19	Ciba-Geigy	Banner 1.1 E	Urea	-----	0.25	14
20	Fermenta	ASC-66608	------	5.0	-----	14
21	Fermenta	ASC-66608	------	7.5	-----	14
22	Fermenta	ASC-66811	------	0.15	-----	14
23	Fermenta	ASC-66811	------	0.15	-----	14
24	Fermenta	ASC-66900	------	4.0	-----	14
25	Fermenta	Daconil 90DG	------	3.5	-----	14
26	Fermenta	Daconil 90DG	------	1.7	-----	14
27	Fermenta	ASC-66617	4 EC	0.2	-----	14
28	Fermenta	ASC-66617	------	0.4	-----	14

Table 2

Analysis of dollar spot disease control

University of Illinois

Date: August 24, 1990

No.	Trt. No.	Mean Disease Severity	Statistics
1	28	0	A
2	12	0	A
3	8	0	A
4	9	0	A
5	13	0	A
6	6	0	A
7	10	0	A
8	7	2	A
9	3	2	A
10	16	4	A
11	11	5	A
12	5	7	A
13	2	8	AB
14	4	8	AB
15	18	9	ABC
16	27	10	ABC
17	23	12	ABCD
18	15	13	ABCD
19	20	22	BCDE
20	21	22	BCDE
21	17	23	CDE
22	14	25	DE
23	25	30	EF
24	22	31	EF
25	1	32	EF
26	26	33	EF
27	24	43	F
28	19	43	F

Disease severity = percentage area with symptoms; statistics (LSD, P=0.05) data followed by similar letters are not significantly different.

Table 3

Analysis of dollar spot disease control

University of Illinois

Date: August 26, 1990

No.	Trt. No.	Mean Disease Severity	Statistics
1	6	0	A
2	5	0	A
3	4	0	A
4	10	0	A
5	9	0	A
6	8	0	A
7	7	0	A
8	18	0	A
9	17	0	A
10	16	0	A
11	2	0	A
12	3	0	A
13	27	1	A
14	28	1	A
15	13	2	A
16	23	2	A
17	15	3	AB
18	11	3	AB
19	14	7	ABC
20	12	7	ABC
21	20	7	ABC
22	21	7	ABC
23	1	10.	ABC
24	22	14	BCD
25	25	17	CD
26	26	23	DE
27	19	28	E
28	24	32	E

Disease severity - percentage area with symptoms; statistics (LSD, P-0.05) data followed by similar letters are not significantly different.

Table 4

Analysis of dollar spot disease control

University of Illinois

Date: July 22, 1990

No.	Trt. No.	Mean Disease Severity	Statistics
1	9	1	A
2	3	2	AB
3	26	2	AB
4	13	2	AB
5	5	2	AB
6	18	4	ABC
7	7	4	ABC
8	6	5	ABCD
9	12	5	ABCD
10	8	7	ABCD
11	10	7	ABCDE
12	2	8	ABCDE
13	11	8	ABCDE
14	4	10	ABCDE
15	16	12	ABCDEF
16	15	15	ABCDEF
17	14	17	BCDEFG
18	24	18	CDEFG
19	22	20	DEFGH
20	20	20	DEFGH
21	1	22	EFGH
22	25	25	FGH
23	17	25	FGH
24	28	25	FGH
25	21	30	GHI
26	19	33	HIJ
27	23	40	IJ
28	27	42	J

Disease severity = percentage area with symptoms; statistics (LSD, P=0.05) data followed by similar letters are not significantly different.

Table 5

Analysis of dollar spot disease control

University of Illinois

Date: July 10, 1990

No.	Trt. No.	Mean Disease Severity	Statistics
1	22	17	A
2	24	20	AB
3	7	20	AB
4	3	22	AB
5	26	23	ABC
6	5	23	ABC
7	14	23	ABC
8	19	23	ABC
9	25	23	ABC
10	1	25	ABC
11	10	25	ABC
12	20	25	ABC
13	12	27	ABC
14	17	27	ABC
15	21	28	ABC
16	8	28	ABC
17	15	28.	ABC
18	4	28	ABC
19	28	30	ABC
20	18	30	ABC
21	16	32	BC
22	13	32	BC
23	9	32	BC
24	11	33	BC
25	6	33	BC
26	23	33	BC
27	27	37	C
28	2	37	C

Disease severity = percentage area with symptoms; statistics (LSD, P=0.05) data followed by similar letters are not significantly different.

Table 6

Analysis of dollar spot disease control

University of Illinois

Date: August 3, 1990

No.	Trt. No.	Mean Disease Severity	Statistics
1	6	4	A
2	5	4	A
3	7	4	A
4	18	5	AB
5	28	7	ABC
6	4	7	ABC
7	9	9	ABC
8	16	10	ABC
9	13	10	ABC
10	10	10	ABC
11	17	10	ABC
12	8	10	ABC
13	23	12	ABCD
14	3	12	ABCD
15	22	13	ABCDE
16	26	13	ABCDE
17	12	13	ABCDE
18	27	13	ABCDE
19	2	14	ABCDE
20	15	18	ABCDE
21	1	18	ABCDE
22	11	20	BCDEF
23	14	20	BCDEF
24	20	22	CDEF
25	21	27	DEF
26	24	27	DEF
27	25	28	EF
28	19	35	F

Disease severity = percentage area with symptoms; statistics (LSD, P=0.05) data followed by similar letters are not significantly different.

Table 7

Analysis of dollar spot disease control

University of Illinois

Date: August 9, 1990

No.	Trt. No.	Mean Disease Severity	Statistics
1	7	2	A
2	5	2	A
3	4	2	AB
4	9	2	AB
5	13	4	AB
6	8	4	AB
7	18	4	AB
8	6	4	AB
9	17	5	AB
10	10	5	AB
11	2	7	AB
12	27	7	AB
13	28	7	AB
14	16	8	ABC
15	22	8	ABC
16	12	8	ABC
17	15	12	ABCD
18	23	12	ABCD
19	3	12	ABCD
20	11	13	ABCDEF
21	14	13	ABCDEF
22	1	13	ABCDEF
23	26	15	BCDEF
24	19	20	CDEF
25	20	23	DEF
26	24	25	DE
27	21	29	EF
28	25	38	F

Disease severity = percentage area with symptoms; statistics (LSD, P=0.05) data followed by similar letters are not significantly different.

Results of Fungicide Treatments for the Control of Dollar Spot

On July 10, 1990, the initial rating of disease severity was made (Tables 2-4). The average severity in the test area was 25-30%, which is excellent for efficacy tests. Also the severity of disease on the entire test area was reasonably uniform, but not perfectly uniform. On this date, the disease severity ratings were unaffected by the chemical treatments. Treatments were applied immediately following the recording of these ratings.

On July 22, 1990, 12 days after the first application, treatment effects can be seen. In my estimation, for a chemical to be "satisfactory" it should reduce dollar spot disease severity to 2% or lower. This is based on the conditions that appeared satisfactory on golf courses in the Mid-West. Disease control at a severity rating of 5% or less is also very good, but noticeably different than 2%. Looking at the statistical analysis of these data, it can be seen that variability among replicates of the same treatment cause fewer justifiable statistical differences among the treatments than appeared when the turf was observed. This is understandable, especially this year. The disease pressure from dollar spot this season was severe. This can be appreciated from the disease severity of 42% for treatment 28 on July 22. In this part of the Mid-West, this is a very high disease severity for this date.

On August 3, the disease control by the various treatments was different for some of the fungicides as compared to July 22. Still, a small group of treatments was obviously better than the rest to the observer, but the variability among the replications caused these differences to be reduced when statistical comparisons were made. It is very important to realize that none of the treatments controlled the disease to a severity of lower than 4%. There is a reason for this, but it is not related to the efficacy of the fungicides. The growing conditions for the bentgrass during the 1990 season were exceptional. The grass grew faster and longer during this season than usual. In July and August, generally the bentgrass growth slows down, but not this season. Because of this, the fast rates that new and unprotected leaf tissues were produced caused a situation in which the new tissues were not covered by fungicide and the frequency of application was not short enough to compensate. This resulted in more severe disease. This is further seen from the data presented for August 24, 1990. These data indicate that more of the fungicide programs were effective, but in addition, the rate of grass growth had finally slowed down. This allowed the chemical to be in position to control the pathogens and the bentgrass to recover from the disease.

By September 14, 1990 (data not shown), all of the natural disease pressure was reduced to nearly zero, i.e., the water control treatment had a disease severity rating of about 1%. At that time the ratings were stopped. These plots will be rated one more time during the 1991 season, to establish if residual effects of the various treatments enhance disease management the season following application.

There were no toxicities from the treatments listed and no other effects such as growth or color enhancement. This is different than last year, in which color enhancement was observed. The lack of color enhancement is probably due to the rapid, natural growth of the grass this season.

Fungicide Control of Brown Patch on Bentgrass

The brown patch disease remains a problem for bentgrass golf greens in the Mid-west, because it develops each year and there are not exceptional control programs for it. This season, 21 different treatments were applied to disease bentgrass and evaluated for their ability to control brown patch. In years past, we relied on natural inoculum for disease pressure in the research greens, but this proved to be too erratic. This season a combination of natural and artificial inoculum of the pathogen was used. We feel that the results are better this year and will be using this method next year to insure good tests. It should be pointed out that the pathogen used to inoculate the grass was the same as the natural one. Listed below are the background data on the conditions of the site. On the following page are specific details of the tests.

BACKGROUND INFORMATION:

1. Grass species: *Agrostis palustris* cv. Penncross.

2. Height of cut: 0.63 cm, every-other-day.

3. Total nitrogen/M/yr: 2.5 Kg.

4. Insecticides and herbicides: applied as needed (addition information upon request).

5. Topdressing: bimonthly; 80:20 sand/soil mixture.

6. Fungicide treatments: applied in 18 L water/M, unit test areas = 1.2 m x 1.5 m (more specific information in *Test Paramenters*).

7. Treatments applied after dollar spot symptoms were observed: July 10, 1990.

8. Inoculum of the pathogens: natural inoculum and laboratory produced inoculum of *Rhizoctonia solani* were used. The artificial inoculum was applied using two methods. Inoculum was spread onto the grass using a fertilizer spreader at a rate of 2 kg/m and using a Ryan slit seeder at a rate of 2 kg/m. The slit seeder was placed to a depth of about 0.5 cm. Immediately following inoculation of the grass, irrigation was applied at 0.5 cm every 6 hr for a period of one week.

9. Irrigation: natural rainfall plus 2.5 cm/week.

10. Disease severity ratings: July 10, July 22, August 3, August 9, August 24, August 26, September 14.

TEST PARAMETERS (DOLLAR SPOT/BROWN PATCH)

1. Plot size: $(1.2 \times 1.5)m^2$
2. Soil type: Drummer Silt loam
3. % O.M.: 2.5
4. pH: 7.0
5. Type of Equip: Back-Pack sprayer
6. Nozzle Type: Brass, flat-fan
7. Nozzle Size: E101
8. Pressure Rate: 35 psi
9. Gals/Acre: 215
10. Ground Speed: 0.85 mph
11. Air Temp: 80-98 F
12. % RH: 70-95
13. Soil Temp: 79-93
14. Plant Stage of
    Growth at Applic: mid-summer - Fall
15. Disease, Weed, or
    Insect Stage of
    Growth at Applic: About 10-20% disease
16. Amount of First
    Rainfall after Applic: Plots receive about 1"/wk
17. Amount of Irrigation
    after Applic: See #16

Table 8

University of Illinois

Brown Patch Trials: 1990

Trt. No.	Company	Chem A	Chem B	(Oz.Form)/M A	(Oz.Form)/M B	I
1	Dow. El.	Rubigan 1AS	DAC-2787	1.5	4.0	14
2	Dow. El.	------	DAC-2787	-----	4.0	14
3	San Doz	Cyproconazole	------	0.25	-----	14
4	San Doz	Rizolex	------	4.0	-----	14
5	San Doz	San 832F	------	4.0	-----	14
6	San Doz	Flutolanil	Cyproco-nazole	2.0	0.167	14
7	Nor-Am	Pro Star (SN 84364)	------	4.0	-----	28
8	SARS	SARS-044 (2.25% wp)	------	2.9	-----	*14
9	SARS	SARS-044 (2.25% wp)	------	5.8	-----	*14
10	SARS	SARS-044 (2.25% wp)	------	11.7	-----	*14
11	SARS	SARS-044 (2.25% wp)	------	5.8	-----	14
12	SARS	SARS-044 (2.25% wp)	------	11.7	-----	14

University of Illinois

Brown Patch Trials: 1990

Trt. No.	Company	Chem A	Chem B	(Oz.Form)/M A	(Oz.Form)/M B	I
13	Ciba-Geigy	Banner	------	1.0	-----	14
14	Ciba-Geigy	Banner	------	2.0	-----	14
15	Fermenta	DAC-2787	------	6.0	-----	14
16	Fermenta	ASC 66518-X-A	------	4.2	-----	14
17	Fermenta	ASC 66518-X-B	------	4.2	-----	14
18	Fermenta	ASC 66518-X-C	------	3.8	-----	14
19	Fermenta	ASC 66518-X-D	------	3.8	-----	14
20	Fermenta	DACNIL 90DG	------	3.5	-----	14
21	--------	Water	------	---	-----	--

*Preventative treatment; all others curative.

