1983

Illinois Turfgrass Research Report

Department of Horticulture and
Agricultural Experiment Station
University of Illinois at Urbana-Champaign

Horticulture Series 51, March 1984

ILLINOIS TURFGRASS RESEARCH REPORT

This report presents the results for 1983 of turfgrass research being conducted at the University of Illinois. The reports represent contributions from the Department of Horticulture, the Office of Agricultural Entomology and the Department of Plant Pathology. We hope that the information presented will be useful when making turfgrass management decisions. The goal of our research program is to provide the turfgrass manager of Illinois with information that will help in maintaining high quality turfgrass stands. We always welcome suggestions regarding our research program.

When evaluating the information in this booklet, please keep in mind that the 1983 growing season was characterized by unusually hot, dry weather. Our research area is given minimal irrigation in order to observe differences in stress tolerance in the treated turf. We urge everyone to attend our 1984 field day which will be held on July 25 to view to view our research and gain an understanding of the work we are doing.

We would like to thank the turf professionals of Illinois for support of our program. Through direct contributions and attendance at Illinois Turfgrass Foundation activities, funds have been raised to conduct our research. Within this booklet we have listed the individual, companies, and organizations that have provided assistance to our program. This support has made our program possible.

David J. Wehner, Editor

Jean E. Haley, Editor

ACKNOWLEDGEMENTS

We would like to express thanks to the following companies and organizations for their support of our turfgrass research program through their contributions of time, materials, or funding.

Allied Chemicals
Beckman Turf & Irrigation
Brayton Chemical Co.
E. F. Burlingham & Sons
Cantigny Gardens & Museums
CelPril
Central Illinois Golf Course Superintendents Association
Chem-Lawn
Chicago District Golf Foundation
Chicago Toro
CIBA-GEIGY Corp.
W. A. Cleary
John Deer & Company
Diamond Shamrock
DuPage County Extension Office
E. I. Du Pont de Nemours & Co.
Elanco Products
Elwood Aviation
Emerald Green Sod Farm
Estech General Chemicals Corp.
BFC Chemicals, Inc.
Glencoe Golf Club
Hawkeye Chemicals
H. and E. Sod Farms
John Hoerr Sod Farm
Illinois Lawn Equipment
Illinois Turfgrass Foundation
International Seeds, Inc.
Jacklin Seed Co.
Ed Keeven Sod Co., Inc.
Lakeshore Equipment & Supply
Lebanon Chemical Corp.
Lofts Pedigreed Seed, Inc.
3M
Mallinckrodt Inc.
Midwest Association of Golf Course Superintendants
Mobay Chemical Corporation
Monsanto Co.
Mueller Turf Nursery
Nice 'N Green
Northrup King Co.
Northwestern Illinois Golf Course Superintendents Association
Olin Corporation

Outdoor Equipment
PBI Gordons
Peoria Landscaping
Permagreen Supreme, Inc.
Pickseed West, Inc.
Pure Seed Testing, Inc.
Rhone-Poulenc, Inc.
Quality Sod
Rock Island County Extension Office
O. M. Scott and Sons
Seaboard Seed Co.
Silver Lake Country Club
Thornton's Turf Nursery
Toro Co.
Tri State Toro
TUCO
Union Carbide
University of Illinois Athletic Association
Benedict O. Warren
Warren's Turf Nursery, Inc.

TABLE OF CONTENTS

TABLE OF CONTENTS

USDA NATIONAL KENTUCKY BLUEGRASS TRIAL

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

INTRODUCTION

Kentucky bluegrass (Poa pratensis)is the primary turfgrass used for home lawns in Illinois. The many available cultivars of Kentucky bluegrass differ considerably in characteristics such as quality, color, density, texture, stress tolerance, and resistance to disease. The turf program at the University of Illinois is one of 35 participants in a nationwide Kentucky bluegrass trial. This evaluation will examine the long term performance of 84 Kentucky bluegrass cultivars under a variety of environmental conditions and cultural regimes. At our Urbana research facility the trial has been established on a silt loam soil. A duplicate trial has been established on a pure sand soil at our Kilbourne facility. The soil at these sites differs primarily in nutrient and moisture holding capacity.

Urbana

MATERIAL AND METHODS

The Urbana evaluation was established September 15, 1980. Plot size is 5 x 6 feet and each cultivar is replicated 3 times. Prior to establishment, the area was fertilized with 1 lb N/1000 sq ft. After seeding, plots were covered with Soil Guard, a synthetic spray mulch and irrigated as needed. In 1981 the area received a total of 4 lb N/1000 sq ft and in 1982 the area was fertilized with a total of 3 lb N/1000 sq ft.

In 1983 half of each 6 x 5 foot plot was treated with the growth regulator Mon 4621 at a rate of 2.0 lb ai/A. This was to determine any differences among the cultivars in response to the growth regulator. The results of this investigation are listed in the report "Kentucky Bluegrass Response to the Application of MON 4621, a Plant Growth Retardant", page 65. During the 1983 growing season the area was treated with 4 lb N/1000 sq ft. No preemergence crabgrass control herbicide was used. The area was irrigated as needed to prevent wilt.

RESULTS

Turfgrass cultivars differed widely in their performance throughout the 1983 season (Table 1). In general turfgrass quality was fair to good with quality the highest during June and September. Although the plots were irrigated, quality declined during July and August because of heat and drouth stress. Several cultivars that did not recover from the stress are Lovegreen, Charlotte, Dormie, and S-21. Cool weather pythium affected the early spring performance of many varieties. Varieties exhibiting the greatest susceptibility to pythium were Piedmont, Wabash, K3-162, S. D. Common, Kenblue and Monopoly. Dollar spot disease was a problem in late July. The cultivars A20-6A, A20-6, Escort, Harmony, Charlotte, Nugget, and Dormie showed the most injury from this disease.

Kilbourne

MATERIAL AND METHODS

The trial at the Illinois River Sand Field, Kilbourne, was established April 6, 1981. Dolomitic limestone was applied to the area at 1.5 tons/A in the fall 1980. Prior to seeding, fertilizer was applied as 34-0-0 (1.6 lb N/1000 sq ft), 0-44-0 (110 lb/A), 0-0-60 (280 lb/A) and potassium magnesium sulfate (180 lb/A). Both complete analysis fertilizers (water soluble nitrogen source) and slow-release nitrogen fertilizers were applied throughout 1981, totalling 6.5 lb N/1000 sq ft. Granular Tupersan, a preemergence crabgass herbicide was applied at seeding at a rate of 6 lb ai/A. A second application of Tupersan WP was made on May 18, 1981 at a rate of 6 lb ai/A. Basagran at 1 quart/A was applied on September 19 and September 28, to control nutsedge. Irrigation is essential for turf growing in a pure sand soil. Although excessive rainfall characterized the 1981 growing season, plots were still irrigated to prevent moisture stress. Plots were irrigated as follows: 3.0"/April in 10 applications, 1.3"/May in 5 applications, 2.8"/June in 4 applications, 3.4"/July in 4 applications, 4.2"/August in 5 applications and 2.5"/September in 3 applications.

During the 1982 growing season the turf was fertilized with a 12-12-12 analysis fertilizer. Applications were made in April, June, August, and October at a rate of .6 lb N/1000 sq ft per application. The preemergence herbicide siduron (Tupersan) was applied at a rate of 6 lb ai/A on April 28 and June 9. Plots were irrigated to prevent moisture stress as follows: 3.0:"/May in 5 applications, 1"/June in 1 application, 6.0"/July in 4 applications, and 6.0"/August in 6 applications.

In 1983 the turf was fertilized with approximately 5.8 lb N/1000 sq ft during the growing season. Fertilizers and rates used include 12-12-12 at .5 lb N/1000 sq ft on May 5 and .6 lb N/1000 sq ft on June 6, July 5 and August 1; 18-5-9 at a rate of .9 lb N/1000 sq ft August 17 and 31; Nitroform (38-0-0) at 1 lb N/1000 sq ft on May 5; and IBDU (31-0-0) at a rate of .7 lb N/1000 sq ft on August 1. The area was irrigated during the season as follows: 5.05"/May in 4 applications, 4.55"/June in 4 applications, 7.45"/July in 6 applications, 4.1"/August in 5 applications and 2.45"/Sept. in 3 applications.

RESULTS

With a few exceptions, quality was better during the 1983 growing season than in previous years. Although July and August were drouthy most cultivar quality remained fair to good. The availability of frequent, deep irrigation prevented any drouth injury to the turf and kept the plants from becoming dormant. There were no disease problems at this site during the 1983 season.

Table 1. Evaluation of Kentucky bluegrass cultivars during the 1983 growing season - Urbana.[1]

Cultivar	Pythium[2] 4/8	Dollar Spot[2] 7/25	Spring Greenup[3] 3/15	Quality All Dates[4]	Quality[5] 5/6	6/7	7/21	8/30	9/22
I-13	8.7	5.7	3.3	7.8	7.7	8.7	6.3	7.3	8.7
Eclipse	9.0	7.7	5.0	7.4	6.0	8.3	7.3	7.7	7.3
PSU-173	8.0	8.3	5.3	7.3	5.7	7.3	8.0	7.7	7.3
Enmundi	7.7	6.7	4.7	7.0	6.3	7.7	7.7	5.7	7.0
H-7	9.0	6.3	3.0	7.0	7.3	8.0	5.7	6.0	7.3
K3-179	8.3	5.7	5.0	7.0	6.0	7.3	6.7	7.7	7.3
A20	8.0	5.0	4.0	6.9	7.0	8.3	5.7	5.0	7.3
Trenton	8.0	7.0	5.0	6.9	7.0	7.3	6.3	6.0	7.3
A20-6A	8.3	4.3	4.0	6.8	6.7	7.7	5.7	5.3	7.3
Rugby	8.3	6.0	4.7	6.8	7.0	7.7	5.7	6.0	7.0
SH-2	6.7	6.3	5.0	6.8	6.3	7.3	5.7	7.0	6.7
225	7.7	5.7	5.3	6.8	6.7	7.3	6.3	6.0	7.0
CEB VB 3965	7.7	5.7	4.7	6.7	6.0	7.0	7.0	5.7	7.3
Monopoly	4.7	7.0	4.3	6.7	6.0	6.7	6.7	6.3	7.0
Barblue	9.0	5.3	8.0	6.7	5.7	8.3	6.0	5.3	7.7
Shasta	7.0	5.3	5.0	6.7	7.3	7.0	6.0	5.0	7.0
WW AG 463	8.0	5.3	5.0	6.7	6.7	7.3	6.3	6.3	6.0
Cello	8.7	5.0	4.3	6.6	7.7	8.3	6.0	4.7	5.0
K3-178	8.0	6.0	5.0	6.6	7.0	7.0	6.0	5.7	7.0
Mona	8.0	4.7	5.3	6.6	6.7	7.7	5.3	5.7	7.0
Plush	7.3	7.3	5.0	6.6	5.3	6.7	7.0	6.7	7.3
PSU-150	8.0	7.3	6.0	6.6	5.7	8.3	7.0	5.3	5.7
Touchdown	7.7	5.3	6.0	6.6	6.7	8.0	5.7	5.0	6.0
A20-6	9.0	4.0	3.3	6.6	6.7	8.0	4.3	5.0	6.7
Columbia	7.3	6.0	5.7	6.6	6.3	7.3	5.7	5.7	7.3
NJ 735	8.0	6.0	4.7	6.6	5.7	7.0	6.3	5.7	6.7
239	8.3	6.3	5.7	6.6	6.7	7.0	5.3	6.0	7.0
Escort	8.3	4.3	4.0	6.5	6.7	8.0	5.3	4.0	7.3
Merion	9.0	7.3	5.7	6.5	6.7	6.0	6.3	6.0	6.3
Adelphi	8.3	6.3	5.7	6.4	6.3	6.7	6.3	6.0	6.3
WW AG 480	7.7	6.0	2.3	6.4	6.3	7.7	6.0	4.7	6.3
Admiral	8.3	6.7	6.0	6.4	5.7	6.3	6.0	6.3	7.3
Banff	8.3	5.3	5.0	6.4	6.3	7.0	5.7	5.3	6.3
Mosa	7.3	7.0	4.0	6.4	5.7	7.3	7.3	5.0	6.0
Vanessa	6.7	6.0	4.0	6.4	5.0	7.3	7.0	5.7	6.3

(continued)

Table 1. Evaluation of Kentucky bluegrass cultivars during the 1983 growing season - Urbana (continued).[1]