Table 9

Analysis of brown patch disease control

University of Illinois

Date - July 24, 1990

No.	Treatment	Mean Disease	Statistics
1	17	2.0	A
2	2	2.3	AB
3	3	2.7	ABC
4	12	2.7	ABC
5	5	2.7	ABC
6	19	2.7	ABC
7	1	2.7	ABC
8	9	2.7	ABC
9	10	2.7	ABC
10	21	3.0	BCD
11	7	3.0	BCD
12	6	3.0	BCD
13	15	3.0	BCD
14	20	3.0	BCD
15	18	3.0	BCD
16	14	3.3	CD
17	11	3.3	CD
18	16	3.3	CD
19	13	3.3	CD
20	8	3.3	CD
21	4	3.7	D

Disease severity - 1-0-25% area blighted, 4-75-100% area blighted; statistics (LSD, P-0.05) data followed by similar letters are not significantly different.

Table 10

Analysis of brown patch disease control

University of Illinois

Date - August 3, 1990

No.	Treatment	Mean Disease	Statistics
1	19	1.3	A
2	7	1.7	AB
3	3	1.7	AB
4	18	1.7	AB
5	20	2.0	ABC
6	1	2.0	ABC
7	15	2.0	ABC
8	11	2.0	ABC
9	4	2.0	ABC
10	12	2.3	ABC
11	8	2.3	ABC
12	2	2.3	ABC
13	9	2.3	ABC
14	10	2.3	ABC
15	14	2.7	ABC
16	16	2.7	ABC
17	5	2.7	ABC
18	17	2.7	ABC
19	13	3.0	BC
20	21	3.0	BC
21	6	3.3	C

Disease severity = 1=0-25% area blighted, 4=75-100% area blighted; statistics (LSD, P=0.05) data followed by similar letters are not significantly different.

Table 11

Analysis of brown patch disease control

University of Illinois

Date - August 9, 1990

No.	Treatment	Mean Disease	Statistics
1	18	2.0	A
2	10	2.0	A
3	19	2.3	AB
4	7	2.3	AB
5	5	2.3	AB
6	1	2.3	AB
7	15	2.3	AB
8	8	2.3	AB
9	17	2.3	AB
10	12	2.3	AB
11	2	2.3	AB
12	20	2.7	AB
13	16	2.7	AB
14	9	2.7	AB
15	6	3.0	AB
16	11	3.0	AB
17	13	3.3	B
18	21	3.3	B
19	14	3.3	B
20	3	3.3	B
21	4	3.3	B

Disease severity - 1-0-25% area blighted, 4-75-100% area blighted; statistics (LSD, P-0.05) data followed by similar letters are not significantly different.

Table 12

Analysis of brown patch disease control

University of Illinois

Date - August 24, 1990

No.	Treatment	Mean Disease	Statistics
1	14	0.7	A
2	6	1.0	AB
3	1	1.0	AB
4	18	1.0	AB
5	5	1.3	ABC
6	7	1.3	ABC
7	16	1.3	ABC
8	17	1.3	ABC
9	13	1.7	ABCD
10	15	1.7	ABCD
11	3	1.7	ABCD
12	20	2.0	BCD
13	2	2.0	BCD
14	4	2.0	BCD
15	19	2.0	BCD
16	10	2.0	BCD
17	8	2.3	CDE
18	12	2.7	DE
19	9	2.7	DE
20	21	3.3	DE
21	11	3.3	DE

Disease severity - 1-0-25% area blighted, 4-75-100% area blighted; statistics (LSD, P-0.05) data followed by similar letters are not significantly different.

Table 13

Analysis of brown patch disease control

University of Illinois

Date - September 10, 1990

No.	Treatment	Mean Disease	Statistics
1	18	0.3	A
2	17	0.3	A
3	1	0.3	A
4	14	0.7	A
5	13	0.7	A
6	19	1.0	AB
7	16	1.0	AB
8	20	1.0	AB
9	5	1.0	AB
10	3	1.0	AB
11	2	1.0	AB
12	6	1.3	ABC
13	4	1.3	ABC
14	15	1.3	ABC
15	7	1.3	ABC
16	8	2.3	BCD
17	12	2.7	CD
18	21	3.0	D
19	9	3.0	D
20	11	3.0	D
21	10	3.3	D

Disease severity - 1-0-25% area blighted, 4-75-100% area blighted; statistics (LSD, P-0.05) data followed by similar letters are not significantly different.

Results of Fungicide Treatments for the Control of Brown Patch

The main limitation of the brown patch research is the lack of uniformity of the disease severity over the treatment plots (Tables 9-13). To assess the disease severity of brown patch a 1-4 rating scale is used. This scale is briefly explained on each table. We use this scale because we have broadcast inoculum in the plots. Brown patch development in these plots was a blight symptom not a patch as it is in nature. I should also point out, that using this type of inoculation technique, disease severity is very high (mean of 3.3/4.0). Treatments that were effective in these tests stand a good change of being effective under natural conditions. On July 10, 1990 there were no symptoms of brown patch evident and the plots looked uniform. On this date all preventative treatments commenced. On July 24, the first of the curative treatments was applied. From the data presented in the table of July 24, 1990, it can be seen that there are differences in the severity of brown patch from one area to the next. This is demonstrated by the differences in disease severity among the curative treatments. This problem is nearly impossible to manage due to the restricted area of testing and the variable nature of the pathogen. However, it can be said that of the three preventative treatments, nos. 9 and 10 were more effective than no. 8 two weeks after application.

By August 3, 1990, only three treatments (3, 7, 19) differed significantly than the untreated water control treatment. There were other differences that I believe gave evidence of partial control of brown patch, but again the variability among replications precluded statistical support. I would offer that treatments that resulted in a disease severity rating of 2 or less are useful and treatments that reduce the disease severity below 1.5 are exceptional. More testing is the answer to determining which chemical fungicides will consistently achieve these levels of control.

In reviewing the data from August 9 and August 24 and September 10, several points should be considered. The fungicides were affecting the disease severity of brown patch, but the weather was also having some effects. The best differentiation among the chemicals appears during the later part of August and early September. You will notice that the ranking of the different chemicals changed during the course of this study. It is not possible to explain this at this time. It should also be carefully observed that there continued to be variability in terms of disease severity among the plots.

In summary, the fungicides and programs that were used had positive effects in controlling or reducing the severity of brown patch, but none were exceptional during the entire treatment program. Some of the fungicides did an exceptional job of control during the later period of the tests. Rhizoctonia sp. are excellent colonizers of roots and rhizomes and have tremendous survival capabilities. For these reasons and the fact that the chemical must work at the soil/plant interface, there may be a period of time required for these chemicals to "work" in reducing disease severity. This would suggest that, turf areas that have a history of brown patch, consider a preventative and multi-year program of control. More research will be required to definitively conclude this. Perhaps other researchers have already come to this conclusion.

Fungicide Control of Summer Patch on Kentucky Bluegrass

Summer patch remains one of the most serious diseases on both Kentucky bluegrass and annual bluegrass. The pathogen is now recognized to be *Magnaporthe poae*. It is unclear if other pathogens are also involved in affecting the severity of disease symptoms. The development and cause of symptoms is still being researched, but much progress has been made. Refer to the SPECIAL RESEARCH PROJECT for current recommendations on programs to manage summer patch. To date, no single fungicide program has resulted in rapid reduction of disease severity or performed consistently over time or over geographic areas. This, in my opinion, is due to a combination of environmental factors and not necessarily due to the ineffectiveness of the fungicides. The research reported below was conducted to determine if fungicidal control could be observed and quantified. In addition to efficacy evaluations, the question of single versus multiple applications of fungicides and the use of fungicides plus nitrogen for the reduction of disease symptoms were examined. The test conditions and management practices are listed below.

BACKGROUND INFORMATION:

1. Grass species: blend of *Poa pratensis* cvs Adelphi, Baron, Ram 1, Sydsport, and Glade in equal proportions.

2. Mowing: 2 inches/weekly; rotary mower.

3. Fertilization (N): 8.8 kg/M, applied in equal amounts during the months of April-September.

4. Irrigation: Natural plus about 2.5 cm/week during the growing season.

5. Fungicide treatments:

   a. Irrigated 1.25 cm prior to application and following application.

   b. All treatments applied in 18 l/M.

   c. Treatment areas: 1 m x 3 m.

   d. Application: backpack, CO_2 sprayer, 101E nozzle, 35 psi, hand-held, single boom.

   e. Disease ratings: turf examined weekly and disease severity recorded on September 10, 1990. Disease severity equaled the percentage of plot area displaying disease symptoms. The degree of symptoms intensity was observed, but is not reflected in all of the ratings.

   f. All treatment were applied when the daily mean soil temperature under the sod at a depth of 5.0 cm was about 21 C (refer to SPECIAL RESEARCH REPORT).

Table 14

Summer patch disease control totals.

University of Illinois

No.	Company	Chemical	oz. Form/M	Interval (Day)
1.	Sandoz	Cyproconazole 40WG	.34	28
2.	Ciba Geigy	Propiconazole 1.1EC	2.0	14
3.			2.0	28
4.			4.0	1X
5.			4.0	28
6.	Fermenta	ASC-66791-X-0107	6	1-4
7.			8	28
8.		ASC 66811	.15	14
9.			.3	28
10.		ASC 66900	4	14
11.		Daconil 90 DG	1.7	14
12.			3.5	14
13.		ASC 66617-4EC	0.2	14
14.			0.4	14
15.	Rhone Poulenc	Chipco 26019	4	28
16.			6	28
17.			8	28
18.	Rohm & Haas	Rh-3866 2E	1	14
19.			1	28
20.			2	28
21.	DowElance	Rubigan 1AS	4	1X
22.			8	1X
23.			4	28
24.		Rubigan 1G	50	1X

Summer patch disease control totals.

University of Illinois

No.	Company	Chemical	oz. Form/M	Interval (Day)
25.	Mobay	Lynx 1.2EC	1.67	28
			3.33	28
26.		Lynx 2F X-77	1.0 + .06	28
27.		Bayleton 25 T/O	2	28
28.		Bayleton 25 T/O	4	28
29.		Bayleton 25 T/O +UREA	2 + .5#/m	28
30.		Bayleton 25 T/O +UREA	4 + .5#/m	28
31.		Check		28

Table 15

Summer Patch disease control trials

University of Illinois

Date: September 10, 1990

No.	Treatment No.	Disease Severity	Statistics
1	27	1.7	A
2	26	1.7	A
3	24	3.3	AB
4	21	3.3	AB
5	30	3.3	AB
6	2	3.3	AB
7	25	3.3	AB
8	17	3.3	AB
9	10	3.3	AB
10	8	5.0	AB
11	13	5.0	AB
12	29	5.0	AB
13	6	5.0	AB
14	19	6.7	AB
15	3	6.7	AB
16	5	6.7	AB
17	16	6.7	AB
18	20	8.3	AB
19	14	8.3	AB
20	1	8.3	AB
21	4	8.3	AB
22	22	8.3	AB
23	9	8.3	AB
24	23	10.0	AB
25	7	10.0	AB
26	28	11.7	AB
27	15	11.7	AB
28	31	11.7	AB
29	18	13.3	AB
30	12	13.3	AB
31	11	15.0	B

Disease severity = percentage area with symptoms; statistics (LSD, P=0.05) data followed by similar letters are not significantly different.

Table 16

SUMMER PATCH DISEASE CONTROL USING FUNGICIDES

(1989)

CHEMICAL	RATE	APPLICATION	MEAN DS
1. Banner	4.0/M	One time	1.2a
2. Banner	2.0	Two times	2.8b
3. Bayleton	4.0	One time	2.9b
4. Bayleton	2.0	Two times	3.2b
5. Rubigan	4.0	One time	2.1b
6. Rubigan	2.0	Two times	3.0b
7. Tersan 1991	8.0	One time	3.1b
8. Water	---	One time	3.0b
9. Water	---	Two times	2.9b

*Fungicides were applied to mature bluegrass sod with a history of summer patch. All fungicides were applied when the soil temperature at a depth of two inches was about 21 C. The second application was made about one month later. Disease severity ratings reflect the intensity and activity of patches. A scale of 1 = none to faint symptoms and 4 = very active disease with dead grass. According to an LSD (P = 0.05) test, disease severity values with the same letter were not significantly different.

Table 17

Take-all patch disease control trial

University of Illinois

Treatment No.	Chemical	Fall Appl.	Spring Appl.
1.	Banner EC	2 oz.	2 oz.
2.	"	4 oz.	4 oz.
3.	Rubigan AS	4 oz.	4 oz.
4.	"	8 oz.	-----
5.	Tersan 1991	8 oz.	8 oz.
6.	Cleary PMA	2 oz.	2 oz.
7.	"	4 oz.	4 oz.
8.	LYNX 2F	2 oz.	2 oz.
9.	SDS 66811 EC	.5 oz.	.5 oz.
10.	SAN 619 F	.6 oz	.6 oz.
11.	Bayleton TO	-----	4
12.	Rubgn+Cutless	-----	4 + .2
13.	Rubigan AS	-----	4 oz.
14.	Banner EC	-----	4 oz.
15.	CONTROL	-----	-----

Applications Fall - 29 Sept or 5 Oct 1989 and Spring - 23 May 1990

Results of Fungicide Control of Summer Patch Trials

The variability and lack of high disease pressure have precluded us from gaining much information from these trials, but will result in improved testing in years to follow (Tables 15 & 16). Directing your attention to the Table 15, it can be appreciated that there was indeed much variability in the severity of the disease among the plots. We were pleased that we did have disease, because it was a poor year for summer patch development. It should be understood that summer patch symptoms developed later during the 1990 season than they have during the last several years, hence the September 10 rating date. The only significant difference observed was between treatments 26, 27 and 11. However, these treatments did not differ from the water control treatment, 31. Also notice that the range of disease severity was only 1.7-15 % which is not enough to evaluate these chemicals. I consider control at a level of about 10% as exceptional, but this can be misleading. It is most likely that a fungicide will only arrest the pathogen. That is to say it is not going to greatly affect the rate of diseased turf recovery. It is very difficult to evaluate the changes in disease severity of summer patch. A combination of the number of infection loci, the intensity of the disease symptoms, the rate of patch diameter increase,and the width of the patch or border, are all important in the evaluation. My observations, which I can not statistically justify at this time, would point to treatments 4, 22, 25, and 30 as performing better than the others. This research needs to be performed yearly in order to make conclusive recommendations.

Referring to Table 16, the control of summer patch of Kentucky bluegrass grown under the same conditions as described above was assessed in terms of different fungicides and one or two application programs. These data are from a test conducted in 1989. The results in the table indicate that only treatment 1 resulted in a significantly lower disease rating compared to the treatments 8 or 9. Notice too, that the disease rating scale used refers to the intensity of the patches not the percentage of affected area. I believe by using the present available methods for applying fungicides to turf, that the control of this disease will develop gradually and require several years. The intensity of symptoms will most likely be reduced before the number of patches or the percentage of turf area affected are reduced. In these experiments a disease severity rating of 1 indicates that the disease does not appear to be active, i.e., no necrotic or colored leaves at the edge of the patch.

Fungicide Control of Take-All Patch on Bentgrass (Chicago)

Take-all patch is a disease that is apparently increasing in incidence in the Mid-West. It is not a new disease, but is very active on sand greens and newly seeded greens. It is primarily a disease of creeping bentgrass and the pathogen that causes it, *Geaumannomyces graminis* var. *avenae*, does not cause a disease on annual bluegrass. The disease is prevalent in the Chicago area and south to Kankakee. Our fungicide trials were conducted on a bentgrass (Penncross) nursery at a Chicago golf course nursery. The nursery was seeded a couple of years ago and severe disease developed on it within 12 months after it was seeded. The grass was maintained with about 8.8 kg nitrogen/M and maintained at a height of about 3 mm. It was irrigated and in general, maintained like the bentgrass green in Urbana (see previous description). The initial rating in the fall of 1989 was done before any treatments were applied. The data are organized in several different arrangements.

Treatments were applied to the same plots in the Fall of 1989 and Spring of 1990. These treatments were not applied according to the temperature of the soil. Ratings were done as a percentage of each plot area displaying disease symptoms. Ratings were recorded on October 5, 1989, April 27, 1990, and June 27, 1990. Below, the treatments are listed.

The following tables (17-20) are summaries and analysis of data collected on each of the three dates. Table 17 represents the initial percent of turf affected by take-all disease prior to treatment application. The ratings ranged from 3.3 to 20%, which is not very high (refer to review of summer patch data). This is not really a large enough difference to make conclusive evaluations on efficacy. It is important to determine the change in severity, which is really a measure of disease control as opposed to instantaneous differences in percentage of affected area. In Table 18-20 changes in disease severity are presented, but not statistically analyzed. However, from these data, it would be predicted that no conclusive prediction on the potential for control of any of the fungicides could be predicted.

The chemicals that were tried have potential to reduce the severity of take-all patch, but more testing will be required to reduce the seasonal variability of disease development. The data and analyses presented should be considered carefully to insure that premature "conclusions" are not made.

Table 18

Take-all patch disease control trials (Chicago)

University of Illinois

Date: October 5, 1989

No.	Treatment No.	Mean Disease Severity	Statistics
1	8	3.3	A
2	1	3.3	A
3	6	3.3	A
4	9	3.3	A
5	14	5.0	A
6	4	5.0	A
7	5	6.7	A
8	13	6.7	A
9	3	8.3	AB
10	11	10.0	AB
11	12	10.0	AB
12	10	11.7	ABC
13	2	11.7	ABC
14	15	16.7	BC
15	7	20.0	C

Disease severity = percentage area with symptoms; statistics (LSD, P=0.05) data followed by similar letters are not significantly different.

Table 19

Take-all patch disease control trials (Chicago)

University of Illinois

Date: April 27, 1990

No.	Treatment No.	Mean Disease Severity	Statistics
1	8	3.3	A
2	6	3.3	A
3	4	8.3	AB
4	5	8.3	AB
5	1	8.3	AB
6	9	10.0	AB
7	14	10.0	AB
8	2	10.0	AB
9	11	11.7	ABC
10	3	13.3	ABC
11	13	13.3	ABC
12	12	15.0	BC
13	10	16.7	BC
14	15	18.3	BC
15	7	21.7	C

Disease severity = percentage area with symptoms; statistics (LSD, P=0.05) data followed by similar letters are not significantly different.

Table 20

Take-all patch disease control trials (Chicago)

University of Illinois

Date: June 27, 1990

No.	Treatment No.	Mean Disease Severity	Statistics
1	8	1.7	A
2	4	6.7	AB
3	6	6.7	AB
4	1	6.7	AB
5	3	6.7	AB
6	9	8.3	ABC
7	7	10.0	ABC
8	5	11.7	BC
9	14	11.7	BC
10	10	13.3	BCD
11	12	15.0	BCD
12	11	15.0	BCD
13	2	15.0	BCD
14	15	16.7	CD
15	13	21.7	D

Disease severity - percentage area with symptoms; statistics (LSD, P=0.05) data followed by similar letters are not significantly different.

TEST PARAMETERS (SUMMER PATCH)

1. Plot size: (1 x 3)m_2
2. Soil type: Drummer silt loam
3. % O.M.: 2.5
4. pH: 7.0
5. Type of Equip: Back-pack sprayer
6. Nozzle Type: Brass flat fan
7. Nozzle Size: E101
8. Pressure Rate: 35 psi
9. Gals/Acre: 215
10. Ground Speed: 0.85 mph
11. Air Temp: 55-85
12. % RH: 90-95
13. Soil Temp: 20-22 C at 2" deep
14. Plant Stage of Growth at Applic: Full green
15. Disease, Weed, or Insect Stage of Growth at Applic: No symptoms
16. Amount of First Rainfall after Applic: Plots received about 1" (2.5 cm) per wk
17. Amount of Irrigation after Applic: See #16

Summary and Future Plans for Field Research on Disease Control

The data collected and presented in this report add useful information concerning the efficacy of fungicides for the control of several diseases. Research examined the use of control programs which integrate fungicides and nitrogen as a tank mixture. Control integration is the way of the future for disease control and this work needs to be advanced. In an attempt to encourage the adoption of this concept, I have demonstrated the research results at field day and have cooperatively applied two programs on the Urbana Country Club, Urbana, IL. In that program, 9 bluegrass fairways were treated with 0.5 oz Banner 1.1E /M + 0.3 lbs nitrogen/M on a 21 day schedule and to the other 9 fairways, 0.5 oz/M Bayleton 25TOF + 0.3 lbs/M were applied on a 21 day schedule. As I described earlier in this report, the disease pressure in 1990 was great. Both programs performed exceptionally and reduced dollar spot, in particular, to disease severity of about 1%. More testing and trials of this kind are necessary for the control of summer patch and brown patch. Additional research conducted at the Urbana Farm included biological control agents for the control of *Rhizoctonia solani* and *Pythium* sp. The results are inconclusive at this time, but promising.

Next year, take-all of bentgrass, summer patch of bluegrass and summer patch of annual bluegrass will be treated with fungicides, fertilizers, and biological control agents. Integration of these factors are expected to yield disease control programs that use less fungicide more efficiently and result in better disease management. The greatest efficiency of fungicidal control will be realized by using different methods to insure that a greater fraction of the chemical applied to the turf is distributed to the root zone and not lost to colloidal surfaces or soil water.

Thank you for your support and I look forward to continuing to work with you for the efficient management of turfgrass diseases.

UPDATE: PROGRAM FOR THE FUNGICIDAL CONTROL OF SUMMER PATCH OF BLUEGRASS

H.T. Wilkinson

As a result of any patch research project results, I will offer the following update which addresses the predicting of summer patch development in bluegrass. I should point out that there are two research programs that are underway from which my comments are based. I think it would clarify prior research developments if I briefly explained them to you. As part of my yearly field research program, I determine at what natural soil temperature the fungus, that causes summer patch (*Magnaporthe poae*), colonized and caused disease on bluegrass that was not moisture stressed. This research was not part of the special research project that five agrichemical companies, agreed to take part in. To continue, the field program only investigated increasing soil temperatures during the spring of the year. To date, no other conclusive research has been conducted on the development of the fungus on grass roots during the spring of the year. Before describing the field research a bit more completely, let me describe the special project.