Cultivar	Pythium[2] 4/8	Dollar Spot[2] 7/25	Spring Greenup[3] 3/15	Quality All Dates[4]	Quality[5] 5/6	6/7	7/21	8/30	9/22
Kimono	8.7	5.3	3.7	6.3	5.3	8.3	6.0	4.7	6.0
Parade	8.7	7.0	6.0	6.3	5.7	6.7	6.3	5.7	6.7
A-34	6.3	6.0	5.3	6.3	6.3	6.3	6.3	5.7	6.3
Ram 1	6.3	5.7	6.3	6.3	6.3	8.0	6.0	3.3	6.0
Baron	9.0	7.0	4.7	6.2	5.0	6.3	7.3	6.3	6.3
Birka	5.7	7.3	5.3	6.2	6.0	8.3	6.3	3.7	5.3
Sydsport	7.0	5.0	3.0	6.2	6.3	7.7	5.7	4.3	5.7
1528T	8.3	6.7	4.3	6.2	4.7	7.0	7.3	6.0	6.7
Bonnieblue	8.7	5.7	6.7	6.2	6.3	7.0	6.0	4.3	6.0
MLM-18011	8.3	7.3	5.7	6.2	5.7	6.3	6.7	5.3	6.3
Bayside	7.3	6.7	4.3	6.1	6.3	6.3	6.0	5.7	6.0
America	6.3	5.0	4.7	6.1	5.7	6.7	5.3	6.0	6.3
Bono	6.3	6.3	6.0	6.1	6.0	7.7	6.7	3.3	5.0
Cheri	7.7	6.7	3.3	6.1	5.0	7.0	6.0	5.3	6.3
Fylking	8.3	6.3	5.0	6.1	6.0	7.3	6.3	3.7	5.3
Glade	5.7	7.0	5.7	6.1	5.3	7.7	6.7	4.7	5.7
K1-152	8.3	6.0	5.0	6.1	5.3	7.0	5.7	5.0	6.3
Mer PP 300	9.0	6.7	4.0	6.0	4.3	6.7	6.7	5.7	5.7
N535	9.0	5.7	6.0	6.0	5.0	7.0	6.3	4.3	5.7
Victa	9.0	7.3	4.0	6.0	4.3	6.7	7.0	6.0	6.3
Majestic	8.0	5.3	6.0	5.9	5.0	7.3	5.7	5.0	6.3
SV-01617	8.3	6.3	4.7	5.9	6.3	7.7	6.0	3.3	5.3
Bristol	8.0	6.0	5.7	5.9	5.0	6.7	5.7	5.3	6.3
Geronimo	8.0	5.7	4.3	5.9	6.0	7.0	5.7	4.3	5.7
PSU-190	7.7	5.7	5.7	5.9	6.3	7.3	5.7	3.3	5.0
WW AG 478	6.3	5.7	5.0	5.8	4.3	7.0	7.3	3.7	7.0
Merit	9.0	6.3	4.7	5.8	4.3	7.0	6.3	5.0	6.0
BA-61-91	9.0	6.7	4.0	5.7	4.7	6.7	6.7	5.0	6.0
Aspen	8.3	5.0	6.0	5.7	4.7	6.3	5.3	5.0	6.3
Enoble	8.0	5.7	3.0	5.6	4.3	6.0	5.3	5.0	5.7
Holiday	8.0	5.0	4.7	5.6	4.7	6.7	5.0	5.0	5.7
Apart	8.0	5.7	5.0	5.5	5.3	6.0	6.0	4.0	5.0
Welcome	8.0	5.0	5.7	5.5	4.3	7.7	6.0	3.3	5.3
Lovegreen	5.3	5.0	4.0	5.4	6.0	7.7	6.0	2.0	3.3
Piedmont	4.7	7.3	6.0	5.4	5.0	4.3	6.3	5.7	6.7

(continued)

Table 1. Evaluation of Kentucky bluegrass cultivars during the 1983 growing season - Urbana (continued).[1]

Cultivar	Pythium[2] 4/8	Dollar Spot[2] 7/25	Spring Greenup[3] 3/15	Quality All Dates[4]	Quality[5] 5/6	6/7	7/21	8/30	9/22
Mystic (P141)	5.0	5.3	6.7	5.4	4.3	7.0	5.7	3.3	6.0
Vantage	5.0	6.3	5.3	5.4	5.0	4.3	6.3	5.3	6.0
Wabash	3.0	7.3	5.3	5.4	3.7	3.3	6.3	7.3	7.3
K3-162	4.3	6.7	6.3	5.3	6.0	4.0	6.0	5.0	6.0
243	8.0	6.7	6.3	5.2	4.3	6.0	5.3	4.7	5.7
Argyle	5.3	6.7	6.3	5.2	5.0	4.7	5.7	5.7	4.7
Harmony	5.0	4.7	5.3	5.2	4.7	6.7	5.0	3.3	5.0
MER PP 43	8.3	5.0	6.3	5.2	5.3	6.7	5.0	3.0	4.3
Charlotte	8.7	4.7	4.3	5.1	4.7	7.3	4.7	3.0	3.3
Nugget	7.3	3.3	2.7	5.0	5.0	6.7	3.7	3.3	5.3
Dormie	8.7	4.3	6.3	4.7	5.3	6.3	4.3	3.0	3.3
S.D. Common	4.3	7.0	6.3	4.5	5.0	4.0	6.0	3.3	4.3
Kenblue	3.7	5.3	6.7	4.3	4.0	3.0	5.0	5.0	4.7
S-21	5.3	6.3	6.3	4.3	4.7	3.7	5.7	3.7	3.0
LSD	1.5	1.7	1.3	0.8	1.2	1.1	1.4	1.4	1.3

[1]All values represent the mean of 3 replications.

[2]Disease evaluations are made on a 1-9 scale where 9 = no visible evidence of disease and 1 = complete necrosis.

[3]Spring greenup evaluations are made on a 1-9 scale, where 9 = very dark turf color and 1 = dormant turfgrass.

[4]Values represent the mean of 15 scores obtained from 3 replications and 5 evaluation dates.

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

Table 2. Evaluation of Kentucky bluegrass cultivars during the 1983 growing season - Kilbourne.[1]

Cultivar	Spring Greenup[2] 3/17	Quality All Dates[3]	Quality[4] 4/13	5/11	6/9	7/12	8/16	9/13	10/10
K1-152	4.7	6.9	6.0	5.3	7.0	6.7	7.7	7.3	8.3
Enoble	4.0	6.6	5.3	4.7	7.3	6.7	7.3	7.7	7.3
Baron	4.0	6.5	5.7	5.0	6.7	5.7	7.3	8.0	7.3
Cheri	3.3	6.5	5.3	4.7	7.0	6.3	7.7	7.3	7.0
Monopoly	5.0	6.5	5.7	5.0	7.3	6.7	7.3	6.7	6.7
Sydsport	3.0	6.5	5.3	5.3	7.0	6.7	8.0	7.0	6.0
A20-6	4.3	6.4	5.3	4.7	7.3	6.0	7.7	7.0	7.0
225	5.3	6.4	5.7	5.0	7.0	6.0	6.7	7.0	7.7
Adelphi	4.0	6.3	5.7	4.3	6.7	5.3	6.7	7.7	7.7
Escort	3.7	6.3	5.3	5.0	6.7	6.3	8.3	6.3	6.0
Merit	3.0	6.3	5.3	4.0	6.0	6.0	8.0	7.7	7.0
Trenton	4.0	6.3	5.7	4.7	6.3	6.0	7.3	6.7	7.3
WW AG 480	4.0	6.3	5.0	4.7	7.0	7.0	8.0	5.3	7.0
A-34	3.7	6.2	5.0	4.0	6.7	6.3	7.0	7.0	7.7
Shasta	4.3	6.2	5.3	4.0	6.0	5.7	7.3	7.7	7.7
WW AG 463	4.3	6.2	5.7	4.3	7.3	6.0	6.7	6.7	7.0
Merion	4.3	6.1	5.7	4.7	6.0	6.3	7.0	6.7	6.7
Banff	4.0	6.1	5.0	4.3	6.7	5.7	6.3	7.0	7.7
Birka	4.7	6.1	5.7	4.3	6.3	5.3	6.7	7.3	7.0
Mosa	3.3	6.1	5.3	3.7	6.3	5.7	6.7	7.7	7.3
America	4.3	6.0	5.0	4.3	6.3	5.3	7.3	7.0	7.0
Columbia	4.7	6.0	5.3	4.0	6.3	6.0	6.7	7.0	7.0
Mona	4.3	6.0	5.0	5.0	6.7	5.3	6.0	7.0	7.3
Plush	4.3	6.0	5.0	3.7	6.0	5.7	7.7	7.3	7.0
PSU-173	3.7	6.0	5.0	3.7	6.3	5.7	7.3	6.7	7.7
Vanessa	2.3	6.0	5.0	4.0	6.3	6.7	7.3	6.7	6.3
Aspen	3.7	6.0	5.0	4.0	6.3	5.3	7.0	7.3	7.0
Holiday	3.0	6.0	5.0	4.3	6.0	5.3	6.3	7.3	7.7
Nugget	3.7	6.0	5.3	3.7	6.0	5.7	7.0	7.3	7.0
Parade	4.3	6.0	5.3	4.3	5.3	5.3	7.0	7.3	7.3
PSU-190	3.3	6.0	5.0	4.0	6.3	6.7	5.7	7.0	7.3
Welcome	4.0	6.0	5.3	3.0	7.0	6.0	6.7	7.0	7.0
1528T	3.0	6.0	5.3	4.0	6.3	5.3	6.3	7.3	7.3
H-7	4.3	6.0	5.0	4.3	6.0	5.7	6.3	7.0	7.3
K3-178	4.0	6.0	5.0	4.3	6.7	5.3	6.0	7.3	7.0

(continued)

Table 2. Evaluation of Kentucky bluegrass cultivars during the 1983 growing season - Kilbourne (continued).[1]

Cultivar	Spring Greenup[2] 3/17	Quality All Dates[3]	Quality[4] 4/13	5/11	6/9	7/12	8/16	9/13	10/10
SH-2	5.0	6.0	5.3	4.3	6.7	6.0	6.0	6.7	6.7
A20-6A	4.3	5.9	5.3	5.0	6.0	5.3	5.7	6.3	7.7
CEB VB 3965	4.0	5.9	5.0	4.3	5.7	5.7	6.7	7.0	7.0
Ram 1	5.3	5.9	5.7	5.0	6.3	6.3	6.3	6.0	5.7
SV-01617	3.7	5.9	5.7	4.3	6.7	6.0	6.0	6.7	6.0
Victa	3.7	5.9	4.3	3.7	4.7	5.3	7.7	8.0	7.7
Eclipse	4.0	5.9	5.0	4.0	6.0	5.0	6.3	7.3	7.3
I-13	4.0	5.9	5.3	4.0	6.3	5.0	5.7	7.0	7.7
Kimono	2.7	5.9	4.7	4.7	7.0	5.7	6.7	6.7	5.7
Rugby	4.7	5.9	5.3	4.3	6.3	5.3	5.7	7.3	6.7
239	4.3	5.9	5.0	4.3	6.0	5.7	6.0	7.0	7.0
Bayside	4.3	5.8	5.3	4.0	5.7	5.7	5.3	7.7	7.0
PSU-150	4.0	5.8	4.3	3.3	6.7	5.7	7.0	6.7	7.0
Bono	3.7	5.8	5.3	4.0	6.3	5.3	6.3	6.0	7.0
Majestic	4.7	5.8	5.3	4.3	5.7	5.3	5.3	7.3	7.0
Admiral	5.0	5.7	5.0	4.3	6.0	4.7	5.7	6.7	7.7
Bonnieblue	4.3	5.7	4.7	4.0	6.0	5.3	7.0	6.7	6.3
Bristol	4.7	5.7	5.3	4.7	5.7	5.3	6.7	6.0	6.3
Geronimo	4.3	5.7	5.7	3.7	6.0	6.0	6.3	6.7	5.7
Enmundi	4.3	5.7	4.7	3.3	6.3	5.7	5.7	7.3	6.7
Fylking	2.7	5.7	4.7	3.7	6.0	6.0	6.7	6.3	6.3
K3-179	4.0	5.7	5.0	3.0	6.3	5.3	5.7	7.3	7.0
MLM-18011	4.3	5.7	5.3	3.3	5.7	5.3	6.0	6.7	7.3
Touchdown	3.0	5.7	5.0	3.7	6.3	5.7	6.7	6.3	6.0
Lovegreen	3.0	5.6	5.0	3.7	6.7	6.7	6.0	7.0	4.3
MER PP 300	3.7	5.6	5.3	4.0	5.0	5.0	6.3	6.7	7.0
A20	3.7	5.6	5.3	4.3	5.3	5.3	5.7	6.3	6.7
Piedmont	3.0	5.6	5.0	3.7	4.7	5.3	6.3	7.3	6.7
Wabash	4.7	5.6	5.3	3.3	6.3	4.0	5.7	6.7	7.7
BA-61-91	3.0	5.5	5.0	4.0	4.7	4.3	6.3	7.3	7.0
Glade	4.0	5.5	5.0	4.0	6.0	4.7	5.3	6.7	6.7
Apart	4.0	5.4	5.0	3.7	5.7	5.0	5.7	6.7	6.3
Cello	4.0	5.4	5.0	4.0	5.3	5.0	5.0	6.7	6.7
NJ 735	3.7	5.3	4.7	4.0	5.0	5.0	5.3	7.0	6.0
N535	4.3	5.3	5.3	4.0	5.7	5.0	3.3	6.3	7.3

(continued)

Table 2. Evaluation of Kentucky bluegrass cultivars during the 1983 growing season - Kilbourne (continued).[1]

Cultivar	Spring Greenup[2] 3/17	Quality All Dates[3]	Quality[4] 4/13	5/11	6/9	7/12	8/16	9/13	10/10
Mystic (P141)	4.7	5.2	4.3	3.0	4.3	5.0	6.0	7.0	7.0
243	5.0	5.2	5.3	4.3	5.0	5.0	5.3	6.3	5.3
MER PP 43	4.0	5.1	4.7	3.3	5.3	4.7	4.0	7.7	6.0
Barblue	5.7	5.0	5.3	3.3	6.0	4.7	4.3	5.7	6.0
Vantage	4.7	5.0	5.0	3.0	4.7	5.3	5.7	6.7	5.0
Harmony	3.3	5.0	4.7	3.3	5.3	4.0	5.0	7.0	5.7
Dormie	3.7	4.8	5.0	3.0	5.0	4.0	5.0	5.7	6.3
S.D. Common	5.0	4.6	5.0	3.0	4.3	4.3	4.7	5.3	5.7
WW AG 478	2.3	4.6	4.7	3.0	5.7	4.7	4.3	5.3	4.7
K3-162	4.7	4.6	4.7	3.0	4.7	3.7	3.3	6.7	6.0
Argyle	3.3	4.4	4.7	3.3	4.3	4.0	3.3	6.3	5.0
Charlotte	3.0	4.3	5.0	3.7	5.3	4.7	3.0	4.7	4.0
S-21	4.0	4.1	4.3	2.7	4.0	4.0	4.7	5.7	3.3
Kenblue	3.7	3.5	4.0	2.3	2.7	2.7	2.7	5.0	5.0
LSD	1.4	0.9	0.9	0.9	1.3	1.3	2.3	1.4	1.8

[1]All values represent the mean of 3 replications.