The special project was developed to and will answer several questions related to the target for fungicidal suppression of *M. poae*. The intent of this laboratory study was to carefully determine if five different commercial fungicides could: i) suppress the fungus when applied to the foliage after the fungus had colonized the roots; ii) suppress the fungus when applied to the soil after the fungus had colonized the roots; iii) suppress the fungus either before or after colonization of the roots when applied directly to the roots. To date research has been completed on the i and ii, and iii is partially completed. The results showed that none of the chemicals when applied to the foliage or the soil surface demonstrated much suppression of the fungus, if the fungus was allowed to colonize the roots. The third study requires more time, but I expect to have it completed in several months and a full report sent to you at that time.

Collectively the results from the field and the laboratory studies have allowed me to develop some recommendations for the use of certain fungicides for the suppression of summer patch of bluegrass. The recommendations, or model if you would, could be listed as follows:

1. The fungus starts colonizing roots at about 68 +/- 3 F if there is sufficient moisture.

Recommendation: fungicides should be applied at that time in the spring when the soil temperature is 68 +/- 3 F (see Fig. 1).

2. The soil temperature measured was the mean daily average which generally occurred at about 10-11 am.

Recommendation: Measure the soil temperature at about 10-11 am or at that time when the soil temperature approximates the daily average temperature.

3. Most of the roots of bluegrass and annual bluegrass that become infected are in the upper 5 cm of the soil profile, not including the thatch layer if it exists.

Recommendation: Measure the soil temperature at a depth of about 5 cm under the sod.

4. Preliminary data indicate that a single application of fungicide applied as described above will be sufficient and that repeated applications during the summer especially after symptoms have developed are of little value in suppressing the disease.

Recommendation: For the Mid-West, a single application of fungicide in the Spring, applied at the high recommended rate should produce the best results. Use of this product may vary as the distance from central Illinois is increased.

5. Only in controlled field experiments did fungicides have a high level of suppression. This was not the case in naturally infested turf. Empirical studies have shown that the suppression of summer patch will generally require several years of an intensive chemical and cultural program.

Recommendation: Do not encourage consumers that a single application of a fungicide is a stand-alone cure for summer patch. It is one component of an integrated program.

6. No research has been done to determine if the fungus is active in the soil during the fall of year. While no research has been done in the field, two facts have come from laboratory studies. The fungus requires a soil temperature of at least 68 F and will still grow on roots at a temperature of 86 F. The fungus colonizes living, growing roots not dead or quiescent roots.

Recommendation: If a sod is displaying the symptoms of summer patch during months of July-September, then the spring control program was not effective enough and a treatment during the following spring should be encouraged and an experimental application of fungicide in the fall should be considered. The fall application should be timed when the grass roots are growing. This will vary greatly from turf to turf and depend on climate, soil, management and so on. Generally, if the roots are going to grow in the fall it will probably be at a soil temperature cooler than 80 F and more likely between 65-75 F when sufficient water is present. Growing roots will be white and flexible.

7. Empirical studies have shown that a wet turf and wet soil under turf are most conducive to realizing disease suppression from the application of fungicides for the control of summer patch.

Recommendation: The turf should be moistened to a depth of at least 5 cm and more if possible. The fungicide should be applied in at least 5 gal water per 93 m2. An additional 1.5 cm of water should be applied after fungicide is applied.

CHAMPAIGN-URBANA 1990 ANNUAL WEATHER SUMMARY

Audrey Bryan

The weather in Champaign-Urbana was near average in temperature, and very much above average in precipitation.

Annual precipitation for 1990 was 53.59 inches, 16.55 inches above the 1951-1980 average. This was the second wettest year here since records began in 1888. The wettest year ever in Champaign-Urbana was in 1927 when 55.64 inches of precipitation were recorded. The annual average for Champaign-Urbana, 37.04 inches, was exceeded by late August. Seven months out of the year (Feb., Mar., May, June, Oct., Nov., Dec.) had total precipitation over average. Five of those months had totals that put them into the records for top ten wettest months. There were also several storm events of note. February's total of 6.05 inches made it the wettest February ever (the previous record was 5.80 inches in 1905). The glaze storm of Valentine's Day was at least the second worst ice storm in the last 30 years in Champaign-Urbana in terms of degree of ice damage, and the length of time households were without power. February also established a new record maximum amount of precipitation in 24 hours, when 2.30 inches were recorded on the 22nd. The old record was 1.78 inches in 1939.

Total precipitation of 8.64 inches for May 1990 made it the second wettest May in Champaign-Urbana (the record is 11.20 inches in 1943). During four hours and 45 minutes during the night of 15/16 May, 3.13 inches of rain fell, equivalent to a 50-year event. During an 18 hour period on 28/29 December, 2.49 inches fell, a 40-year event. However, when the snowmelt from the 8 inches already on the ground was added to the rain that fell, the event was then about a 100-year event. Champaign-Urbana experienced another heavy precipitation event on 30 July 1987 when 4.43 inches fell in four hours, equalling the 100-year event. Champaign-Urbana has experienced 3 extreme rain storms in the last three years, each of which exhibited a recurrence frequency of at least 50 years.

June 1990 monthly precipitation total of 8.33 inches made this the 5th wettest June ever (record wettest is 10.98 in 1902). October's total of 6.90 inches made October 1990 also the fifth wettest October (record is 9.01 inches in 1941). Total precipitation in December of 6.45 inches made this the second wettest December (record is 6.63 in 1967). December's total snowfall of 14.0 inches was 7th highest for December (record is 20.0 inches in 1983).

There were not many temperature records set in 1990. In January, the monthly average maximum temperature of 45.1F was the second highest for January (record is 45.8F, 1933). The monthly average minimum temperature of 26.6F was the fifth highest (record is 29.6F, 1933) and the average monthly mean temperature of 35.9F is the second highest for January (record is 37.7F, 1933). November 1990 also had average monthly temperatures in the top ten. The average monthly maximum temperature of 57.5F was the third highest for November (record highest is 60.2F set in 1909). The average monthly minimum temperature of 36.0F is the eighth highest (record is 42.2F, 1931) and the average monthly mean temperature of 46.8F was the fifth highest for November (record is 50.2F, 1931).

March 1990 saw three new record daily maximum temperatures. The 10th with a high of 73F (old record 72F, 1953), the 12th with 78F (old record 68F, 1972), and the

13th with 78F (old 76F, 1933). The high temperature on August 28th, (97F), tied the previous record high set in 1953.

Some occurrences of note but not of record are as follows. The last frost in spring this past year was on April 18th, the average date being April 21. The first frost in the fall was on October 11, the average date is October 20th. The growing season from April 19th to October 10th lasted 175 days (-6 days). The growing season precipitation, from April through September was 26.71 inches (+4.31 inches). On July 24, a cold air funnel cloud was sighted in Champaign-Urbana. No wind, rain, or thunder was associtated with it. It was observed for approximately one hour and caused no damage.

The annual mean temperature for 1990 was 53.3F (+1.3). The mean maximum was 63.4F (+1.9F) and the mean minimum was 42.9F (+0.6F). The warmest day of 1990 occurred on August 28th and September 6th (97F) and the coldest day occurred on December 24th (-8F). There were 3 days with minimum temperature of 0F or below (-3). The highest daily average temperature was 84F (June 17th) and the lowest daily average was 2 F (December 24th). The total number of days with a maximum temperature of 32F or lower was 15 (-23 days). There were 118 days with a minimum temperature of 32F or lower (+0).

Measurable precipitation fell on 119 days (+3 days). One inch or more precipitation fell on 17 days (+8 days).

There were 40 days with thunder (-5 days). Although spring is the season which typically exhibits the greatest thunderstorm frequency in Illinois, thunder was not recorded on any day in April this past year. Hail was observed on 2 days (-2 days) and 8 days had freezing precipitation (-1 day).

There were 121 clear days (+16 days), 82 partly cloudy days (-42 days), and 162 cloudy days (+26 days).

Annual heating degree days totaled 5149 (-509). Cooling degree days totaled 940 (-79).

The prevailing wind direction for 1990 was south (southwest is the 1951-1980 prevailing direction) and the average speed was 6.1 mph (-0.9 mph). The peak gust of 58.9 mph came from the south on March 15th.

CLIMATOLOGICAL DATA
Champaign-Urbana, Illinois 1990

ILLINOIS STATE WATER SURVEY

Temperature (°F)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL SUMMARY
Highest	64	61	78	86	79	94	96	97	97	85	75	60	97
Lowest	14	10	18	21	37	43	55	51	36	28	22	-4	-4
Mean Maximum	45.1	42.9	54.8	61.4	69.0	82.5	83.2	82.6	78.8	65.2	57.5	38.3	63.4
Mean Minimum	26.6	26.5	34.6	39.0	49.6	61.7	63.2	61.2	55.8	39.9	36.0	20.6	42.9
Monthly Mean	35.9	34.7	44.7	50.2	59.3	72.1	73.2	71.9	67.3	52.6	46.8	29.5	53.2
Departure from Average*	+11.2	+5.4	+5.2	-2.1	-3.5	+0.2	-2.0	-1.3	+0.6	-2.3	+5.6	-0.7	+1.3
Number of Days Maximum ≥ 90°	0	0	0	0	0	6	4	5	4	0	0	0	19
Maximum ≤ 32°	3	2	1	0	0	0	0	0	0	0	0	9	15
Minimum ≤ 32°	27	21	17	9	0	0	0	0	0	7	12	23	118
Minimum ≤ 0°	0	0	0	0	0	0	0	0	0	0	0	3	3
Heating Degree Days	896	843	644	463	176	14	3	2	83	391	540	1094	5149
Cooling Degree Days	0	0	11	26	9	233	265	223	160	13	0	0	940
Precipitation (Inches) Total (liq. Equivalent)	1.01	6.85	3.47	2.14	8.64	8.33	3.63	2.48	1.49	6.90	3.00	6.45	53.59
Departure from Average*	-0.96	+4.17	+0.15	-1.70	+5.05	+4.41	-0.72	-1.18	-1.53	+4.39	+0.52	+3.95	+16.55
Maximum in 24 hours	0.33	2.30	1.86	1.12	2.80	2.39	1.19	0.76	0.46	1.37	1.54	2.41	2.80
Snowfall (unmelted)	0.1	0.5	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	14.0	15.7
Departure from average*	-7.2	-5.6	-3.9	-0.6	0.0	0.0	0.0	0.0	0.0	0.6	2.9	+9.4	-10.7
Number of Days With 0.01 Inch or More	9	11	11	10	15	14	9	6	4	10	7	13	119
0.50 Inch or More	0	3	2	1	6	6	2	3	0	3	2	4	34
1.00 Inch or More	0	1	1	1	2	3	1	0	0	4	1	1	17
Thunder	1	1	3	0	7	11	6	2	4	3	1	1	40
Hail	0	0	1	0	0	1	0	0	0	0	0	0	2
Freezing Precipitation	0	3	0	0	0	0	0	0	0	0	0	5	8
Snow	2	6	4	3	0	0	0	0	0	0	2	9	26
Snowfall 1.0 Inch	0	0	0	0	0	0	0	0	0	0	0	4	4
Snowfall Trace or More	4	0	2	0	0	0	0	0	0	0	0	11	17
Average Sky Condition (No. of Days)													
Clear	11	9	7	8	9	9	14	8	12	17	9	8	121
Partly Cloudy	4	3	3	11	4	11	8	11	5	4	11	7	82
Cloudy	16	14	21	11	18	10	9	12	13	10	10	16	162
Wind Prevailing Direction	S	S	S	S	S	S	NE	SE	NW	S	S	W	S
Average Speed (mph)	8.3	8.3	9.0	7.8	7.6	6.1	4.1	2.8	5.1	4.2	3.1	6.9	6.11
Peak Gust (mph)	64.5	42.9	58.9	56.7	45.1	56.9	28.5	20.9	25.5	32.3	30.1	64.9	38.9

Annual averages and totals are correct. Some errors were found in temperature, precipitation and wind data in monthly climatological data, February through June. If you need the corrected versions of those LCD's, please call 333-0890 between 10:00 a.m. and 4:00 p.m.
Average computed from 1951-1980, Urbana data or portions thereof.

CHAMPAIGN, ILL. LOCAL CLIMATOLOGICAL DATA MARCH 1990
WATER SURVEY RESEARCH CENTER ILLINOIS STATE WATER SURVEY SUMMARY

DATE	MAX TEMP	MIN TEMP	MEAN TEMP	PRECIP T	PRECIP (INCHES)	SNOW T	SNOW (INCHES)	DEPTH	WEATHER TYPES	WIND DIR	WIND SPD	SKY COVER	HEAT DEG. DAYS	COOL DEG. DAYS
03/01/90	43	18	31.0		0.00		0.0			SW	3.6	CLR	34	0
03/02/90	58	27	43.0		0.00		0.0			W	8.1	CLR	22	0
03/03/90	37	24	31.0		0.00		0.0			N	8.7	CLR	34	0
03/04/90	48	19	34.0		0.00		0.0			S	7.4	CLDY	31	0
03/05/90	57	30	44.0	T	0.00		0.0		L--,F	NE	6.7	CLDY	21	0
03/06/90	37	28	33.0	T	0.00		0.0		L--,F	NE	10.0	CLDY	32	0
03/07/90	45	28	37.0		0.00		0.0			E	6.0	CLDY	28	0
03/08/90	52	38	45.0		0.84		0.0		T,R	S	10.2	CLDY	20	0
03/09/90	66	39	53.0		0.02		0.0		L-	W	6.4	CLDY	12	0
03/10/90	73	51	62.0		1.86		0.0		T,R,A	S	8.1	CLDY	3	0
03/11/90	76	58	67.0		0.00		0.0			S	13.7	CLDY	0	2
03/12/90	78	62	70.0		0.00		0.0			S	17.2	CLR	0	5
03/13/90	78	60	69.0		0.00		0.0			S	10.2	CLDY	0	4
03/14/90	69	57	63.0		0.05		0.0		R-	S	11.3	CLDY	2	0
03/15/90	63	46	55.0		0.00		0.0			S	14.7	CLDY	10	0
03/16/90	63	38	51.0		0.00		0.0		F	SW	9.0	PC	14	0
03/17/90	52	37	45.0	T	0.00		0.0		L--	W	11.2	PC	20	0
03/18/90	53	26	40.0		0.01	T	0.0		S--	W	9.6	CLDY	25	0
03/19/90	32	22	27.0	T	0.00	T	0.0		S--,R--	NW	6.6	CLDY	38	0
03/20/90	45	19	32.0		0.00		0.0			SW	4.9	CLR	33	0
03/21/90	62	30	46.0		0.00		0.0			S	13.8	PC	19	0
03/22/90	60	37	49.0		0.16		0.0		T,R-	S	11.9	CLDY	16	0
03/23/90	37	24	31.0		0.06		0.6	1	S-	N	9.2	CLDY	34	0
03/24/90	39	24	32.0		0.05		0.5	1	S-	NW	14.6	CLDY	33	0
03/25/90	44	24	34.0		0.00		0.0			W	7.3	CLDY	31	0
03/26/90	50	28	39.0		0.00		0.0			N	6.6	CLR	26	0
03/27/90	52	25	39.0		0.00		0.0			E	2.8	CLR	26	0
03/28/90	52	28	40.0		0.12		0.0		R,F	E	5.0	CLDY	25	0
03/29/90	49	40	45.0		0.29		0.0		R,F	E	3.9	CLDY	20	0
03/30/90	47	42	45.0	T	0.00		0.0		F,R--	NE	7.4	CLDY	20	0
03/31/90	57	42	50.0		0.01		0.0		L-	W	11.4	CLDY	15	0
TOTAL					3.47		1.1			S	8.4		644	11
AVERAGE	54.0	34.5	44.3				5.0							
DEPARTURE									AVERAGE	S	-.2		803	
FROM NORMAL	+6.2	+4.1	+5.2	+	.15		-3.9					DIFF.	-159	+11

NUMBER OF DAYS AND DEPARTURE

	MAX-TEMP >=90	MAX-TEMP <=32	MIN-TEMP <=32	MIN-TEMP <=0	PRECIPITATION T	PRECIPITATION >=.01	PRECIPITATION >=.10	PRECIPITATION >=.50	PRECIPITATION >=1.00	SNOW >=1	SKY COVER CLEAR	SKY COVER PCLDY	SKY COVER CLDY
TOTAL	0	1	17	0	16	11	5	2	1	0	7	3	21
DEP.	-	-2	-2	-	+2	-1	-2	-	-	-1	-	-6	+6

	F	T	IP	A	R	L	S	Z	D	H	BS	SEASONAL HEATING DEGREE DAYS	SEASONAL COOLING DEGREE DAYS	JAN-MAR PRECIPITATION
TOTAL	6	4	0	1	5	5	2	0	0	0	0	5022	11	10.53
DEP.	+2	+1	-	-	-4	+1	-5	-1	-	-	-	-182	+11	+3.36

WEATHER TYPES: F=Fog; T=Thunderstorm; IP=Ice Pellets; A=Hail; R=Rain; S=Snow; Z=Glaze; D=Dust; H=Haze BS=Blowing Snow; RW=Rain Showers; SW=Snow Showers; L=Drizzle; Intensities: +heavy; -light; absence of symbol indicates moderate. Degree day base = 65F T= Trace; Normals 1889-1980 Data. Snow depth at 7AM LST SKY 7AM-7PM LST. Other data midnight-midnight.

REMARKS: New highs were set on the 10th, 73(old-72(1955) 12th, 78(old-68(1972) 13th, 78(old-76(1933)

CHAMPAIGN,ILL. LOCAL CLIMATOLOGICAL DATA APRIL 1990
WATER SURVEY RESEARCH CENTER ILLINOIS STATE WATER SURVEY SUMMARY

DATE	MAX TEMP	MIN TEMP	MEAN TEMP	PRECIP T	PRECIP (INCHES)	SNOW T	SNOW (INCHES)	DEPTH	WEATHER TYPES	WIND DIR	WIND SPD	SKY COVER	HT/DEG DAYS	CL/DEG DAYS
04/01/90	63	43	53.0		0.09		0.0		R-	SW	7.7	CLDY	12	0
04/02/90	43	33	38.0		0.00	T	0.0		S--	NW	11.0	CLDY	27	0
04/03/90	50	33	42.0		0.00	T	0.0		S--	NW	7.7	PC	23	0
04/04/90	60	31	46.0		0.02		0.0		R--,F	W	6.3	PC	19	0
04/05/90	51	30	41.0		0.00		0.0			NW	7.3	PC	24	0
04/06/90	47	27	37.0		0.00		0.0			NW	7.9	CLR	28	0
04/07/90	48	21	35.0		0.00		0.0			W	5.8	CLR	30	0
04/08/90	66	22	44.0		0.00		0.0			S	9.5	CLR	21	0
04/09/90	63	39	51.0		0.06		0.0		R-	S	10.9	CLDY	14	0
04/10/90	51	34	43.0		1.12		0.0		R,F	NW	8.1	CLDY	22	0
04/11/90	44	30	37.0		0.00	T	0.0		F,S--	NW	6.9	PC	28	0
04/12/90	49	26	38.0		0.00		0.0			W	4.9	PC	27	0
04/13/90	48	33	41.0		0.45		0.0		L--,R-	S	9.5	CLDY	24	0
04/14/90	52	38	45.0		0.02		0.0		R-	SW	7.6	PC	20	0
04/15/90	55	35	45.0	T	0.00		0.0		R--	SW	6.0	CLDY	20	0
04/16/90	60	39	50.0		0.09		0.0		R-,F	SW	7.5	CLDY	15	0
04/17/90	49	34	42.0		0.00		0.0			N	9.2	PC	23	0
04/18/90	56	28	42.0		0.00		0.0			SE	4.0	CLR	23	0
04/19/90	55	34	45.0		0.01		0.0		R--,R-	S	8.0	CLDY	20	0
04/20/90	62	50	56.0		0.24		0.0		F,R-	S	7.2	CLDY	9	0
04/21/90	67	49	58.0	T	0.00		0.0		F,R--	NE	5.0	PC	7	0
04/22/90	72	46	59.0		0.00		0.0			SE	3.8	CLR	6	0
04/23/90	83	47	65.0		0.00		0.0			S	7.3	PC	0	0
04/24/90	86	58	72.0		0.00		0.0			S	11.1	PC	0	7
04/25/90	86	59	73.0		0.00		0.0			S	8.5	CLR	0	8
04/26/90	84	58	71.0		0.00		0.0			S	11.5	CLR	0	6
04/27/90	84	56	70.0		0.00		0.0			S	11.4	PC	0	5
04/28/90	69	48	59.0		0.04		0.0		R-,L-,L--	NW	8.3	CLDY	6	0
04/29/90	74	44	59.0		0.00		0.0			SE	6.4	CLR	6	0
04/30/90	65	48	57.0		0.00		0.0			NW	6.1	CLDY	8	0
TOTAL					2.14		0.0			S	8.4		462	26
AVERAGE	61.4	39.1	50.3											
DEPARTURE									AVERAGE	S	8.5		381	
FROM NORMAL	-1.2	-2.8	-2.0		-1.70		-.6		DIFF.		-.1		+ 80	+26

NUMBER OF DAYS AND DEPARTURE

	MAX-TEMP >=90	MAX-TEMP <=32	MIN-TEMP <=32	MIN-TEMP <=0	PRECIPITATION T	PRECIPITATION >=.01	PRECIPITATION >=.10	PRECIPITATION >=.50	PRECIPITATION >=1.00	SNOW >=1	SKY COVER CLEAR	SKY COVER PCLDY	SKY COVER CLDY
TOTAL	0	0	8	0	13	10	3	1	1	0	8	11	11
AVG.	0	0	4	0	20	12	7	2	1	0	7	10	13
DEP.	-	-	+4	-	-7	-2	-4	-1	-	-	+1	+1	-2

	F	T	IP	A	R	L	S	Z	D	H	BS	SEASONAL HEATING DEGREE DAYS	SEASONAL COOLING DEGREE DAYS	JAN-APR PRECIPITATION
TOTAL	6	0	0	0	12	2	0	0	0	0	0	5483	37	12.57
AVG.	2	5	0	1	14	11	3	0	0	0	0	5585	0	11.01
DEP.	+4	-5	-	-1	-2	-9	-3	-	-	-	-	-102	+37	+1.56

WEATHER TYPES: F=Fog; T=Thunderstorm; IP=Ice Pellets; A=Hail; R=Rain; S=Snow; Z=Glaze; D=Dust; H=Haze BS=Blowing Snow; RW=Rain Showers; SW=Snow Showers; L=Drizzle; Intensities: +heavy; -light; absence of symbol indicates moderate. Degree day base = 65F T= Trace; Normals 1889-1980 Data. Snow depth at 7AM LST SKY 7AM-7PM LST. Other data midnight-midnight.

REMARKS: No records were set this month.