[2]Spring greenup evaluations are made on a 1-9 scale, where 9 = very dark turf color and 1 = dormant turfgrass.

[3]Values represent the mean of 21 scores obtained from 3 replications and 7 evaluation dates.

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

USDA NATIONAL PERENNIAL RYEGRASS CULTIVAR EVALUATION

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

INTRODUCTION

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

METHODS AND MATERIAL

The Urbana trial, established September 8, 1982, includes 50 perennial ryegrass cultivars, some that are experimental and other that are commercially available (Table 1). Plots measure 5 x 6 feet and each cultivar is replicated 3 times. All plots are mowed at 2.0 inches and receive 4 lb N/1000 sq ft/year. The ryegrass is irrigated as needed to prevent wilt.

RESULTS

Early spring density evaluations reflect turf resistance to cool weather pythium and injury from winter stress. Density, for most cultivars, was generally poor to fair with Gator, Blazer, NK80389, Fiesta, and Manhattan/Blazer being the most dense. Cultivars performed the best in spring and fall with the highest quality observed in November. Although the plots were irrigated, several cultivars performed very poorly during drouth stressed August. They include Elka, Cupido, Pippin and Linn.

Table 1. Evaluation of perennial ryegrass cultivars during the 1983 growing season.[1]

Cultivar	Density[2] 4/7	Quality All Dates[3]	Quality[4] 5/6	6/10	7/15	8/22	9/22	11/21
Palmer	5.0	7.2	7.0	6.0	6.7	6.3	8.0	9.0
GT II	5.3	7.1	6.3	7.0	6.7	6.0	7.7	9.0
BT I	4.7	7.0	6.3	6.7	6.7	5.7	7.7	9.0
Prelude	5.3	7.0	7.0	6.0	6.7	6.0	7.3	9.0
Fiesta	5.7	6.9	7.0	6.0	6.7	5.7	7.7	8.7
Gator	6.0	6.8	7.0	7.0	6.0	5.7	7.0	8.3
Premier	5.3	6.8	7.0	5.7	6.3	6.0	7.7	8.3
Blazer	5.7	6.8	6.7	6.7	6.3	5.7	7.0	8.3
Prelude/Blazer	5.7	6.7	6.7	5.7	6.0	5.7	7.7	8.7
SWRC-1	4.0	6.7	5.7	7.0	6.0	6.0	7.3	8.3
Derby	4.7	6.7	6.7	6.0	7.0	5.7	7.0	7.7
Yorktown	5.0	6.7	6.7	7.0	6.0	5.3	6.3	8.7
Manhattan	5.3	6.6	7.0	7.0	6.0	4.7	6.3	8.7
282	5.0	6.6	7.0	6.0	6.7	5.0	6.7	8.3
Fiesta/ Manhattan II	5.0	6.6	6.0	6.3	6.7	5.3	6.7	8.3
HR-1	4.7	6.6	6.0	6.0	6.0	5.7	7.7	8.0
Ranger	5.3	6.6	6.0	6.3	5.7	5.0	7.3	9.0
Diplomat	3.7	6.5	6.0	6.7	5.7	5.3	7.0	8.3
LP 702	4.7	6.5	5.7	8.0	6.3	5.0	5.3	8.7
M382	4.3	6.5	5.7	7.0	5.0	5.7	7.0	8.7
Barry	4.0	6.4	5.3	7.7	5.3	5.0	6.7	8.7
Manhattan II/ Blazer	5.7	6.4	6.3	7.0	6.0	5.3	6.3	7.7
Elka	4.7	6.3	6.0	8.0	5.0	3.7	7.0	8.0
Dasher	4.3	6.2	6.3	6.0	6.0	6.0	5.7	7.3
IA 728	4.0	6.2	5.7	6.0	5.7	6.0	6.7	7.3
Omega	4.0	6.2	5.7	6.3	5.3	5.3	6.7	8.0
2ED	3.7	6.2	6.0	5.6	6.0	5.7	6.3	7.7
NK 80389	6.0	6.1	6.3	7.3	5.3	4.0	5.3	8.0
Manhattan II	4.0	6.0	5.3	6.3	5.7	4.7	5.3	8.7
NK 79307	3.3	6.0	5.0	5.7	6.7	5.7	6.0	7.0

(continued)

Table 1. Evaluation of perennial ryegrass cultivars during the 1983 growing season (continued).[1]

Cultivar	Density[2] 4/7	Quality All Dates[3]	Quality[4] 5/6	6/10	7/15	8/22	9/22	11/21
LP 792	3.0	5.9	5.3	6.3	5.0	4.3	6.3	8.0
2EE	3.0	5.8	4.7	5.3	5.3	5.0	6.7	7.7
Regal	3.7	5.7	5.3	5.7	5.7	5.7	5.3	6.7
WWE 19	5.0	5.7	6.3	6.3	5.3	4.0	5.7	6.7
Cockade	4.3	5.7	5.3	7.0	5.3	4.3	5.0	7.0
Pennant	3.3	5.7	5.0	6.3	5.3	4.7	5.3	7.3
HE168	2.0	5.6	3.3	7.3	4.3	5.0	6.3	7.3
NK 79309	4.0	5.4	5.0	5.3	5.7	5.0	5.0	6.3
Pennfine	2.7	5.4	4.3	5.0	4.7	5.3	6.3	6.7
Delray	3.0	5.3	3.7	5.0	5.0	4.7	6.7	7.0
Cupido	3.3	5.3	5.0	7.3	4.7	3.7	4.0	7.0
LP 736	2.7	5.3	3.7	6.3	4.7	4.7	5.3	7.0
Citation	2.7	5.2	4.0	4.7	5.0	4.7	6.0	7.0
HE178	2.3	5.2	3.0	6.0	4.7	4.7	6.0	7.0
LP 210	3.7	5.2	5.7	6.3	4.0	3.0	5.0	7.3
Cigil	2.7	5.2	3.0	7.3	4.3	4.7	5.0	6.7
Acclaim	3.0	5.1	4.3	5.3	4.3	4.3	5.7	6.3
Crown	2.0	4.8	3.7	5.3	4.0	4.7	5.0	6.3
Pippin	3.3	4.7	4.0	7.0	4.3	2.7	4.0	6.3
Linn	2.0	3.3	3.0	3.0	3.3	2.7	3.0	5.0
LSD	1.2	0.5	1.2	0.8	1.0	1.0	1.6	0.9

[1]All values represent the mean of 3 replications.

[2]Density evaluations are made on a 1-9 scale, where 9 = very dense turf and 1 = low turfgrass density.

[3]Values represent the mean of 18 scores obtained from 3 replications and 6 evaluation dates.

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

USDA NATIONAL FINE FESCUE CULTIVAR EVALUATION

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

INTRODUCTION

Fine fescue is a term that generally is used to refer to several fine leaf turfgrasses of the Festuca genus. Fine fescues include red or creeping fescue (Festuca rubra), chewings fescue (Festuca rubra var. commutata), sheeps fescue (Festuca ovina) and hard fescue (Festuca ovina var. duriuscula). Red fescue does well as a turfgrass under shade and has a stoloniferous habit. Chewings, sheeps and hard fescue do well in sunny dry areas as low maintenance turfs. These fescues have a bunch type growth habit. New cultivars have been developed to improve the adaptibility and quality of the fineleaf fescues. The University of Illinois turf program is participating in the USDA national fineleaf fescue test. This test evaluates the performance of 47 cultivars of creeping red, chewings, sheep, and hard fescue in central Illinois. Identical tests have been established at other universities nationawide to examine the cultivars under a broad range of climates and cultural programs.

METHODS AND MATERIALS

The Urbana trial, established September 27, 1983, includes 47 fineleaf fescue cultivars, some that are experimental and others that are commercially available (Table 1). Plots measure 5 x 6 feet and each cultivar is replicated 3 times. Plots were seeded at 3.6 lb seed per 1000 sq ft (50 grams seed/30 sq ft). Prior to seeding the area was fertilized with 1 lb N/1000 sq ft. The seeded area was covered with a straw mulch that was removed when the seedlings emerged. Over the years the plots will be evaluated for quality, disease resistance, density, cold tolerance and drouth tolerance.

Table 1. USDA fineleaf fescue cultivars.

Chewings fescue		
Atlanta	Epsom	Magenta
Banner	HF 9-3	Mary
Beauty	Highlight	Shadow
Center	Ivalo	Tamara
CF-2	Jamestown	Tatjana
Checker	Koket	Waldorf
Enjoy	Longfellow	Wilma
Creeping red fescue		
Boreal	Flyer	Robot
Ceres	Logro	Ruby
Commodore	Lovisa	Wintergreen
Ensylva	Pennlawn	430
Estica	Pernille	
Hard fescue		
Aurora	Reliant	ST-2
BAR Fo 81-225	Scaldis	Valda
Biljart	Spartan	Waldina
Sheeps fescue		
4LS		
Unknown fescue species		
FRI-Frt 83-1		
entry no. 47		

TALL FESCUE CULTIVAR EVALUATION UNDER TWO MAINTENANCE LEVELS

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

INTRODUCTION

In Illinois, tall fescue (Festuca arundinacea) is primarily used on low maintenance sites as roadways and playgrounds. Tall fescue has excellent heat, drouth and wear tolerance but a coarse texture prevents its use in areas where a high quality turf is needed and a bunch type growth habit prevents its use in mixtures with other turf species. The susceptibility of tall fescue to low temperature injury reduces its use outside the transition zone. Improved "turf" type tall fescue cultivars with finer texture and improved cold tolerance have recently been introduced.

MATERIAL AND METHODS

In order to examine the performance of these "turf" type tall fescue cultivars, an evaluation trial was established in Urbana, September 20, 1982. The trial contains 22 "turf type" tall fescue cultivars (experimental and commercially available), one "forage type" (K-31), five tall fescue-Kentucky bluegrass mixes, two tall fescue-perennial ryegrass mixes and one tall fescue blend (Table 1). Plot size is 5 x 6 feet and each cultivar is replicated three times. The trial is duplicated in order to evaluate the cultivars at two levels of cultural maintenance. Under maintenance level I, the turf is not irrigated. It is fertilized only once in the fall with 1 lb N/1000 sq ft. Under maintenance level II, the turf is irrigated and fertilized four times per year with 1 lb N/1000 sq ft. All turf is maintained at 2.5 inch height of cut.

RESULTS

Despite high temperatures and drouthy conditions tall fescue performance was good for those cultivars maintained without irrigation (Table 1). The exceptions to this were the tall fescue-perennial ryegrass mixes. Quality was highest during June and July and deteriorated only slightly in the fall. In general, the tall fescue cultivars grown under this low maintenance level were not as severely affected by cool weather pythium as those with higher nitrogen fertilization and irrigation. Cultivars susceptible to pythium under a high maintenance program were SYN GA, Clemfine, Clemfine/Olympic, K-31, and K-82142 (Table 2). Plots maintained with irrigation and high fertilization exhibited excellent quality throughout the summer, although there was a slight decline in performance in August.

Table 1. Evaluation of tall fescue cultivars maintained with no irrigation and low fertilization.[1]

Cultivar	Pythium[2] Quality 4/7	Quality All Dates[3]	Quality[4] 5/12	6/10	7/11	8/19	9/30	11/21
5 M4-82	7.7	7.4	7.0	8.0	8.0	7.7	8.0	6.0
Jaguar	7.7	7.4	6.7	8.3	8.0	7.3	7.7	6.3
K 82142	6.0	7.2	6.3	8.0	8.0	7.7	7.0	6.0
Olympic + 5% PST 483	7.7	7.2	6.7	8.0	7.7	7.0	7.7	6.0
K 79628	5.0	7.1	7.0	7.7	8.0	7.3	7.0	5.7
Rebel/Bonnieblue	7.3	7.1	6.0	8.0	7.7	7.7	7.0	6.3
Rebel/Newport	7.3	7.0	6.7	8.3	8.0	7.0	6.7	5.3
52 H	7.7	7.0	6.3	8.7	7.0	7.0	7.0	6.0
Marathon	7.3	6.9	7.0	7.7	7.3	6.7	7.3	5.7
Mustang	7.7	6.9	6.0	8.3	7.7	7.0	6.7	6.0
Rebel/Baron	7.0	6.9	6.3	7.7	8.0	6.7	7.0	6.0
SYN GA	6.7	6.9	6.7	7.7	7.7	7.0	7.0	5.7
Falcon	8.0	6.9	5.7	8.0	8.0	6.7	7.3	5.7
Olympic + 10% PST 483	7.3	6.8	6.7	7.7	7.7	6.7	6.7	5.7
Rebel	7.3	6.8	6.0	7.3	7.7	6.0	7.3	6.3
52 W	8.3	6.7	6.7	8.3	7.3	6.7	6.3	5.0
Clemfine	6.0	6.7	5.7	7.3	7.3	7.0	7.0	5.7
Clemfine/Olympic	6.7	6.7	5.7	7.3	7.3	7.0	7.0	5.7
Olympic	7.7	6.7	6.0	7.7	7.0	6.3	7.3	5.7
Brookston	8.0	6.6	6.3	7.0	7.0	7.0	6.7	5.3
Galway	7.0	6.6	6.7	7.3	7.0	6.0	6.7	5.7
Houndog	6.3	6.6	6.0	7.0	7.3	7.0	6.7	5.3
ISI BK 2	6.7	6.5	5.7	7.0	7.0	6.7	7.0	5.7
TF805	8.0	6.4	6.0	7.7	7.0	6.3	6.3	5.3
K-31	6.0	6.3	6.0	7.3	7.0	7.0	6.0	4.7
NK 81452	7.3	6.3	6.0	8.0	7.0	5.7	6.3	5.0
Barcel	7.0	6.1	5.3	6.3	7.0	5.7	6.3	5.7
Rebel/Blazer	7.7	5.9	7.3	6.3	5.0	4.3	5.0	7.7
Rebel/Fiesta	7.3	5.8	7.7	6.3	5.0	3.0	5.0	8.0
BEL SYN 22	7.7	5.7	4.0	6.0	6.3	6.0	6.7	5.0
NK 81453	8.3	5.4	6.7	7.0	5.0	2.7	4.3	7.0
LSD	1.6	0.5	1.0	0.8	0.6	1.3	0.8	1.1

[1]All values represent the mean of 3 replications.