CHAMPAIGN, ILL.
WATER SURVEY RESEARCH CENTER

LOCAL CLIMATOLOGICAL DATA
ILLINOIS STATE WATER SURVEY

MAY 1990
SUMMARY

DATE	MAX TEMP	MIN TEMP	MEAN TEMP	PRECIP T (INCHES)	SNOW T (INCHES)	DEPTH	WEATHER TYPES	WIND DIR	WIND SPD	SKY COVER	HEAT DEG. DAYS	COOL DEG. DAYS
05/01/90	63	49	56	0.00	0.0			N	6.6	CLDY	9	0
05/02/90	66	41	54	0.00	0.0			SE	3.5	CLDY	11	0
05/03/90	52	47	50	0.61	0.0		R-,R	E	6.1	CLDY	15	0
05/04/90	72	44	58	0.39	0.0		R-,F	WNW	9.0	CLDY	7	0
05/05/90	65	44	55	0.22	0.0		R-	N	7.9	CLDY	10	0
05/06/90	67	45	56	0.00	0.0			WNW	3.9	CLR	9	0
05/07/90	77	48	63	0.00	0.0			SW	11.3	CLR	2	0
05/08/90	79	58	69	0.00	0.0			SW	12.5	CLR	0	4
05/09/90	78	48	63	0.69	0.0		TRW+	S	18.3	PC	2	0
05/10/90	52	39	46	0.01	0.0		L-	W	13.9	CLDY	19	0
05/11/90	68	37	53	0.00	0.0			W	4.9	CLR	12	0
05/12/90	64	48	56	1.81	0.0		R,TRW	S	6.7	CLDY	9	0
05/13/90	64	48	56	0.00	0.0			N	6.0	CLDY	9	0
05/14/90	69	48	59	0.00	0.0			S	7.4	CLDY	6	0
05/15/90	69	60	65	0.74	0.0		R-,TRW+	S	7.5	CLDY	0	0
05/16/90	72	61	67	2.80	0.0		R-,TRW-	SW	8.3	CLDY	0	2
05/17/90	67	53	60	0.17	0.0		TRW	W	13.5	CLR	5	0
05/18/90	76	49	63	0.00	0.0			W	8.0	CLR	2	0
05/19/90	72	56	64	0.18	0.0		RW-	S	11.0	CLDY	1	0
05/20/90	71	50	61	0.00	0.0			NNW	7.2	CLDY	4	0
05/21/90	57	50	54	0.02	0.0		L--	NE	18.5	CLDY	11	0
05/22/90	69	48	59	0.00	0.0		H	N	5.1	FC	6	0
05/23/90	64	48	56	0.11	0.0		RW-	E	2.5	PC	9	0
05/24/90	72	48	60	0.03	0.0		R-,TRW-	E	3.4	CLDY	5	0
05/25/90	72	59	65	0.82	0.0		TRW-,TRW,F	E	5.0	CLDY	0	0
05/26/90	67	60	64	0.04	0.0		L-,F	NE	5.0	CLDY	1	0
05/27/90	73	56	65	0.00	0.0			NE	6.0	PC	0	0
05/28/90	76	59	68	0.00	0.0			NE	7.9	CLDY	0	3
05/29/90	78	48	63	0.00	0.0			N	9.8	CLR	2	0
05/30/90	71	45	58	0.00	0.0			E	4.3	CLR	7	0
05/31/90	78	47	63	0.00	0.0			S	5.0	CLR	2	0
TOTAL				8.64	0.0			E	8.0		175	9
AVERAGE	69.0	49.7	59.4									
DEPARTURE							AVERAGE	S	+1.0		+20	-76
FROM NORMAL	-4.50	-2.50	-3.4	+5.05								

NUMBER OF DAYS AND DEPARTURE

	MAX-TEMP >=90	MAX-TEMP <=32	MIN-TEMP <=32	MIN-TEMP <=0	PRECIPITATION T	PRECIPITATION >=.01	PRECIPITATION >=.10	PRECIPITATION >=.50	PRECIPITATION >=1.00	SNOW >=1	SKY COVER CLEAR	SKY COVER PCLDY	SKY COVER CLDY
TOTAL	0	0	0	0	15	15	11	6	2		9	4	18
DEP.	-1	-	-	-		+5	+4	+3	+1		-	-8	+8

	WEATHER TYPES F	T	IP	A	R	L	S	Z	D	H	BS	SEASONAL HEATING DEGREE DAYS	SEASONAL COOLING DEGREE DAYS	JAN - MAY PRECIPITATION
TOTAL	3	7	0	1	12	3	0	0	0	0	0	5658	46	21.31
DEP.	-	+1		-								-82	-41	+6.71

WEATHER TYPES: F=Fog; T=Thunderstorm; IP=Ice Pellets; A=Hail; R=Rain; S=Snow; Z=Glaze; D=Dust; H=Haze BS=Blowing Snow; RW=Rain Showers; SW=Snow Showers; L=Drizzle; Intensities: +heavy; -light; absence of symbol indicates moderate. Degree day base = 65F T= Trace; Normals 1889-1980 Data. Snow depth at 7AM LST SKY 7AM-7PM LST. Other data midnight-midnight.

REMARKS: This was the second wettest May in Urbana history(August 1988) the wettest May ever being 11.20 inches in 1943. There were no other records for the month.

CHAMPAIGN,ILL.
WATER SURVEY RESEARCH CENTER

LOCAL CLIMATOLOGICAL DATA
ILLINOIS STATE WATER SURVEY

JUNE 1990
SUMMARY

DATE	MAX TEMP	MIN TEMP	MEAN TEMP	PRECIP T	PRECIP (INCHES)	SNOW T	SNOW (INCHES)	DEPTH	WEATHER TYPES	WIND DIR	WIND SPD	SKY COVER	HEAT DEG. DAYS	COOL DEG. DAYS
06/01/90	85	59	72		0.00		0.0			S	9.4	CLR	0	7
06/02/90	85	62	74		0.24		0.0			S	13.2	PC	0	9
06/03/90	79	51	65		0.00		0.0			SW	11.7	CLDY	0	0
06/04/90	66	49	58		0.00		0.0			N	4.6	PC	7	0
06/05/90	73	43	58	T	0.00		0.0		T,R-	S	6.0	CLDY	7	0
06/06/90	73	59	66		0.93		0.0		T,R	SW	4.2	CLDY	0	1
06/07/90	76	62	69		0.87		0.0		T,R,F	S	4.1	CLDY	0	4
06/08/90	86	66	76		0.07		0.0		T,R-	W	5.7	PC	0	11
06/09/90	82	64	73		0.10		0.0		R	NW	5.5	CLR	0	8
06/10/90	80	60	70		0.00		0.0			NE	6.1	CLR	0	5
06/11/90	83	53	68		0.00		0.0			S	4.9	CLR	0	3
06/12/90	87	62	75		0.00		0.0			S	7.9	PC	0	10
06/13/90	92	64	78		0.01		0.0		T,L-	S	10.0	PC	0	13
06/14/90	81	69	75		0.04		0.0		R-	N	5.3	CLDY	0	10
06/15/90	92	64	78		0.00		0.0			NE	3.7	CLR	0	13
06/16/90	93	70	82		0.00		0.0			S	6.1	CLDY	0	17
06/17/90	94	73	84		1.20		0.0		T,R	S	8.0	PC	0	19
06/18/90	85	66	77		0.00		0.0			NW	6.6	CLR	0	12
06/19/90	77	58	68		0.18		0.0		T,R	S	4.0	PC	0	3
06/20/90	76	64	70		2.39		0.0		T,R,A	W	6.9	CLDY	0	5
06/21/90	85	61	73		0.00		0.0			W	4.6	CLR	0	8
06/22/90	74	61	68		0.59		0.0		T,R	W	8.3	CLDY	0	3
06/23/90	74	57	66	T	0.00		0.0		L--	NW	5.7	PC	0	1
06/24/90	79	57	68		0.00		0.0			N	3.4	CLR	0	3
06/25/90	83	61	72		0.00		0.0			SW	4.2	CLR	0	7
06/26/90	85	62	74	T	0.00		0.0		R--	SW	4.1	PC	0	9
06/27/90	90	65	78		0.00		0.0		H	S	3.0	PC	0	13
06/28/90	91	69	80		0.47		0.0		T,R,H	SW	6.9	PC	0	15
06/29/90	84	65	75		1.22		0.0		T,R	SW	5.4	CLDY	0	10
06/30/90	85	72	79		0.02		0.0		T,R--	W	4.3	CLDY	0	14
TOTAL					8.33		0.0						14	233
AVERAGE	82.5	61.7	72.1											
DEPARTURE FROM NORMAL	[illegible]	+.6	+.2		+4.41									

	WIND DIR	WIND SPD
AVERAGE	SSW	6.1
NORMAL	SSW	-.1

NUMBER OF DAYS AND DEPARTURE

	MAX-TEMP >=90	MAX-TEMP <=32	MIN-TEMP <=32	MIN-TEMP <=0	PRECIPITATION >=T	PRECIPITATION >=.01	PRECIPITATION >=.10	PRECIPITATION >=.50	PRECIPITATION >=1.00	SNOW >=1	SKY COVER CLEAR	SKY COVER PCLDY	SKY COVER CLDY
TOTAL	6	0	0	0	17	14	10	6	3		9	11	10
DEF.	-	0	0	0		+4	+4	+3	+2		-	-2	+2

	F	T	IP	A	R	L	S	Z	D	H	BS	SEASONAL HEATING DEGREE DAYS	SEASONAL COOLING DEGREE DAYS	JAN - JUNE PRECIPITATION
TOTAL	1	12	0	1	14	2	0	0	0	0	0	5672	279	29.64
DEF.	0	+5	0	0	+7	0	0	0	0	0	0	-86	-33	+11.20

WEATHER TYPES: F=Fog; T=Thunderstorm; IP=Ice Pellets; A=Hail; R=Rain; S=Snow; Z=Glaze; D=Dust; H=Haze BS=Blowing Snow; RW=Rain Showers; SW=Snow Showers; L=Drizzle; Intensities: +heavy; -light; absence of symbol indicates moderate. Degree day base = 65F T= Trace; Normals 1889-1980 Data. Snow depth at 7AM LST SKY 7AM-7PM LST. Other data midnight-midnight.

REMARKS: Fifth highest June precip since 1889. Highest 10.98 inches in 1902.

CHAMPAIGN, ILL. LOCAL CLIMATOLOGICAL DATA JULY 1990
WATER SURVEY RESEARCH CENTER ILLINOIS STATE WATER SURVEY SUMMARY

DATE	MAX TEMP	MIN TEMP	MEAN TEMP	PRECIP T	PRECIP (INCHES)	SNOW T	SNOW (INCHES)	SNOW DEPTH	WEATHER TYPES	WIND DIR	WIND SPD	SKY COVER	HEAT DEG. DAYS	COOL DEG. DAYS
07/01/90	84	67	76		0.00		0.0	0		NE	5.0	CLR	0	11
07/02/90	83	58	71		0.00		0.0	0		SE	3.3	CLR	0	6
07/03/90	90	61	76		0.00		0.0	0		S	5.6	CLR	0	11
07/04/90	*96*	75	86		0.00		0.0	0		SW	5.4	CLR	0	*21*
07/05/90	88	64	76		0.00		0.0	0		NE	4.4	PC	0	11
07/06/90	79	60	70		0.00		0.0	0		NE	4.7	PC	0	5
07/07/90	84	60	72		0.00		0.0	0		SE	3.7	PC	0	7
07/08/90	94	72	83		0.00		0.0	0		SW	5.4	CLR	0	18
07/09/90	95	71	83		0.20		0.0	0	TRW+	W	4.7	CLR	0	18
07/10/90	84	70	77		0.00		0.0	0		W	2.8	CLDY	0	12
07/11/90	75	68	72		*1.19*		0.0	0	TRW+,RW,L	NE	4.4	CLDY	0	7
07/12/90	74	63	69		0.06		0.0	0	RW-,L	NE	6.6	CLDY	0	4
07/13/90	68	*55*	62		0.17		0.0	0	R,RW,L	NE	6.9	CLDY	*3*	0
07/14/90	69	60	65		0.00		0.0	0	F	N	3.3	CLDY	0	0
07/15/90	74	64	69		0.43		0.0	0	TRW+	SW	4.6	PC	0	4
07/16/90	86	*55*	71		0.00		0.0	0		SW	5.5	CLDY	0	6
07/17/90	86	59	73		0.00		0.0	0	F	S	5.3	CLR	0	8
07/18/90	89	64	77		0.00		0.0	0	F	SW	4.0	CLR	0	12
07/19/90	89	65	77		0.00		0.0	0	T,F,H	S	4.7	CLR	0	12
07/20/90	83	71	77		0.12		0.0	0	R,RW	NW	3.2	CLDY	0	12
07/21/90	81	68	75		0.40		0.0	0	TRW,R,F	E	2.5	CLDY	0	10
07/22/90	75	61	68		0.64		0.0	0	R,RW	N	4.4	CLDY	0	3
07/23/90	79	56	68		0.00		0.0	0		W	3.1	PC	0	3
07/24/90	83	57	70	T	0.00		0.0	0	RW-	W	2.5	CLR	0	5
07/25/90	84	58	71		0.00		0.0	0		E	2.4	CLR	0	6
07/26/90	84	61	73		0.00		0.0	0		SE	2.9	CLR	0	8
07/27/90	87	62	75		0.00		0.0	0	F	SE	2.0	PC	0	10
07/28/90	88	67	78		0.00		0.0	0	F	SE	2.2	CLR	0	13
07/29/90	88	66	77		0.42		0.0	0	TRW	S	3.6	PC	0	12
07/30/90	83	64	74		0.00		0.0	0		NW	4.0	PC	0	9
07/31/90	76	56	66		0.00		0.0	0		NE	4.6	CLR	0	1
TOTAL					3.63		0.0						3	265
AVERAGE	83.2	63.2	73.2						AVERAGE	NE	4.1			
DEPARTURE FROM NORMAL	-2.3	-1.6	-2.0		-0.72				NORMAL	SW	-0.9		+3	-51