[2]Pythium evaluations are made on a 1-9 scale where 9 = no visible evidence of disease and 1 = complete necrosis.

[3]Values represent the mean of 18 scores obtained from 3 replications and 6 evaluation dates.

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

Table 2. Evaluation of tall fescue cultivars maintained with irrigation and high fertilization.[1]

Cultivar	Pythium[2] 4/7	Quality All Dates[3]	Quality[4] 5/12	6/10	7/11	8/19	9/30	11/21
Jaguar	5.0	8.1	7.3	8.7	8.3	6.3	9.0	9.0
5 M4-82	6.3	7.9	8.0	8.0	7.3	7.0	8.7	8.7
Falcon	4.3	7.9	7.0	8.3	8.0	7.3	8.7	8.0
Rebel	4.3	7.9	7.0	9.0	7.7	6.7	8.7	8.3
Rebel/Baron	5.7	7.9	6.7	8.0	7.7	7.3	8.7	9.0
Olympic + 5% PST 483	5.3	7.8	7.0	8.0	8.0	6.7	8.3	9.0
Rebel/Bonnieblue	5.3	7.8	6.7	8.0	7.7	6.7	9.0	9.0
Olympic + 10% PST 483	4.3	7.8	7.0	8.7	8.0	6.3	8.0	8.7
Rebel/Newport	4.7	7.8	6.7	7.7	8.3	6.3	9.0	8.7
Mustang	5.3	7.7	7.3	8.7	7.3	6.0	8.7	8.3
52 W	6.3	7.7	7.0	9.0	7.7	5.7	8.7	8.3
Houndog	4.7	7.6	7.0	8.0	7.3	6.7	8.0	8.3
Clemfine/Olympic	2.7	7.5	7.3	8.0	7.3	7.0	7.0	8.3
SYN GA	3.7	7.4	6.7	8.0	7.3	6.7	7.7	8.3
Clemfine	3.3	7.4	6.7	8.3	7.7	7.0	7.3	7.3
K 79628	4.0	7.4	6.7	8.3	7.0	6.3	7.3	8.7
Olympic	6.7	7.4	6.3	8.3	7.3	6.3	7.7	8.3
Rebel/Blazer	4.3	7.3	7.0	6.0	6.3	6.7	9.0	9.0
TF805	5.0	7.3	7.0	8.3	7.3	5.3	7.7	8.3
52 H	5.0	7.3	6.7	7.7	8.0	6.3	7.3	8.0
K-31	2.7	7.3	7.0	7.7	7.7	6.3	7.3	7.7
Marathon	6.3	7.3	7.0	7.0	7.3	6.3	8.0	8.0
Brookston	6.3	7.2	7.3	7.3	7.0	5.3	7.7	8.7
Galway	4.3	7.2	6.7	7.7	7.7	6.3	7.0	8.0
ISI BK 2	4.7	7.2	6.7	7.3	7.3	5.3	8.0	8.7
NK 81452	4.0	7.2	7.0	8.0	7.3	6.3	6.7	7.7
K 82142	3.7	7.1	6.7	7.7	8.0	5.7	7.0	7.7
Rebel/Fiesta	6.3	7.0	7.3	5.7	6.0	6.0	8.7	8.7
Barcel	5.7	6.5	6.0	6.3	6.7	5.3	7.0	7.7
BEL SYN 22	5.7	5.9	4.3	6.7	5.3	4.3	7.3	7.7
NK 81453	7.7	4.6	6.3	4.3	5.0	3.0	3.0	5.7
LSD	2.1	0.4	0.9	1.1	0.9	1.3	1.1	1.0

[1] All values represent the mean of 3 replications.

[2] Pythium evaluations are made on a 1-9 scale where 9 = no visible evidence of disease and 1 = complete necrosis.

[3] Values represent the mean of 18 scores obtained from 3 replications and 6 evaluation dates.

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

REGIONAL CULTIVAR EVALUATION

T. W. Fermanian and J. E. Haley

INTRODUCTION

Turfgrass cultivar recommendations in Illinois are generally made from data obtained from turfgrass evaluation trials at the Urbana or Kilbourne research facilities. However, Illinois is a state over 400 miles long, with a wide range of temperatures, precipitation and soil conditions. A cultivar suited to central Illinois may not be suited to northern or southern Illinois. With this in mind, cultivar evaluation trials were established in Rock Island County, September 10, 1981 and DuPage County, September 23,1981. Cultivars established at these sites are as follows:

Kentucky bluegrass

Adelphi	Mystic	Victa
America	Parade	WTN-A20
Aspen	Ram I	WTN-A-34
Baron	Rugby	WTN-H7
Bonnieblue	Shasta	WTN-I13
Columbia	Sydsport	
Haga	Touchdown	

Perennial ryegrass

Blazer	Goalie	Pennant
Dasher	Lesco's CBS blend	Pennfine
Diplomat	Loretta	Premier
Fiesta	Manhattan	Yorktown

Tall fescue

Falcon	Mustang	Rebel
K-31	Olympic	Shannon

Fine fescue

Agram	Jamestown	Scaldis
Biljart	Pennlawn	Waldina

RESULTS

In Rock Island the quality of Kentucky bluegrass cultivars improved throughout the summer and was highest in July and October. September quality was lower than expected because plants were recovering from drouth stress in August (Table 1). Helminthosporium leaf spot was a problem with some varieties in April. Those cultivars which showed the greatest resistance to the disease were WTN-A20, WTN-H7 and WTN-I13.

Most of the perennial ryegrass cultivars retained some color during August and did not appear to be severely affected by the summer drouth. Ryegrass quality improved throughout July and remained good through October.

The tall fescue cultivars exhibited good to excellent quality throughout the season, although the performance of K-31 and Shannon was generally not as high as the other cultivars tested. Of all the species evaluated, the tall fescue varieties were the most drouth tolerant. They showed excellent resistance to leaf spot.

In 1983 the performance of the fineleaf fescues was only fair. These cultivars did not recover as rapidily from drouth stress as did the other species. The hard fescues, Biljart, Scaldis and Waldina, were of the fineleaf fescues tested, the most susceptible to Helminthosporium leaf spot. Over all evaluation dates the cultivar Biljart had the lowest quality.

The evaluation in DuPage County suffered from snow mold damage in the 1981-1982 winter and did not fully recover during the 1982 or 1983 growing seasons. Except where noted, quality ratings for all turfgrass species were poor to fair with little differance exhibited among cultivars within a species (Table 2). Kentucky bluegrass performance was highest in July. Those cultivars exhibiting excellent turfgrass quality were Aspen, Bonnieblue, Haga, Parade, Sydsport and WTN-A34. Two cultivars that were susceptible to Helminthosporium leaf spot were Ram I and Vantage. The performance of the fineleaf fescues deteriorated throughout the season and by October the quality was very poor.

At both locations the turfgrass Puccinellia distans (L.) Parl. cv. Fults or weeping alkaligrass exhibited very poor quality. Although it has poor quality, this grass is salt tolerant and can be used to stabilize areas with a high concentration of salts in the soil. This can be useful along roadways that are salted during the winter.

Table 1. Regional cultivar evaluation - Rock Island County.[1]

Cultivar	Leaf Spot[2] 4/14	Dormancy[3] 8/16	Quality All Dates[4]	Quality[5] 4/14	5/11	6/9	7/12	9/14	10/10
Kentucky Bluegrass									
WTN-I13	8.0a	3.3a	7.7a	6.3a-c	7.0ab	8.3a	9.0a	7.0ab	8.3a
America	6.3b-d	3.3a	7.6ab	7.0a	7.3a	7.7ab	8.3a-c	7.0ab	8.3a
Bonnieblue	6.7bc	2.7a	7.4a-c	6.3a-c	7.3a	7.7ab	9.0a	6.7ab	7.7a
WTN-H7	7.0ab	3.0a	7.4a-c	7.0a	7.0ab	7.3ab	9.0a	6.3a-c	7.7a
Sydsport	4.3fg	2.0a	7.0a-d	6.7ab	6.7a-c	7.7ab	8.7ab	6.0b-d	6.3a
WTN-A20	7.0ab	1.7a	6.9a-e	5.7b-d	5.7c-e	6.7b-d	8.7ab	7.0ab	7.7a
Adelphi	5.3d-f	2.7a	6.8a-e	6.3a-c	5.7c-e	5.3d-f	8.3a-c	7.0ab	8.3a
WTN-A34	5.7c-e	1.0a	6.8a-e	6.3a-c	6.7a-c	6.7b-d	8.7ab	5.3cd	7.3a
Parade	5.7c-e	2.7a	6.8b-f	6.0a-c	6.3a-d	6.3b-e	8.3a-c	6.7ab	7.0a
Aspen	6.3b-d	2.3a	6.7c-f	6.0a-c	6.3a-d	6.3b-e	7.3cd	6.3a-c	7.7a
Baron	5.7c-e	3.0a	6.7c-f	6.0a-c	6.0b-d	5.7c-e	8.3a-c	6.7ab	7.3a
Columbia	5.3d-f	1.7a	6.7c-f	6.7ab	6.7a-c	7.0a-c	7.7b-d	5.3cd	7.0a
Haga	6.3cd	1.3a	6.7c-f	6.3a-c	6.7a-c	7.0a-c	7.7b-d	6.0b-d	6.7a
Rugby	6.3b-d	1.0a	6.7c-f	6.0a-c	6.7a-c	6.7b-d	7.7b-d	6.0b-d	7.3a
Touchdown	6.3b-d	2.0a	6.7c-f	6.0a-c	6.7a-c	6.7b-d	8.7ab	5.0d	7.0a
Ram 1	4.7e-g	3.3a	6.4d-g	5.3cd	4.7ef	6.7b-d	8.0a-d	7.0ab	7.0a
Victa	6.0b-d	3.3a	6.4d-g	5.7b-d	5.7c-e	5.3d-f	8.0a-d	6.3a-c	7.7a
Shasta	6.0b-d	2.0a	6.0e-g	6.3a-c	5.3d-f	5.0ef	7.7b-d	5.3cd	6.7a
Mystic	5.3d-f	2.3a	5.9fg	5.3cd	4.3f	5.3d-f	7.0d	6.0b-d	7.7a
Vantage	4.0g	2.3a	5.8g	4.7d	4.3f	4.0f	7.0d	7.3a	7.3a

(continued)

Table 1. Regional cultivar evaluation - Rock Island County (continued).[1]

Cultivar	Leaf Spot[2] 4/14	Dormancy[3] 8/16	Quality All Dates[4]	Quality[5] 4/14	5/11	6/9	7/12	9/14	10/10
Perennial Ryegrass									
Blazer	6.0a	5.3ab	7.4a	5.7a	6.7a	7.7a	8.0a	7.7ab	8.7a
Dasher	5.7a	4.3b-d	7.3ab	5.7a	7.0a	7.0ab	7.7a	7.7ab	8.7a
Loretta	4.7a	5.3ab	7.3ab	5.7a	7.0a	7.3a	7.7a	8.0a	8.0a
Diplomat	5.0a	5.0a-c	7.1ab	5.7a	6.7a	7.0ab	7.7a	7.7ab	8.0a
Manhattan	5.3a	5.7a	7.1ab	5.7a	7.0a	7.3a	7.0a	7.7ab	8.0a
Lesco's CBS Blend	5.7a	4.0cd	7.0ab	5.7a	7.0a	6.3bc	7.0a	7.7ab	8.3a
Pennant	5.3a	4.3b-d	7.0ab	5.7a	7.0a	6.3bc	7.3a	7.7ab	8.0a
Pennfine	5.3a	4.0cd	7.0ab	5.3a	7.0a	6.3bc	7.3a	8.0a	8.0a
Fiesta	5.7a	3.3de	6.9bc	5.3a	6.7a	6.3bc	7.0a	7.3b	8.7a
Premier	5.3a	4.0cd	6.9bc	5.7a	7.3a	6.0c	7.3a	7.3b	8.0a
Yorktown II	5.7a	4.0cd	6.9bc	5.0a	6.3a	7.3a	7.7a	7.7ab	7.3a
Goalie	4.3a	2.3e	6.6c	5.0a	6.7a	5.7c	7.3a	6.7c	8.0a
Tall Fescue									
Mustang	7.7a	9.0a	7.7a	5.7a	7.0a	8.7a	9.0a	8.0a	8.0a
Falcon	6.7a	8.7a	7.4a	5.7a	6.7a	8.0a	9.0a	7.7a	7.3a
Rebel	7.3a	8.3a	7.4a	6.0a	6.7a	8.0a	9.0a	7.3a	7.7a
Olympic	8.3a	9.0a	7.3a	6.0a	7.0a	8.0a	9.0a	7.0a	7.0a
Shannon	7.3a	9.0a	6.9b	5.3a	6.3ab	7.0b	8.3b	7.0a	7.3a
K-31	7.3a	8.7a	6.7b	5.7a	5.7b	7.0b	7.7c	7.0a	7.0a

(continued)

Table 1. Regional cultivar evaluation - Rock Island County (continued).[1]

Cultivar	Leaf Spot[2] 4/14	Dormancy[3] 8/16	Quality All Dates[4]	Quality[5] 4/14	5/11	6/9	7/12	9/14	10/10
Fine Fescue									
Waldina	4.3b	3.3a	5.8a	6.0a	5.7a	5.0a	5.7a	6.7a	6.0a
Agram	6.0a	1.3a	5.4a	6.3a	6.0a	5.7a	6.0a	3.3c	5.0a
Jamestown	6.7a	1.7a	5.4a	5.3ab	6.0a	5.0a	5.3a	5.3b	5.3a
Pennlawn	6.0a	2.0a	5.2a	6.3a	4.7ab	3.7bc	5.0a	5.0b	6.3a
Scaldis	4.7b	2.7a	5.0a	5.7a	4.7ab	4.7ab	5.0a	4.7b	5.7a
Biljart	4.7b	2.3a	4.2b	4.3b	3.0b	3.3c	4.7a	4.7b	5.0a
Local Mixes									
Fast & Fine NK	6.0a	2.3b	6.9a	6.0a	7.0a	6.0a	7.7a	7.0a	7.7a
Teske's Seed	6.0a	3.7a	6.7ab	5.7a	5.7a	6.0a	7.7a	7.3a	7.7a
Golf Lawn Seed Mix	5.7a	2.7b	6.4bc	5.7a	6.0a	5.3ab	7.0ab	7.0a	7.7a
Prevail Low Maint.	5.3a	2.3b	6.2cd	5.7a	6.3a	4.7bc	6.3b	7.0a	7.3a
Evergreen Lawn Mix	4.3a	2.3b	6.0d	5.0a	4.7a	4.3c	7.3a	7.0a	7.7a

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

[2]Disease evaluations are made on a 1-9 scale where 9 = no visible evidence of disease and 1 = complete necrosis.