NUMBER OF DAYS AND DEPARTURE

	MAX-TEMP >=90	MAX-TEMP <=32	MIN-TEMP <=32	MIN-TEMP <=0	PRECIP >=T	PRECIP >=.01	PRECIP >=.10	PRECIP >=.50	PRECIP >=1.00	SNOW >=1	SKY COVER CLEAR	SKY COVER PCLDY	SKY COVER CLDY
TOTAL	4	0	0	0	10	9	8	2	1		14	8	9
DEP.	-4	0	0	0		+0	+2	-1	+0		+4	-6	+2

	WEATHER TYPES F	T	IP	A	R	L	S	Z	D	H	BS	SEASONAL HEATING DEGREE DAYS	SEASONAL COOLING DEGREE DAYS	JAN - JULY PRECIPITATION
TOTAL	7	6	0	0	10	3	0	0	0	1	0	3	544	33.27
DEP.	+5	-1	0	0	+4	+2	0	0	0	-	-	+3	-84	+10.15

WEATHER TYPES: F=Fog; T=Thunderstorm; IP=Ice Pellets; A=Hail; R=Rain; S=Snow; Z=Glaze; D=Dust; H=Haze
BS=Blowing Snow; RW=Rain Showers; SW=Snow Showers; L=Drizzle; Intensities: +heavy; -light; absence of symbol indicates moderate. Degree day base = 65F T= Trace; Normals 1951-1980 Data. Snow depth at 7AM LST
SKY 7AM-7PM LST. Other data midnight-midnight.

REMARKS: Seasonal precip second highest in C-U for this period since 1888. Record is 34.07,1909.
Cold air funnel cloud on 24th. Peak gust 28.5 mph from west on the 15th.

CHAMPAIGN, ILL. — LOCAL CLIMATOLOGICAL DATA — AUGUST 1990
WATER SURVEY RESEARCH CENTER — ILLINOIS STATE WATER SURVEY — SUMMARY

DATE	MAX TEMP	MIN TEMP	MEAN TEMP	PRECIP T	PRECIP (INCHES)	SNOW T	SNOW (INCHES)	DEPTH	WEATHER TYPES	WIND DIR	WIND SPD	SKY COVER	HEAT DEG. DAYS	COOL DEG. DAYS
08/01/90	78	52	65		0.00		0.0	0		ESE	1.8	CLR	0	0
08/02/90	82	57	70		0.00		0.0	0		SE	1.6	PC	0	5
08/03/90	87	60	74		0.17		0.0	0	RW,RW-,F	S	3.3	CLR	0	9
08/04/90	83	68	76		0.00		0.0	0	F	N	3.6	CLDY	0	11
08/05/90	82	60	71		0.00		0.0	0		N	4.4	PC	0	6
08/06/90	72	56	64		0.00		0.0	0		N	4.4	PC	*1	0
08/07/90	75	53	64		0.00		0.0	0		N	2.5	PC	*1	0
08/08/90	79	*51	65		0.00		0.0			E	1.4	CLR	0	0
08/09/90	81	56	69		0.00		0.0			E	1.5	CLR	0	4
08/10/90	77	56	67		0.00		0.0		F	SW	2.4	PC	0	2
08/11/90	84	57	71		0.00		0.0		F	SW	1.8	CLDY	0	6
08/12/90	74	64	69		*0.76		0.0		R,RW	SE	2.7	CLDY	0	4
08/13/90	77	57	67		0.00		0.0			N	3.8	CLDY	0	2
08/14/90	79	53	66		0.00		0.0		F	SE	1.7	PC	0	1
08/15/90	80	58	69		0.00		0.0			SE	2.4	CLDY	0	4
08/16/90	80	62	71		0.00		0.0			S	3.7	CLDY	0	6
08/17/90	86	66	76	T	0.00		0.0		L,F,H	S	3.7	CLDY	0	11
08/18/90	92	70	81		0.00		0.0		F	SW	3.2	CLDY	0	16
08/19/90	93	70	82		0.00		0.0		F	SW	2.8	PC	0	17
08/20/90	86	70	78		0.74		0.0		TRW+,TRW,R,L	S	2.8	CLDY	0	13
08/21/90	75	68	72		0.02		0.0		R-,L,F	N	3.4	CLDY	0	7
08/22/90	76	67	72		0.05		0.0		R-,L,F	NE	4.0	CLDY	0	7
08/23/90	81	[illegible]	72		0.00		0.0		F	NE	1.5	CLDY	0	7
08/24/90	84	60	72		0.00		0.0		F	SE	1.8	PC	0	7
08/25/90	84	62	73		0.00		0.0		F	SE	2.3	CLR	0	8
08/26/90	90	63	77		0.00		0.0		F,H	S	2.5	CLR	0	12
08/27/90	93	65	79		0.00		0.0		F	SW	2.9	CLR	0	14
08/28/90	*97	71	84		0.00		0.0		F	SW	3.9	PC	0	*19
08/29/90	86	65	76		0.74		0.0		TRW+,TRW-	N	3.4	PC	0	11
08/30/90	83	60	72	T	0.00		0.0		L	NE	2.9	PC	0	7
08/31/90	85	58	72		0.00		0.0			SE	2.5	CLR	0	7
TOTAL					2.48		0.0						2	223
AVERAGE	82.6	61.2	71.9											
DEPARTURE									PREVAILING	SE	2.8			
FROM AVERAGE	-1.[illegible]	-1.6	-1.3		-1.18		0		AVERAGE	SW	-2.0		+2	-34

NUMBER OF DAYS AND DEPARTURE

	MAX-TEMP >=90	MAX-TEMP <=32	MIN-TEMP <=32	MIN-TEMP <=0	PRECIPITATION >=T	PRECIPITATION >=.01	PRECIPITATION >=.10	PRECIPITATION >=.50	PRECIPITATION >=1.00	SNOW >=1	SKY COVER CLEAR	SKY COVER PCLDY	SKY COVER CLDY
TOTAL	5	0	0	0	8	6	4	3	0	0	8	11	12
DEP.	+0	+0	+0	+0	-	-2	-2	+0	-1	+0	-2	-3	+5

	WEATHER TYPES F	T	IP	A	R	L	S	Z	D	H	BS	SEASONAL HEATING DEGREE DAYS	SEASONAL COOLING DEGREE DAYS	JAN - AUG PRECIPITATION
TOTAL	16	2	0	0	6	5	0	0	0	2	0	5	767	35.75
DEP.	+12	-5	+0	+0	+0	+4	+0	+0	-	-	-	+5	-118	+8.97

WEATHER TYPES: F=Fog; T=Thunderstorm; IP=Ice Pellets; A=Hail; R=Rain; S=Snow; Z=Glaze; D=Dust; H=Haze BS=Blowing Snow; RW=Rain Showers; SW=Snow Showers; L=Drizzle; Intensities: +heavy; -light; absence of symbol indicates moderate. Degree day base = 65F T= Trace; Averages 1951-1980 Data. Snow depth at 7AM LST SKY 7AM-7PM LST. Other data midnight-midnight.

REMARKS: Tied record high temperature on 28th.Record set in 1953. Peak gust was 20.9 mph from the NW on the 29th.

CHAMPAIGN, ILL. — LOCAL CLIMATOLOGICAL DATA — SEPTEMBER 1990
WATER SURVEY RESEARCH CENTER — ILLINOIS STATE WATER SURVEY — SUMMARY

DATE	MAX TEMP	MIN TEMP	MEAN TEMP	PRECIP T	PRECIP (INCHES)	SNOW T	SNOW (INCHES)	DEPTH	WEATHER TYPES	WIND DIR	WIND SPD	SKY COVER	HEAT DEG. DAYS	COOL DEG. DAYS
09/01/90	90	59	75		0.00		0.0			SE	2.7	CLR	0	10
09/02/90	87	65	76		0.00		0.0			NE	2.9	PC	0	11
09/03/90	85	66	76	T	0.00		0.0		L	E	2.1	CLR	0	11
09/04/90	92	64	78		0.00		0.0		H	S	3.0	PC	0	13
09/05/90	95	71	83		0.00		0.0		F	W	3.1	CLR	0	18
09/06/90	*97	72	85		0.00		0.0		F,H	SW	4.4	CLR	0	*20
09/07/90	82	67	75		0.13		0.0		TRW,RW,L,F	NE	3.3	CLDY	0	10
09/08/90	79	65	72		0.00		0.0			NE	2.4	CLDY	0	7
09/09/90	83	64	74		0.00		0.0		F	WSW	1.5	CLDY	0	9
09/10/90	85	62	74		0.02		0.0		L,F	E	1.4	CLDY	0	9
09/11/90	86	65	76		0.00		0.0		F	E	2.2	PC	0	11
09/12/90	83	64	74		0.00		0.0		F	E	1.3	CLDY	0	9
09/13/90	85	60	73		0.00		0.0		F	S	3.0	CLDY	0	8
09/14/90	78	57	68		0.10		0.0		TRW	NW	6.0	CLDY	0	3
09/15/90	75	48	62		0.00		0.0			NW	2.6	CLR	3	0
09/16/90	72	50	61		0.00		0.0			N	5.4	CLR	4	0
09/17/90	70	45	58		0.00		0.0			NE	2.9	CLR	7	0
09/18/90	57	49	53		*0.46		0.0		TRW+,RW,R,L	SE	3.2	CLDY	12	0
09/19/90	67	57	62		0.22		0.0		RW,R	NW	3.1	CLDY	3	0
09/20/90	77	52	65		0.00		0.0		F	S	2.1	PC	0	0
09/21/90	69	50	60		0.12		0.0		RW,RW-,L	NW	3.2	CLDY	5	0
09/22/90	72	45	59	T	0.00		0.0		L	WNW	4.8	PC	6	0
09/23/90	58	38	48		0.00		0.0			NW	4.3	CLDY	*17	0
09/24/90	70	*36	53		0.00		0.0			SW	4.7	CLR	12	0
09/25/90	79	46	63		0.00		0.0			W	4.7	CLR	2	0
09/26/90	85	51	68		0.00		0.0			NW	2.0	CLR	0	3
09/27/90	87	50	69		0.00		0.0			SSE	2.9	CLR	0	4
09/28/90	81	56	69		0.36		0.0		TRW+	NE	2.7	CLDY	0	4
09/29/90	72	54	63		0.00		0.0			N	3.7	CLDY	2	0
09/30/90	65	45	55		0.08		0.0		R-,L	NW	2.2	CLR	10	0
TOTAL					1.49		0.0						83	160
AVERAGE	78.8	55.8	67.3											
DEPARTURE									PREVAILING	NW	3.1			
FROM AVERAGE	+0.6	+0.6	+0.6		-1.53		0	0	AVERAGE	SSW	-2.1		+26	+46

NUMBER OF DAYS AND DEPARTURE

	MAX-TEMP >=90	MAX-TEMP <=32	MIN-TEMP <=32	MIN-TEMP <=0	PRECIPITATION >=T	PRECIPITATION >=.01	PRECIPITATION >=.10	PRECIPITATION >=.50	PRECIPITATION >=1.00	SNOW >=1	SKY COVER CLEAR	SKY COVER PCLDY	SKY COVER CLDY
TOTAL	4	0	0	0	10	8	6	0	0	0	12	5	13
DEP.	+1	+0	+0	+0	-	-1	+1	-2	-1	+0	+1	-5	+4

	F	T	IP	A	R	L	S	Z	D	H	BS	SEASONAL HEATING DEGREE DAYS	SEASONAL COOLING DEGREE DAYS	JAN - SEP PRECIPITATION
TOTAL	8	4	0	0	7	7	0	0	0	2	0	88	927	37.24
DEP.	+5	+0	+0	+0	+0	+5	+0	+0	-	-	-	+31	-72	+7.44

WEATHER TYPES: F=Fog; T=Thunderstorm; IP=Ice Pellets; A=Hail; R=Rain; S=Snow; Z=Glaze; D=Dust; H=Haze BS=Blowing Snow; RW=Rain Showers; SW=Snow Showers; L=Drizzle; Intensities: +heavy; -light; absence of symbol indicates moderate. Degree day base = 65F T= Trace; Averages 1951-1980 Data. Snow depth at 7AM LST SKY 7AM-7PM LST. Other data midnight-midnight.