[3]Dormancy evaluations are made on a 1-9 scale where 9 = no dormancy of the turf and 1 = complete dormancy.

[4]Values represent the mean of 18 scores obtained from 3 replications and 6 evaluation dates.

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

Table 2. Regional cultivar evaluation - Du Page County.[1]

Cultivar	Leaf Spot[2] 4/14	Quality All Dates[3]	Quality[4] 4/14	5/11	6/9	7/12	8/17	9/14	10/10
Kentucky Bluegrass									
WTN-A34	5.0a-c	6.5a	5.7a	5.0a	6.7a	8.7a	6.3a	6.7b-d	6.3a
Merit	5.3ab	6.0a	5.7a	4.0b-d	5.3a-c	7.3b-d	6.7a	7.7a	5.7a
Parade	4.7a-d	6.0a	5.3a	4.3a-c	5.3a-c	7.7a-c	6.0a	7.0a-c	6.0a
Sydsport	5.0a-c	6.0a	5.3a	4.0b-d	5.7ab	7.7a-c	6.0a	7.0a-c	6.0a
Bonnieblue	5.7a	5.9a	5.0a	4.7ab	5.3a-c	7.7a-c	5.3a	7.3ab	6.0a
Aspen	5.7a	5.7a	5.7a	4.0b-d	5.3a-c	8.0ab	5.0a	6.3c-e	5.7a
Baron	4.7a-d	5.7a	5.0a	3.7c-e	4.3b-d	7.3b-d	6.7a	6.3c-e	6.3a
Columbia	5.0a-c	5.7a	5.3a	4.3a-c	5.0a-c	7.3b-d	5.7a	6.3c-e	5.7a
Haga	5.0a-c	5.7a	5.0a	4.0b-d	5.7ab	7.7a-c	5.3a	6.3c-e	6.0a
Adelphi	4.7a-d	5.6a	5.0a	4.3a-c	3.7cd	7.3b-d	5.7a	6.7b-d	6.3a
WTN-H7	5.0a-c	5.6a	5.0a	4.7ab	5.3a-c	7.0b-e	4.7a	6.3c-e	6.0a
America	5.0a-c	5.4a	4.7a	4.0b-d	5.3a-c	6.7c-f	5.3a	6.3c-e	5.3a
Rugby	5.7a	5.4a	4.7a	4.0b-d	4.3b-d	7.3b-d	5.0a	6.7b-d	5.7a
Touchdown	4.7a-d	5.4a	5.0a	4.3a-c	5.0a-c	6.3d-f	5.7a	6.0de	5.7a
WTN-I13	5.0a-c	5.4a	5.0a	4.3a-c	5.0a-c	6.3d-f	5.0a	5.7e	6.3a
Victa	4.7a-d	5.3a	5.0a	3.0e	3.7cd	7.0b-e	6.7a	6.0de	5.7a
Shasta	4.3b-d	5.1a	5.3a	4.3a-c	3.7cd	6.0ef	5.3a	5.7e	5.3a
WTN-A20	4.3b-d	5.1a	5.0a	4.0b-d	4.0b-d	6.3d-f	4.7a	6.0de	5.7a
Mystic	4.0c-e	5.0a	4.3a	3.7c-e	3.7cd	6.0ef	5.7a	6.3c-e	5.7a
Ram 1	3.0e	4.8a	4.0a	3.3de	3.0d	6.3d-f	5.0a	5.7e	6.0a
Vantage	3.7de	4.8a	4.7a	3.7c-e	3.0d	5.7f	5.0a	6.7b-d	5.3a

(continued)

Table 2. Regional cultivar evaluation - Du Page County (continued).[1]

Cultivar	Leaf Spot[2] 4/14	Quality All Dates[3]	Quality[4] 4/14	5/11	6/9	7/12	8/17	9/14	10/10
Perennial Ryegrass									
Pennant	4.0a	5.5a	4.3a	4.7a	5.7a	5.7a	6.3a	6.0a	5.7a
Blazer	4.0a	5.2a	4.7a	4.0ab	5.7a	5.3a	5.0bc	6.3a	5.3ab
Fiesta	4.7a	5.1a	4.7a	4.7a	5.0a	5.7a	5.0bc	5.7a	4.0a-c
Manhattan	4.3a	5.1a	4.3a	4.3a	5.7a	6.0a	5.3ab	5.7a	4.7b-d
Loretta	4.0a	5.0a	4.3a	4.3a	6.7a	6.0a	4.0c	5.3a	4.7b-d
Pennfine	4.7a	4.9a	4.7a	4.0ab	5.0a	6.0a	4.3bc	5.7a	4.7b-d
Lesco's CBS Blend	4.3a	4.8a	4.3a	4.3a	5.0a	5.7a	4.0c	5.3a	5.0a-c
Premier	4.3a	4.8a	4.7a	4.3a	4.3a	4.3a	5.3ab	5.7a	5.3ab
Dasher	4.7a	4.6a	4.0a	3.0b	4.7a	4.3a	5.3ab	5.3a	5.3ab
Yorktown II	4.0a	4.5a	4.0a	3.7ab	5.0a	5.0a	4.3bc	5.0a	4.7b-d
Goalie	4.3a	4.4a	4.0a	3.0b	5.0a	4.7a	4.7bc	5.3a	4.3cd
Diplomat	4.3a	4.2a	3.7a	3.0b	3.3a	5.0a	4.7bc	6.0a	4.0d
Tall Fescue									
Rebel	6.7a	6.6a	6.3a	5.7a	6.7a	7.7a	6.3a	7.3a	6.3a
Olympic	6.3a	6.3a	5.7a	5.3a	6.3a	7.3a	6.3a	6.7a	6.3a
Falcon	6.0a	6.0a	5.7a	4.7a	5.7a	7.3a	6.3a	6.3a	5.7b
Shannon	6.0a	6.0a	5.7a	5.0a	6.0a	7.3a	6.3a	6.3a	5.3b
K-31	6.0a	5.9a	5.3a	5.0a	6.0a	7.3a	6.0a	6.3a	5.3b

(continued)

Table 2. Regional cultivar evaluation - Du Page County (continued).[1]

Cultivar	Leaf Spot[2] 4/14	Quality All Dates[3]	Quality[4] 4/14	5/11	6/9	7/12	8/17	9/14	10/10
Fine Fescue									
Pennlawn	4.3a	3.7a	4.7a	4.0a	2.7c	3.3a	2.3ab	3.0a	3.0a
Biljart	5.7a	3.5a	5.0a	4.7a	3.0bc	3.3a	3.0a	3.0a	2.7a
Scaldis	5.3a	3.4a	5.3a	5.0a	4.0ab	3.0a	2.3ab	2.0a	2.0b
Waldina	4.7a	3.4a	6.0a	5.3a	4.0ab	3.0a	1.7bc	1.7a	2.0b
Jamestown	6.0a	3.3a	5.7a	5.0a	4.7a	4.0a	1.7bc	2.3a	2.7a
Agram	5.7a	3.2a	5.0a	4.7a	4.3a	3.7a	1.3c	1.7a	2.0b
Mixes									
Baron-Pennfine	5.0a	6.0a	5.0a	4.0a	6.0ab	7.3a	6.3a	7.0a	6.0a
Adelphi-Pennfine	5.3a	5.8a	4.3a	4.7a	5.3b	7.7a	6.0a	6.7a	5.7a
Victa-Yorktown	4.3a	5.8a	4.7a	4.3a	6.7a	6.3a	6.0a	6.0a	6.0a
Columbia-Manhattan	5.0a	5.6a	5.0a	4.0a	5.3b	6.7a	5.7a	7.3a	5.3a

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

[2]Disease evaluations are made on a 1-9 scale where 9 = no visible evidence of disease and 1 = complete necrosis.

[3]Values represent the mean of 21 scores obtained from 3 replications and 7 evaluation dates.

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

BENTGRASS BLENDS FOR PUTTING GREEN TURF

D. J. Wehner and J. E. Haley

INTRODUCTION

There are advantages and disadvantages associated with using vegetatively propagated bentgrass selections for putting green turf. The main advantage is that the putting green will be very uniform since every plant is genetically identical to every other plant. The main disadvantage is that any factor which affects the given cultivar can affect the entire green. Disease outbreaks have the potential of being more severe on vegetatively propagated areas because the susceptability of all plants is basically the same. Seeded bentgrass cultivars offer an advantage over vegetative strains in that they are genetically more diverse. A seeded variety may be composed of several different individuals which possess agronomically similar characteristics.

Blending two or more bentgrass varieties to gain genetic diversity is a sound principle in theory. Problems may arise however because the two varieties may not have similar enough growth rates or morphological characteristics. Past attempts to blend vegetatively propagated bentgrass varieties have not always been successful. Swirling or excessive grain has sometimes occurred on these areas. After seeing severely damaged Toronto greens it was felt that an evaluation of blends of seeded bentgrass cultivars would be worthwhile. This would be an attempt to produce a quality putting surface and at the same time increase the genetic diversity of the stand.

MATERIALS AND METHODS

All possible two-way blends of the cultivars Penncross, Penneagle, Seaside, and Emerald were established at the Ornamental Horticulture Research Center in Urbana August 21, 1981. Each blend and the four individual components were established in 6 x 10 ft plots with three replications. The turf is maintained at a 0.25 inch height of cut and irrigated as necessary to prevent wilt. During the growing season the turf is fertilized with 5 lb N/1000 sq ft and is on a preventative fungicide program. The area is topdressed to level the surface.

RESULTS

There was no difference in rate of establishment among the components and blends. In 1982 turfgrass quality was highest in plots containing Penneagle, alone or in a blend. In 1983, the same trends were apparent (Table 1). Seaside and Emerald had a higher incidence of dollar spot prior to fungicide application and had poorer color throughout the season. At this time no cultivar segregation is apparant in the blends; however, plots will be evaluated over several years to see if any segregation occurs.

Table 1. Evaluation of creeping bentgrass cultivars and blends for the 1983 growing season.[1]

	Quality[2]							Quality All Dates[3]	Spring Greenup[4]	Dollar Spot[5]
	4/20	5/17	6/14	7/11	8/19	9/22	10/28		3/15	6/27
Penneagle	5.7ab	7.0a	7.7a	7.7a	8.7a	8.0a	8.7a	7.6a	6.0a	8.0a
Penncross-Penneagle	6.0a	6.7ab	7.3ab	8.0a	8.0ab	7.0bc	8.3ab	7.3ab	5.7ab	8.0a
Penneagle-Emerald	6.0a	5.3a-c	6.0ab	7.7a	8.0ab	7.0bc	8.3ab	7.0bc	5.3ab	7.3ab
Penneagle-Seaside	6.0a	7.0a	7.7a	7.7a	8.0ab	7.3ab	8.3ab	7.4ab	5.3ab	8.0a
Penncross	5.3a-c	5.3a-c	7.3ab	7.3ab	7.3bc	7.3ab	7.7a-c	6.8cd	4.3cd	8.0a
Penncross-Emerald	5.0a-c	5.3a-c	6.7b	6.7b	6.7cd	7.0bc	7.0c	6.3de	4.0d	6.7b
Penncross-Seaside	5.0a-c	5.3a-c	6.7b	6.7b	6.3c-e	6.0de	7.3bc	6.2e	4.3cd	7.3ab
Emerald	4.3cd	4.3c	5.0c	5.0c	6.0de	6.3cd	7.3bc	5.5f	5.0bc	5.0c
Seaside-Emerald	4.7b-d	5.0bc	5.3c	5.7c	5.7de	6.0de	6.7c	5.6f	5.3ab	5.7c
Seaside	3.7d	4.7c	5.3c	5.3c	5.3e	5.3e	7.0c	5.2f	4.3cd	5.7c

[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] Values represent the mean of 21 scores obtained from 3 replications and 7 evaluation dates.

[4] Spring greenup evaluations are made on a 1-9 scale, where 9 = very dark green and 1 = straw colored.

[5] Dollar spot evaluations are made on a 1-9 scale, where 9 = no disease visible and 1 = complete necrosis.