REMARKS: No temperature or precipitation records set this month. Peak gust was 25.5 mph from the NW on the 14th.

CHAMPAIGN,ILL. LOCAL CLIMATOLOGICAL DATA OCTOBER 1990
WATER SURVEY RESEARCH CENTER ILLINOIS STATE WATER SURVEY SUMMARY

DATE	MAX TEMP	MIN TEMP	MEAN TEMP	PRECIP T	PRECIP (INCHES)	SNOW T	SNOW (INCHES)	DEPTH	WEATHER TYPES	WIND DIR	WIND SPD	SKY COVER	HEAT DEG. DAYS	COOL DEG. DAYS
10/01/90	73	39	56		0.00		0.0			W	3.6	CLR	9	0
10/02/90	80	41	61		0.00		0.0			SE	3.1	CLR	4	0
10/03/90	84	54	69		1.19		0.0		TRW+,R,L	S	6.9	CLDY	0	4
10/04/90	74	49	62		0.00		0.0			W	5.1	PC	3	0
10/05/90	85	51	68		0.00		0.0			SW	6.2	CLR	0	3
10/06/90	83	58	71		0.00		0.0			SW	6.1	PC	0	6
10/07/90	65	53	59		1.57		0.0		TRW,RW,F	S	4.1	CLDY	6	0
10/08/90	59	48	54		1.50		0.0		R,R-	NE	3.4	CLDY	11	0
10/09/90	49	43	46		1.49		0.0		R,L	NE	5.3	CLDY	19	0
10/10/90	45	36	41		0.38		0.0		R,L,F	W	4.6	CLDY	24	0
10/11/90	60	32	46		0.00		0.0		F	ENE	2.0	CLR	19	0
10/12/90	64	37	51		0.00		0.0			N	2.2	CLR	14	0
10/13/90	68	38	53		0.00		0.0		F	S	1.9	CLR	12	0
10/14/90	73	44	59		0.03		0.0		L	S	5.2	PC	6	0
10/15/90	64	39	52		0.00		0.0			W	2.7	CLR	13	0
10/16/90	70	46	58		0.02		0.0		L	S	5.2	CLDY	7	0
10/17/90	75	49	62		0.69		0.0		TRW+,R	S	9.7	CLDY	3	0
10/18/90	49	34	42	T	0.00		0.0		L	W	7.8	CLDY	23	0
10/19/90	56	29	43		0.00		0.0			SE	2.9	CLR	22	0
10/20/90	68	36	52		0.00		0.0		F	SE	5.0	CLR	13	0
10/21/90	58	44	51		0.02		0.0		L	NW	4.7	CLDY	14	0
10/22/90	58	37	48		0.00		0.0			N	2.5	CLR	17	0
10/23/90	62	31	47		0.01		0.0		L	W	1.5	CLR	18	0
10/24/90	57	37	47		0.00		0.0			NW	3.8	CLDY	18	0
10/25/90	53	31	42		0.00		0.0			N	3.3	CLR	23	0
10/26/90	57	28	43		0.00		0.0		F	S	2.2	CLR	22	0
10/27/90	66	35	51		0.00		0.0		F	S	5.8	CLR	14	0
10/28/90	52	28	40		0.00		0.0			NW	2.3	PC	25	0
10/29/90	63	28	46		0.00		0.0			S	4.1	CLR	19	0
10/30/90	76	37	57		0.00		0.0			SW	4.0	CLR	8	0
10/31/90	76	44	60		0.00		0.0			SW	3.3	CLR	5	0
TOTAL					6.90		0.0						391	13
AVERAGE	65.2	39.9	52.6											
DEPARTURE									PREVAILING	S	4.2			
FROM AVERAGE	-0.5	-4.2	-2.3		+4.39		-0.0	0	AVERAGE	SW	-2.1		+71	-7

NUMBER OF DAYS AND DEPARTURE

	MAX-TEMP >=90	MAX-TEMP <=32	MIN-TEMP <=32	MIN-TEMP <=0	PRECIPITATION >=T	PRECIPITATION >=.01	PRECIPITATION >=.10	PRECIPITATION >=.50	PRECIPITATION >=1.00	SNOW >=1	SKY COVER CLEAR	SKY COVER PCLDY	SKY COVER CLDY
TOTAL	0	0	7	0	11	10	6	5	4	0	17	4	10
DEP.	0	0	+4	0	-	+2	+1	+4	+3	+0	+5	-5	+0

	WEATHER TYPES F	T	IP	A	R	L	S	Z	D	H	BS	SEASONAL HEATING DEGREE DAYS	SEASONAL COOLING DEGREE DAYS	JAN - OCT PRECIPITATION
TOTAL	7	3	0	0	6	8	0	0	0	0	0	479	940	44.14
DEP.	+4	+1	-	0	-2	+6	+0	0	-	-	-	+102	-79	+12.08

WEATHER TYPES: F=Fog; T=Thunderstorm; IP=Ice Pellets; A=Hail; R=Rain; S=Snow; Z=Glaze; D=Dust; H=Haze BS=Blowing Snow; RW=Rain Showers; SW=Snow Showers; L=Drizzle; Intensities: +heavy; -light; absence of symbol indicates moderate. Degree day base = 65F T= Trace; Averages 1951-1980 Data. Snow depth at 7AM LST SKY 7AM-7PM LST. Other data midnight-midnight.

REMARKS: This was the fifth wettest Oct in Urbana history (August 1888) the wettest Oct ever being 9.01 in 1941. Peak gust was 32.3 from the south on the 3rd.

CHAMPAIGN, ILL. LOCAL CLIMATOLOGICAL DATA NOVEMBER 1990
WATER SURVEY RESEARCH CENTER ILLINOIS STATE WATER SURVEY SUMMARY

DATE	MAX TEMP	MIN TEMP	MEAN TEMP	PRECIP T (INCHES)	SNOW T (INCHES)	DEPTH	WEATHER TYPES	WIND DIR	WIND SPD	SKY COVER	HEAT DEG. DAYS	COOL DEG. DAYS
11/01/90	74	41	58	0	0			S	6.0	CLR	7	*0
11/02/90	*75	51	63	0	0		F	S	6.3	PC	2	0
11/03/90	74	43	59	0	0			S	4.9	CLDY	6	0
11/04/90	60	44	52	0.40	0		R,L	NE	5.8	CLDY	13	0
11/05/90	55	34	45	0.66	T 0	0	R,L,SW-,F	NW	5.3	CLDY	20	0
11/06/90	46	31	39	0	0			SE	1.7	PC	26	0
11/07/90	42	28	35	0	0			NW	4.1	CLDY	30	0
11/08/90	41	*22	32	0	0			SE	2.8	CLR	*33	0
11/09/90	42	35	39	0	0			N	2.8	PC	26	0
11/10/90	56	32	44	0	0		F	N	4.5	PC	21	0
11/11/90	57	25	41	0	0			WSW	4.8	PC	24	0
11/12/90	49	30	40	0	0			NW	2.6	CLR	25	0
11/13/90	54	30	42	0	0			SE	2.7	PC	23	0
11/14/90	70	33	52	0	0			S	4.8	CLR	13	0
11/15/90	72	42	57	0	0		F	SW	6.6	CLR	8	0
11/16/90	59	39	49	0	0			NW	6.8	PC	16	0
11/17/90	53	30	42	0	0			NW	2.1	CLR	23	0
11/18/90	54	34	44	0	0			SE	3.7	PC	21	0
11/19/90	51	44	48	T 0	0		L	SE	1.6	CLDY	17	0
11/20/90	61	38	50	0	0			SE	4.7	CLDY	15	0
11/21/90	71	52	62	0.07	0		RW,L	S	10.7	CLDY	3	0
11/22/90	54	37	46	0.07	0		RW	SW	3.3	CLDY	19	0
11/23/90	53	34	44	0	0			W	7.4	PC	21	0
11/24/90	61	30	46	0	0			SW	4.4	CLR	19	0
11/25/90	64	38	51	0	0			SE	2.7	PC	14	0
11/26/90	67	43	55	0.25	0		TRW,R,L,F	S	7.7	CLDY	10	0
11/27/90	68	52	60	*1.54	0		RW+,RW,R,L	S	11.4	CLDY	5	0
11/28/90	52	30	41	0.01	T 0	0	RW,SG-	W	7.7	PC	24	0
11/29/90	41	27	34	0	0			W	4.0	CLR	31	0
11/30/90	49	31	40	0	0			S	9.3	CLR	25	0
TOTAL				3.00	0.0						540	0
AVERAGE	57.5	36.0	46.8									
DEPARTURE							PREVAILING	S	5.1			
FROM AVERAGE	+8.0	+3.1	+5.6	+0.52	T -2.9	0	AVERAGE	S	-2.7		-165	+0

NUMBER OF DAYS AND DEPARTURE

	MAX-TEMP >=90	MAX-TEMP <=32	MIN-TEMP <=32	MIN-TEMP <=0	PRECIPITATION >=T	PRECIPITATION >=.01	PRECIPITATION >=.10	PRECIPITATION >=.50	PRECIPITATION >=1.00	SNOW >=1	SKY COVER CLEAR	SKY COVER PCLDY	SKY COVER CLDY
TOTAL	0	0	12	0	8	7	4	2	1	0	9	11	10
DEP.	0	-2	-3	0	-	-2	-1	+0	+0	-1	+1	+3	-4

	WEATHER TYPES F	T	IP	A	R	L	S	Z	D	H	BS	SEASONAL HEATING DEGREE DAYS	SEASONAL COOLING DEGREE DAYS	JAN - NOV PRECIPITATION
TOTAL	4	1	0	0	7	6	2	0	0	0	0	1019	940	47.14
DEP.	+1	+0	-	0	-1	+3	-3	-	-	-	-	-63	-79	+12.58

WEATHER TYPES: F=Fog; T=Thunderstorm; IP=Ice Pellets; A=Hail; R=Rain; S=Snow; Z=Glaze; D=Dust; H=Haze BS=Blowing Snow; RW=Rain Showers; SW=Snow Showers; L=Drizzle; Intensities: +heavy; -light; absence of symbol indicates moderate. Degree day base = 65F T= Trace; Averages 1951-1980 Data. Snow depth at 7AM LST SKY 7AM-7PM LST. Other data midnight-midnight.

REMARKS: 3rd highest mon. max. temp. for Nov (rec 60.2/1909). 8th highest mon. min. temp for Nov (rec 42.2, 1931). Tied 5th highest mon. mean temp. for Nov, set 1975. (rec 50.2/1931) Peak gust 30.1mph from west on 23rd.

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