FAIRWAY BENTGRASS MANAGEMENT STUDY

D. J. Wehner and J. E. Haley

INTRODUCTION

Creeping bentgrass has not been widely utilized for golf course fairways because of its aggressive nature and requirement for high levels of maintenance. However, annual bluegrass, which is a predominant component of many golf course fairways and is susceptible to heat and drought injury, can also require high levels of maintenance to produce quality turf. The purpose of this research is to evaluate the creeping bentgrass cultivars Prominent, Penncross, Penneagle, Seaside, Emerald, and Highland colonial bentgrass under varying levels of fairway management.

MATERIAL AND METHODS

The large blocks of each cultivar which were established in 1981 have been split so that half the area is receiving a preventative fungicide program while the other half receives no fungicide. Perpendicular to the fungicide strips are cultivation treatments consisting of vertical mowing, core aerification, or no cultivation. These treatments were applied in June of 1983. The plots are monitored for turfgrass quality, thatch buildup, and disease severity. Plots are mowed at 5/8" and given 3 lbs nitrogen/1000 sq ft/yr as 18-5-9.

RESULTS

During 1982, the first year of the study, major quality differences started to appear in June with the incidence of dollar spot. Fungicide treated plots had higher quality ratings than the nonsprayed plots until October when dollar spot activity subsided. Lower overall quality ratings for Penncross and Penneagle resulted from their poorer mowing quality during very warm weather. Emerald lacked the vigor to prevent crabgrass from becoming a problem and thus, received lower quality ratings.

In 1983, dollar spot was not a serious problem on the plots because of the warm dry summer. The plots that were vertical mowed received lower quality ratings (Table 1) because they were damaged and the hot weather restricted recovery. The cultivars Penneagle, Penncross, Seaside, and Prominent received the highest quality ratings throughout the year while Highland, because of its poor heat tolerance, and Emerald, because of its poor vigor, received lower quality ratings. No one cultivar consistantly outranked the others in terms of quality. There was a higher percentage of crabgrass in plots that were core cultivated. A preemergence material was not applied in 1983.

Table 1. Evaluation of creeping bentgrasses maintained as fairway turf.[1]

Treatment	Spring Greenup[2]	Quality[3]					Percent crabgrass[4]
	3/15	4/20	5/17	6/15	7/14	9/22	9/22
Fungicide	4.7a	5.4a	6.5a				
No Fungicide	4.2b	4.4b	5.3b				
Prominent	5.0a	5.4a	5.8b	6.8ab	6.0b	5.3b	15.9b
Seaside	4.2b	5.0ab	5.8b	6.4b	6.2ab	5.8ab	5.4cd
Penncross	3.8b	5.4a	6.6a	7.4a	6.8a	5.2b	6.6b-d
Penneagle	4.2b	4.4b	6.8a	6.5b	6.8a	6.5a	2.6d
Highland	5.5a	4.5b	5.4bc	6.4b	4.8c	5.2b	14.2bc
Emerald	4.3b	4.7ab	5.1c	5.8c	5.9b	4.1c	30.7a
Core cultivation	4.9a	5.1a			6.1a		18.9a
Vertical mowing	4.4b	4.7b			5.7b		10.0b
No cultivation	4.3b	5.0a			6.4a		8.8b

[1]All values represent the mean of 4 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]Spring greenup evaluations are made on a 1-9 scale, where 9 = very dark turf color and 1 = dormant turfgrass.

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

[4]Percent crabgrass evaluations are made on a scale of 0-100, where 100 = 100 percent cover of the plot with crabgrass.

ANNUAL BLUEGRASS CONTROL IN CREEPING BENTGRASS

D. J. Wehner and J. E. Haley

Annual bluegrass (Poa annua) is often a major component of golf course turf. It competes well with creeping bentgrass and Kentucky bluegrass when irrigation is frequent, nitrogen levels are high, and mowing heights are low. Even when mowing heights are .25 inches or less, annual bluegrass is able to produce large amounts of seed. Annual bluegrass is often considered undesirable golf turf. It is suceptible to winter damage and is difficult to maintain as a quality turf during the stressful summer months. The purpose of this study was to evaluate several pesticides as controls of annual bluegrass in a mature creeping bentgrass putting green.

METHODS AND MATERIALS

The study was established May 24, 1982 in Urbana, IL. The north end of the experimental plot is a Penncross creeping bentgrass turf and the south end is a Toronto creeping bentgrass turf with 15% to 50% annual bluegrass infestation. The materials tested were a preemergence control herbicide, Prograss, at 1 and 2 lb ai/A, and a post emergence herbicide, Rubigan, at 1 oz and 2 oz commercial formulation (cf)/1000 sq ft. A growth regulator, EL-500, was evaluated at 1.25 lb ai/A alone and in combination with Rubigan at 1 oz cf/1000 sq ft and Rubigan at 2 oz cf/1000 sq ft. In 1983, the preemergence herbicide, Antor was added to the study at the rates of 2 to 4 lb ai/A. Dates of application are listed in Table 1. Plots are monitored for phytotoxicity and will be evaluated in the spring for percent of annual bluegrass per plot.

RESULTS

There was reduction of annual bluegrass cover during the first year of this study (1982) in all plots regardless of the treatment (Table 2). The percent control ratings are based on a visual evaluation of the plots in the Spring of 1983. As indicated in the table, there were no significant treatment differences. The initial ratings of annual bluegrass control for the herbicide antor will be made in the Spring of 1984. There was unacceptable phytotoxicity on plots that were treated with Prograss and the EL-500 growth retardant compound (Table 3). No application of a preemergent annual bluegrass herbicide was made in conjunction with the Rubigan treatments. It is possible that Rubigan is reducing the percent annual bluegrass in the plots during the growing season but the weakened plants are being replaced with new seedlings in the fall. Our ratings would not reflect any reduction in annual bluegrass on these plots during the growing season because we are evaluating them in the Spring. The predominant period for annual bluegrass germination is in the fall of the year.

Table 1. Pesticide evaluation for the control of annual bluegrass in a creeping bentgrass turf - 1983 rates and application dates.

Pesticide Treatment	Rate/Application Date (lb ai/A unless noted)					
	3/31	5/10	6/15	7/19	8/31	10/5
Prograss	1.0	-	-	-	1.0	-
Prograss	2.0	-	-	-	2.0	-
Rubigan	-	-	1.0 oz	0.5 oz	0.5 oz	-
Rubigan	-	-	2.0 oz	1.0 oz	1.0 oz	-
EL-500	-	-	1.25	-	-	-
EL-500 +	-	-	1.25	-	-	-
Rubigan	-	-	1.0 oz	-	-	-
EL-500 +	-	-	1.25	-	-	-
Rubigan	-	-	2.0 oz	-	-	-
Antor	1.0	1.0	-	-	1.0	1.0
Antor	2.0	1.0	-	-	2.0	1.0
Antor	2.0	2.0	-	-	2.0	2.0
Control	-	-	-	-	-	-

All Rubigan formulations are oz of commercial formulation per 1000 sq ft.

Table 2. Per cent control of the May 1982 annual bluegrass populations in creeping bentgrass plots as evaluated in May 1983.[1]

Material	Rate (lb ai/A/yr)	Per Cent Control[2] May 1983
Prograss	2.0	68.3a
Prograss	4.0	73.9a
Rubigan	2.0 oz cf/M/yr	60.5a
Rubigan	4.0 oz cf/M/yr	38.3a
EL-500	1.25	72.2a
EL-500 + Rubigan	1.25 + 1.0 oz cf/M/yr	38.9a
EL-500 + Rubigan	1.25 + 2.0 oz cf/M/yr	40.3a
Control	-	79.4a

[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]Per cent control of May 1982 annual bluegrass populations are based on visual evaluations of Poa annua populations made in May of 1982 and May 1983, where per cent control = (1982 population - 1983 population)/1982 population. This score was multiplied by 100 to obtain per cent.

Table 3. Phytotoxicity evaluation in 1983 of several pesticides used to control annual bluegrass in a creeping bentgrass turf.[1]

Material	Rate lb ai/A/yr	Phytotoxicity to Penncross creeping bent[2] 6/27	7/11	9/16
Prograss	2.0	8.7ab	9.0a	7.0d
Prograss	4.0	8.3bc	9.0a	5.0e
Rubigan	2.0 oz cf/M/yr	8.0c	8.7a	9.0a
Rubigan	4.0 oz cf/M/yr	9.0a	8.3a	9.0a
EL-500	1.25	5.0d	6.7b	9.0a
EL-500 + Rubigan	1.25 + 1.0 oz cf/M/yr	5.0d	6.3b	9.0a
EL-500 + Rubigan	1.25 + 2.0 oz cf/M/yr	5.0d	6.0b	9.0a
Antor	4.0	9.0a	9.0a	9.0a
Antor	6.0	9.0a	9.0a	8.0b
Antor	8.0	9.0a	9.0a	7.7c
Control	-	9.0a	9.0a	9.0a

Material	Rate lb ai/A/yr	Phytotoxicity to Toronto creeping bent[2] 6/27	7/11	9/16
Prograss	2.0	9.0a	9.0a	7.0c
Prograss	4.0	8.7b	9.0a	5.0d
Rubigan	2.0 oz cf/M/yr	9.0a	9.0a	9.0a
Rubigan	4.0 oz cf/M/yr	9.0a	8.0ab	9.0a
EL-500	1.25	5.0c	7.0bc	9.0a
EL-500 + Rubigan	1.25 + 1.0 oz cf/M/yr	5.0c	7.0bc	9.0a
EL-500 + Rubigan	1.25 + 2.0 oz cf/M/yr	5.0c	6.0c	9.0a
Antor	4.0	9.0a	9.0a	9.0a
Antor	6.0	9.0a	7.0bc	8.3b
Antor	8.0	9.0a	9.0a	7.3c
Control	-	9.0a	9.0a	9.0a

[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 Least Significant Difference test.

[2]Phytoxicity ratings are made on a scale of 1-9, where 9 = no visible injury to the turfgrass and 1 = complete necrosis.

EVALUATION OF HERBICIDES FOR PREEMERGENCE AND POSTEMERGENCE CONTROL OF CRABGRASS

J. E. Haley and D. J. Wehner

INTRODUCTION

The evaluation of preemergence and postemergence herbicides for crabgrass (Digitaria sp.) control on established turf is a continuing process. Periodic evaluations are necessary to determine the suitability of new materials and formulations for use on turf. The evaluation of herbicides used for crabgrass control in other crops but not labeled for turf is also necessary to determine their potential for use on turfgrass.

METHODS AND MATERIALS

The herbicides evaluated in this trial were Dacthal 75WP, Dacthal 6F, Betamec 4EC, Balan 2.5G, Ronstar 2G, UC 77892 80WP and a herbicide - insecticide combination Balan + Oftanol. With some of the materials a second application at a one half rate was made 6 weeks following the first application. The post-emergence herbicides evaluated were Daconate 6 and two formulations of Trimec and MSMA, EH 707 and EH 697. Preemergence treatments were applied April 18, 1983 and the application date for postemergence treatments was August 9, 1983. Plot size was 3 x 12 feet and materials were applied at 28 gallons per acre to a Kentucky bluegrass - tall fescue stand. The area was fertilized with 1 lb N/1000 sq ft on June 7. The area was not irrigated.

RESULTS

Best preemergence control of crabgrass was obtained with both formulations of Dacthal, Betamec and 2 applications of Ronstar (Table 1). The herbicide UC 77892 80WP showed little preemergence activity and exhibited some phytotoxicity to the turf (page 37, Table 2). Daconate 6 provided the best post emergence control of the crabgrass with minimal damage to the turf.

Table 1. Evaluation of herbicides for preemergence and postemergence control of crabgrass in a Kentucky bluegrass - tall fescue turf.[1]

Material	Rate lb ai/A	Percent crabgrass[2]
UC 77892 80WP	4.0	18.3b-d
UC 77892 80WP	4.5	43.3b
UC 77892 80WP	5.0	20.0b-d
UC 77892 80WP	5.5	25.0b-d
UC 77892 80WP	6.0	22.3b-d
UC 77892 80WP	7.0	31.7bc
Dacthal 75WP (DCPA)	10.5	0.7d
Dacthal 75WP	10.5 + 7.5*	0.0d
Dacthal 6F	10.5	2.3d
Dacthal 6F	10.5 + 7.5*	0.0d
Betamec 4EC (bensulide)	7.5	1.3d
Balan 2.5G (benefin)	2.0	13.3cd
Balan 2.5G	2.0 + 1.0*	15.0cd
Ronstar 2G (oxadiazon)	2.0	13.3cd
Ronstar 2G	2.0 + 1.0*	4.0d
Balan + Oftanol	5 lb cf/1000 sq ft	16.7cd
EH 707 (Trimec + MSMA)	4 oz/1000 sq ft	35.0bc
EH 697 (Trimec + MSMA)	4 oz/1000 sq ft	19.3b-d
Daconate 6 (MSMA)	2.0	10.0cd
Control	-	93.3a

[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 Least Significant Difference test.

[2]Percent crabgrass control indicates the percent of plot area covered by crabgrass plants.

*Second applications were made 6 weeks following the first.

EVALUATION OF HERBICIDES FOR BROADLEAF WEED CONTROL IN TURF

J. E. Haley and D. J. Wehner

INTRODUCTION

The high cost of pesticide development has prohibited the introduction of new herbicides which are used exclusively for broadleaf weed control in turfgrass stands. Manufacturers are evaluating new formulations of standard turfgrass herbicides or seeking data to expand the label of products which have proven efficacious on large scale crops. The purpose of this research was to evaluate the herbicides Benazolin 4F, dicamba 4S, 2,4-D, MCPP, bromoxynil and UC 77892 for control of broadleaf plantain (Plantago major L.), buckhorn plantain (Plantgo lanceolate L.) and white clover (Trifolium repens L.) in a mixed Kentucky bluegrass - tall fescue turfgrass stand.

METHODS AND MATERIALS

Treatments consisted of sprays containing individual herbicides or combinations of herbicides. The material was applied June 6, 1983 in 28 gallons of water per acre. Plot size was 3 x 12 feet and each treatment was replicated 3 times. Weed evaluations were made on a scale of 1-9, where 9 = no control of the weed species and 1 = no weeds present. Ratings were made July 13, 1983.

RESULTS

The best control of both plantain species was obtained with the herbicides 2,4-D and MCPP alone or in combination with other herbicides (Table 1). White clover was best controlled with dicamba at a rate of .25 lb ai/A alone, or in combination with benazolin; 2,4-D and MCPP; and MCPP D4 alone at a rate of 2 lb ai/A, or combined with 2,4-D. Good control of both weed species was obtained with the combination of 2,4-D, MCPP and dicamba. The experimental compound UC 77892 80WP provided no control of either weed species present and proved to have some phytotoxic effect on a Kentucky bluegrass turf in another test established October 6, 1983. (Table 2).

Table 1. Post-emergence control of broadleaf weeds 4 weeks following herbicide application.[1]

Material	Rate lb ai/A	White Clover[2]	Plantain[2]
Benazolin 4F + Dicamba 4S	0.25 + 0.125	2.0d-f	4.0d
Benazolin 4F + Dicamba 4S	0.25 + 0.06	4.0bc	6.3c
Benazolin 4F + Dicamba 4S	0.50 + 0.06	4.0bc	6.0c
Benazolin 4F + Dicamba 4S	0.50 + 0.125	1.3ef	6.7c
Benazolin 4F + Dicamba 4S	0.50 + 0.25	1.3ef	5.7c
Dicamba	0.125	3.3b-d	6.3c
Dicamba	0.25	1.0f	6.0c
Dicamba	0.06	3.7bc	7.0bc
Trimec	4.0 pt cf/A	1.0f	1.0e
2,4-D + MCPP + Dicamba	1.0 + 0.5 + 0.25	1.0f	1.0e
2,4-D	1.0	4.3b	1.0e
MCPP D4	1.0	2.0d-f	1.7e
MCPP D4	2.0	1.7ef	2.3e
Buctril + MCPP D4	1.0 + 1.0	2.7c-ed	2.3e
MCPP D4 + 2,4-D	6 pt cf/A	1.0f	1.0e
UC 77892 80WP	5.0	9.0a	9.0a

[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 Least Significant Difference test.

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

Table 2. Phytotoxicity evaluation of several turfgrass herbicides on a Kentucky bluegrass turf.[1]

Herbicide	Rate lb ai/A	Phytotoxicity[2]
UC 77892 80WP	4.0	6.3c-e
UC 77892 80WP	5.5	5.7de
UC 77892 80WP	7.0	5.0e
EH 697 (Trimec + MSMA)	4.0 oz cf/1000 sq ft	8.3ab
EH 707 (Trimec + MSMA)	4.0 oz cf/1000 sq ft	8.3ab
Trimec	4.0 pt cf/A	7.7a-c
Daconate 6	1.0	8.7a
Daconate 6	2.0	8.0ab
Benazolin + Dicamba	0.25 + .125	8.7a
Benazolin + Dicamba	0.5 + .25	9.0a
Benazolin	0.25	9.0a
Benazolin	0.5	8.0ab
MCPP D4 + 2,4-D	6.0 pt cf/A	7.0b-d

[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]Phytotoxicity evaluations are made on a scale of 1-9, where 9 = no visible injury to the turf and 1 = complete necrosis.

FLUID NITROGEN FERTILIZERS FOR HOME LAWNS

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

INTRODUCTION

Nitrogen is generally considered the nutrient exhibiting the greatest influence on turfgrass growth. Actively growing turfgrass responds quickly to available nitrogen with improved color and an increased growth rate. The majority of nitrogen fertilizers for turf are applied as dry materials. However, liquid application can offer such advantages as reduced labor, reduced mixing and loading time, and increased accuracy with liquid metering. There are several nitrogen materials which can be applied as solutions to turf. With the rapid growth of the home lawn care industry in recent years, an evaluation of these types of materials is needed. The purpose of this study is to evaluate the performances of liquid nitrogen sources relative to each other and to granular sources in a home lawn use situation.

MATERIAL AND METHODS

Nitrogen sources applied as liquids include FLUF, Formolene, Folian (12-4-3 and 12-4-6), Nitroform and urea. Granular sources used in this study include urea with inhibitor, and Oxamide. Urea is added to some of the controlled release liquid sources to provide a quickly available source of nitrogen until the controlled release material becomes available to the turf. There are a total of 11 treatments in addition to the check in this study, which are shown along with treatment schedule in Table 1.

This study was initiated on May 1, 1981, on an established stand of 'Columbia-Touchdown' Kentucky bluegrass. Each treatment is replicated three times in a randomized complete block design. Liquid materials were applied with a CO backpack sprayer, with a final spray volume of four gallons per 1000 square feet. Granular materials were spread by hand. A schedule similar to that of a home lawn care company was followed, with three applications in 1983 on May 6, June 16, and August 15. A similar schedule with an additional application in October was followed in 1981 and 1982.

RESULTS

The main turf response measured in this study in 1983 was color. Color was visually estimated, using a scale of 1 to 9, with a 9 rating representing ideal turf color (Table 2).

The oxamide treatment was added to the study for the first time in 1983 and represents a first year response. As with most other materials in the first season, very sharp responses were noticed with additions of any fertilizer.

The urea and ureaform based materials again showed excellent response throughout the growing season and in particular during June and July with Formolene and Formolene with WIN having some of the best overall responses of all fertilizers tested. While showing good color response in May and early June, the materials that contained only urea tended to have the poorest overall response, especially during the July and August period. The addition of urea to ureaform materials such as FLUF and Nitroform showed no real gains in color response as compared to the ureaform source alone.

Table 1. Schedule of treatments of liquid nitrogen sources for home lawns.

Nitrogen Source	Pounds of Actual Nitrogen/1000 square feet		
	May 6	June 16	August 16
Urea (liquid)	1.0	1.0	1.0
Urea with inhibitor	1.0	1.0	1.0
FLUF	1.0	1.0	1.0
FLUF + urea	.50/.50	.50/.50	.50/.50
Formolene	1.0	1.0	1.0
Formolene with WIN	1.0	1.0	1.0
Nitroform	1.0	1.0	1.0
Nitroform + urea	0/.50	.50/.50	.50/.50
Oxamide	1.0	1.0	1.0
Folian 12-4-4	1.0	1.0	1.0
Folian 12-4-6	1.0	1.0	1.0
Check	0	0	0

Table 2. Color response of Kentucky bluegrass to fluid nitrogen fertilizers used for the home lawn.[1]

Source	Color[2] 5/10	6/1	6/7	6/14	6/22	6/29	7/13	7/21	All Dates[3]
Formolene	8.0a	8.0b	6.7bc	7.3ab	8.0a	8.0ab	8.0a	7.3a	7.7a
Oxamide	7.7a	9.0a	8.0a	8.0a	7.3bc	7.0c	7.0b	7.3a	7.7ab
Urea with inhibitor	8.0a	7.7bc	7.0b	7.0bc	8.0a	8.3a	7.0b	7.3a	7.5a-c
Formolene with WIN	8.0a	7.7bc	6.7bc	7.0bc	8.0a	8.3a	7.0b	7.3a	7.5a-d
FLUF	8.0a	7.3b-d	6.3b-d	6.7b-d	7.0c	7.7a-c	7.7ab	8.0a	7.3b-d
FLUF + urea	8.0a	7.7bc	6.3b-d	6.7b-d	7.7ab	7.7a-c	7.3ab	7.3a	7.3b-d
Nitroform	8.0a	6.7de	6.3b-d	7.0bc	7.7ab	7.7a-c	7.3ab	8.0a	7.3b-d
Folian 12-4-4	8.0a	7.0c-e	6.0cd	6.7b-d	7.3bc	8.0ab	7.7ab	7.7a	7.2cd
Nitroform + urea	8.0a	6.3e	6.3b-d	6.7b-d	7.0c	7.3bc	8.0a	8.0a	7.2cd
Urea	7.7a	7.7bc	6.3b-d	6.3c-e	7.0c	7.3bc	7.3ab	7.7a	7.2d
Folian 12-4-6	7.0b	6.7de	5.7d	5.7e	7.0c	7.0c	7.0b	7.3a	6.7e
Check	8.0a	6.3e	7.0b	6.0de	6.3d	5.3d	6.0c	6.0b	6.4e

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

[3]Values represent the mean of 24 scores obtained from 3 replications and 8 evaluation dates.

LOW VOLUME FLUID FERTILIZER APPLICATION

T. W. Fermanian and J. E. Haley

INTRODUCTION

When applying fertilizers in liquid form to turf, a spray volume of 4 gallons or more is generally used. If a fertilizer could be safely applied with reduced amounts of water, it would be possible to spray more lawns with one tankfull of material, or to spray the same number of lawns with a smaller tank. The purpose of this study was to evaluate the effects of a one or two pounds of nitrogen/1000 sq ft applications at various carrier rates and to evaluate the potential for phytotoxicity with these applications on a Kentucky bluegrass turf.

MATERIAL AND METHODS

Four liquid-applied nitrogen fertilizers are used in this trial: FLUF, Fan, Formolene, and urea. Fertilizers were applied at carrier rates of 3, 2, 1, 1.18 (FLUF), 0.50 (Formolene), and 0.59 (FLUF) gallons per 1000 sq ft. All treatments provided 1 or 2 pounds of nitrogen per 1000 sq ft. Fertilizers were applied on July 19 at 2:00 pm. The air temperature was 93° F with the relative humidity at 100%. No significant rainfall was recorded in the previous 18 days. Materials were applied using a CO backpack sprayer. Plot size was 3 x 5 ft.

RESULTS

Following application, the plots were evaluated for phytoxicity or injury to the turfgrass. This was a visual rating describing the total leaf blade injury appearing on the plots after fertilizer application. A rating of 0 to 5 percent is considered within the acceptable injury range.

The results from 1983 (Table 1) show a clear separation between totally soluble materials and those with some slow-release characteristics. FLUF and Formolene did not injure the turf, even at the lowest carrier rates. Urea showed significant injury at all rates and spray volumes. Fan caused injury only with the application of more than 1 pound N/1000 sq ft. While significant injury of the leaf blade was observed for some materials, the greatest injury measured was 20%. The turf recovered from this injury within 14 days.

Table 1. Percent leaf blade injury with low volume fluid fertilizer applications on July 19.[1]

Material	Analysis	Nitrogen Rate lb N/1000 sq ft	Carrier Rate gal/1000 sq ft	% Leaf Blade Injury[2]
Urea	46-0-0	1	4	5.2b
Urea	46-0-0	2	4	20.0a
Urea	46-0-0	1	3	4.0b
Urea	46-0-0	1	2	3.8b
Formolene	30-0-2	1	2	0.0c
Formolene	30-0-2	1	1	0.0c
Formolene	30-0-2	2	1	0.0c
Formolene	30-0-2	1	0.5	0.0c
Formolene	30-0-2	1.62	0.5	0.0c
FLUF	18-0-0	1	2	0.0c
FLUF	18-0-0	2	2	0.0c
FLUF	18-0-0	1	1	0.0c
FLUF	18-0-0	1	0.59	0.0c
FLUF	18-0-0	2	1.18	0.0c
FAN	16-2-5	1	1	0.0c
FAN	16-2-5	1.6	1	5.0b
FAN	20-0-0	1	1	0.0c
FAN	20-0-0	1.9	1	2.5bc

[1]All values represent the mean of 4 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]Percent leaf blade injury is a visual rating of describing the total leaf blade injury appearing on the plots after fertilizer application.

THE EVALUATION OF LATE FALL FERTILIZATION

D. J. Wehner and J. E. Haley

INTRODUCTION

The idea behind late fall fertilization is to keep the shoot of the grass plant green as it enters winter. Because air temperatures in late fall restrict shoot growth, the food manufactured by the shoot is placed in reserve or used for root growth resulting in a healthier plant. Also, less fertilization is needed in early spring because the previous year's application promotes rapid greenup. The practice of late fall fertilization got started in the transiton zone where it is possible to keep turf green almost all year. Northern turfgrass managers have found that late fall fertilization also works well in the cool humid regions of the country. The purpose of this study is to evaluate fertilizer programs with and without a late fall application of nitrogen. In addition, several different nitrogen sources are being evaluated for application in late fall.

MATERIAL AND METHODS

The trial was established September 7, 1982 on a 3 month old stand of Baron Kentucky bluegrass and on an adjacent 3 month old stand of Kenblue Kentucky bluegrass. The materials being evaluated are urea, 45-0-0; IBDU, 31-0-0 and CIL-SCU, 32-0-0. Materials are applied as lbs nitrogen/1000 sq ft as follows:

Trt.	Following First Mowing	June 1	July 15	Sept. 1	Nov. 1
1	1.25 urea	1.0 urea	0.75 urea	1.0 urea	0
2	0	1.0 urea	0.75 urea	1.0 urea	1.25 urea
3	0	1.0 urea	0.75 urea	1.0 urea	1.25 SCU
4	0.5 urea	1.0 urea	0.75 urea	1.25 urea	0
5	0	2.0 IBDU	0	2.0 IBDU	0
6	0	2.0 SCU	0	2.0 SCU	0
7	0	2.0 IBDU	0	0	2.0 IBDU
8	0	2.0 SCU	0	0	2.0 SCU
9	0	1.0 IBDU	0	1.0 IBDU	1.5 IBDU
10	0	1.0 SCU	0	1.0 SCU	1.5 SCU
11	check	---	---	---	---

Plot size is 3 x 12 feet and materials are applied by hand.

RESULTS

The results from both cultivars show similar trends with the exception that the Kenblue plots started active growth earlier in the spring than the Baron plots. The highest ratings for spring greenup were assigned to plots that had received a November application of urea, a September or November application of IBDU, or a November application of Sulfur Coated Urea (SCU). Apparently, there was not enough carryover from the September SCU application to provide

maximum spring greenup. The June turf quality ratings for plots treated with two applications of IBDU per year were lower than turf receiving other treatments because of the lag between IBDU application and measurable turfgrass response. Throughout the rest of the growing season, all treatments provided acceptable turfgrass response and there were few significant differences between programs. We expect to maintain this study for three or four years to determine if any trends develop due to long term use of a particular program or source.

Table 1. The evaluation of a late fall fertilization program on a Baron Kentucky bluegrass.[1]

Material	lb N /1000 sq ft					Spring greenup[2]	Quality[3]							
	First Mowing	June 1	July 15	Sept 1	Nov 1	4/19	5/6	6/2	6/15	6/22	7/13	7/28	8/19	9/22	10/28
Urea	1.25	1.0	.75	1.0	-	2.0d	3.0d	6.0a	7.0a	7.0a	8.0a	8.0a	8.0a	8.3ab	7.7bc
Urea	-	1.0	.75	1.0	1.25	5.7ab	5.7a	5.0c	6.3b	6.3ab	7.0b	7.3ab	7.3ab	8.0a-c	7.7bc
Urea + SCU	-	1.0	.75	1.0	1.25	5.0bc	5.3ab	5.0c	6.0bc	7.0a	7.0b	7.3ab	7.7ab	7.7a-d	8.3ab
Urea	.5	1.0	.75	1.25	-	2.3d	2.3de	4.0d	5.0d	5.7bc	6.7bc	7.3ab	7.3ab	8.3ab	8.0b
IBDU	-	2.0	-	2.0	-	6.0a	5.7a	5.0c	5.0d	5.0cd	6.3cd	7.0b	8.0a	8.0a-c	9.0a
SCU	-	2.0	-	2.0	-	4.7c	4.7bc	4.0d	5.7c	6.0b	8.0a	7.3ab	7.7ab	8.7a	9.0a
IBDU	-	2.0	-	-	2.0	4.7c	4.0c	4.0d	4.0e	4.7d	6.0d	6.7b	7.3ab	7.0cd	6.3d
SCU	-	2.0	-	-	2.0	5.7ab	5.3ab	5.7b	6.3b	7.0a	8.0a	7.3ab	8.0a	7.3b-d	6.3d
IBDU	-	1.0	-	1.0	1.5	6.0a	5.3ab	6.0a	5.0d	5.0cd	6.0d	6.7b	6.7b	6.7d	7.0cd
SCU	-	1.0	-	1.0	1.5	6.0a	5.7a	6.0a	6.0bc	6.3ab	7.0b	7.3ab	6.7b	8.3ab	6.7d
Control	-	-	-	-	-	1.0e	2.0e	2.0e	3.0f	2.3e	3.0e	3.0c	3.3c	2.7e	3.7e

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

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

Table 2. The evaluation of a late fall fertilization program on a Kenblue Kentucky bluegrass.[1]

	lb N /1000 sq ft													
	First					Spring greenup[2]	Quality[3]							
Material	Mowing	June 1	July 15	Sept 1	Nov 1	4/19	5/6	6/2	6/15	6/22	7/13	7/28	8/19	9/22	10/28
Urea	1.25	1.0	.75	1.0	-	3.3ef	4.0c	6.3ab	7.0a	7.0b	7.3ab	7.7a	8.0ab	8.7a	8.3ab
Urea	-	1.0	.75	1.0	1.25	7.0a-c	6.3a	5.3cd	6.0bc	6.7b	7.7a	8.0a	8.3a	8.7a	8.3ab
Urea + SCU	-	1.0	.75	1.0	1.25	6.3bc	6.3a	6.0a-c	6.3ab	7.0b	7.3ab	8.0a	8.7a	9.0a	8.3ab
Urea	.5	1.0	.75	1.25	-	3.7e	4.7bc	5.7b-d	6.3ab	6.7b	7.0a-c	7.7a	7.7ab	8.7a	8.3ab
IBDU	-	2.0	-	2.0	-	6.7bc	5.7ab	5.7b-d	4.7d	5.0d	6.0d	7.0ab	7.7ab	8.0ab	9.0a
SCU	-	2.0	-	2.0	-	5.0d	5.3a-c	5.0d	5.3cd	7.0b	7.3ab	7.7a	8.3a	9.0a	8.7a
IBDU	-	2.0	-	-	2.0	6.0cd	5.3a-c	5.7b-d	5.0d	6.0c	6.7b-d	7.0ab	7.7ab	7.3b	6.7c
SCU	-	2.0	-	-	2.0	7.3ab	6.0ab	6.3ab	7.0a	8.0a	7.7a	7.7a	8.3a	7.3b	6.7c
IBDU	-	1.0	-	1.0	1.5	8.0a	6.3a	6.7a	5.0d	5.0d	6.3cd	6.3b	7.0b	8.0ab	8.7a
SCU	-	1.0	-	1.0	1.5	7.3ab	6.7a	6.0a-c	6.0bc	6.0c	6.0d	6.0b	7.0b	8.0ab	7.7b
Control	-	-	-	-	-	2.3f	2.3d	3.7e	3.3e	3.3e	4.0e	3.7c	4.0c	4.3c	3.7d

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

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

LIQUID NITROGEN RESIDUAL STUDY

D. L. Martin and D. J. Wehner

INTRODUCTION

Nitrogen is generally considered the most important nutrient influencing turfgrass color and growth. Several new nitrogen materials are available to the lawn care industry. The main characteristic of these materials is that there is a reduced potential for turfgrass burn when applying them compared to a liquid urea solution. Questions exist concerning the length of turfgrass response to these new materials relative to urea. The purpose of this study was to see how long there is a measurable turfgrass color and growth response from a single application of several nitrogen sources that may be used by the lawn care industry. Sulfur Coated Urea and Nitroform were included in this study as slow release sources for comparison.

METHODS AND MATERIALS

This experiment was initiated June 21, 1983 on a Kentucky bluegrass stand composed of the cultivars Bristol, Bonnieblue and Parade. The turfgrass stand was established in the fall of 1982 and only received fertilizer during establishment. Each treatment was replicated four times as a 3 x 12 feet plot in a randomized complete block design. The liquid treatments were applied to the plots with a CO2 powered backpack sprayer. The spray volume applied was 4 gallons per 1000 sq ft, using an 8015E nozzle. Granular materials were applied by hand. The first application of all treatments except FAN was made on June 21, 1983. The first FAN treatments were applied on June 28, as FAN was not available for application on the date the study was initiated. A second application of all materials was made on August 24, 1983.

The nitrogen sources applied as liquids in this study include Super 60 (55-0-0), Urea (46-0-0), FLUF (18-0-0), FAN (20-0-0), Cleary's 16-2-4, FLUF + Trugreen, Formolene (30-0-2), Mello 15-3-6, and Nitroform (38-0-0). Trugreen is a micronutrient fertilizer. Materials applied as granulars included Sulfur Coated Urea (CIL 32-0-0) and Oxamide (32-0-0). A control treatment which received no nitrogen source was included in each replication. All fertilizer treatments were applied at 1 lb of actual nitrogen per 1000 sq ft.

Color and growth rates were monitered on a weekly basis in this study. Color was rated visually, while growth rate was measured on the basis of fresh clipping weights. Clippings were not returned to the plots after being weighed. The second application of materials was made when the color and growth response of the fertilized plots were no longer significantly different from the controls. After the treatments were applied, the plots were irrigated to wash material from the leaves into the soil. Irrigation practices in the study duplicated those of a home lawn situation, with the plots receiving irrigation to avoid wilting of the turfgrass.

RESULTS

Results of this first season's data must be viewed with the knowledge that the plots had no nitrogen fertilization since their establishment in the fall of 1982. It should also be noted that a heavy rain followed within days of both applications of the fertilizers being tested in this study.

As expected, Urea gave the best initial color response within the first week after the first application (Table 1). Super 60 treated plots received color ratings very similar to those of Urea. Although FLUF + Trugreen treated plots showed a tendancy for higher color ratings than the FLUF treated plots, the differences were not significant. Similar color responses were obtained throughout the study from plots treated with Urea, FLUF, FAN, Cleary's 16-2-4, Formolene and Mello 15-3-6. Plots treated with Oxamide, a slow release material, did not give a satisactory color response until the fourth week after application. The color and clipping weights of all fertilizer treated plots approached those of the check plots seven weeks after the first application of fertilizers. After an initial slow response, plots treated with Oxamide rated very high in color ratings throughout the study. Nitroform treated plots showed an increase in color response relative to the other plots as the season progressed. This increase in color and growth response can be expected of Nitroform and other slow release materials, as a residual base is built in the soil over a period of time. Table 2 shows the weights of the clippings taken from the plots during the study. The large differences in the clipping weights from week to week were due primarily to differences in rainfall.

Table 1. Color response of Kentucky bluegrass to various fertilizer treatments applied June 21 and August 24.[1]

Treatments	Color Ratings[2]									
	6/28	7/5	7/12	7/19	7/26	8/2	8/9	8/16	8/23	8/31
Super 60	4.8bc	5.5c-e	4.8cd	5.3c	6.8c-e	6.5bc	5.8a	5.5a	5.5a	8.0a
Urea	5.5a	6.3b	5.5a-c	6.0b	7.0b-d	6.8b	5.8a	5.8a	5.8a	8.0a
FLUF	5.0ab	5.5c-e	4.8cd	5.8bc	6.5de	6.5bc	5.8a	5.8a	5.8a	7.8ab
FAN*	3.5d	6.0bc	5.8ab	6.0b	6.8c-e	6.5bc	5.5a	5.5a	5.5a	8.0a
Cleary's 16-2-4	4.8bc	5.5c-e	4.8cd	6.0b	6.8c-e	6.5bc	5.8a	5.5a	5.8a	8.0a
Oxamide	3.3d	5.0ef	4.5de	6.8a	7.8a	7.5a	6.0a	6.0a	6.0a	7.5b
FLUF + Trugreen	4.8bc	5.5c-e	4.8cd	5.8bc	6.5de	6.8b	6.0a	6.0a	6.0a	8.0a
Formolene	5.3ab	6.3b	5.3b-d	6.0b	7.0b-d	6.8b	6.0a	5.8a	5.8a	8.0a
Mello 15-3-6	5.3ab	5.8b-d	5.0b-d	5.8bc	7.3a-c	6.8b	5.5a	5.8a	5.8a	8.0a
Nitroform	4.3c	5.3de	4.8cd	5.8bc	6.8c-e	6.5bc	6.0a	6.0a	6.0a	8.0a
CIL-SCU	5.0ab	7.0a	6.3a	7.0a	7.5ab	7.5a	6.0a	5.8a	5.8a	8.0a
Control	3.3d	4.5f	3.8e	4.3d	6.3e	6.0c	5.5a	5.5a	5.5a	6.5c

(continued)

Table 1. Color response of Kentucky bluegrass to various fertilizer treatments applied June 21 and August 24 (continued).[1]

	Color Ratings[2]									
Treatments	9/7	9/14	9/21	9/28	10/5	10/12	10/19	10/26	11/2	11/9
Super 60	8.0bc	7.5c	7.0cd	7.3bc	5.0b	4.5bc	4.5d	5.3de	5.0c	5.0c
Urea	8.0bc	7.8bc	7.3bc	7.3bc	5.0b	4.8bc	4.8cd	5.8cd	5.3bc	5.3bc
FLUF	8.0bc	7.8bc	7.0cd	7.3bc	5.0b	4.5bc	4.8cd	5.3de	5.3bc	5.0c
FAN*	7.8c	7.8bc	7.0cd	7.3bc	5.3b	4.5bc	4.5d	5.3de	5.0c	5.0c
Cleary's 16-2-4	8.0bc	7.8bc	7.0cd	7.3bc	5.0b	4.5bc	4.5d	5.5cd	5.3bc	5.3bc
Oxamide	8.5ab	8.3a	8.0a	8.0a	6.3a	5.5a	6.0a	6.8a	6.0a	6.3a
FLUF + Trugreen	7.8c	8.0ab	7.3bc	7.8ab	5.5b	4.8bc	5.0c	6.0bc	5.8ab	5.8ab
Formolene	7.8c	8.3a	7.3bc	7.8ab	5.3b	4.5bc	4.8cd	5.8cd	5.3bc	5.3bc
Mello 15-3-6	8.0bc	8.0ab	7.3bc	7.5a-c	5.5b	4.8bc	4.8cd	5.3de	5.0c	5.0c
Nitroform	8.0bc	8.0ab	7.5b	7.5a-c	5.5b	5.0ab	5.0c	6.0bc	5.8ab	5.8ab
CIL-SCU	8.8a	8.3a	8.0a	7.8ab	6.3a	5.5a	5.5b	6.5ab	6.0a	5.8ab
Control	6.5d	7.0d	6.8d	7.0c	4.3c	4.3c	4.5d	4.8e	4.8c	4.8c

[1]All values represent the mean of 4 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]Color evaluations are made on a scale of 1 to 9, where 9 = very dark green and 1 = straw colored.

*FAN was applied initially on June 28, 1983.

Table 2. Clipping weight response of Kentucky bluegrass to various fertilizer treatments applied June 21 and August 24.[1]

Treatments	Clipping Weights in Grams							
	6/28	7/5	7/12	7/19	7/26	8/2	8/9	8/16
Super 60	79.3a	94.1bc	58.8ab	81.5bc	61.2b	55.8b	60.2c	20.9bc
Urea	76.4a	101.9b	61.3ab	79.6bc	57.6b	54.3b	56.2cd	24.2a-c
FLUF	76.7a	91.3b-d	60.6ab	82.7bc	63.5b	57.5b	59.0cd	21.8bc
FAN*	45.3b	71.7d-f	60.9ab	87.8b	63.0b	56.4b	57.9cd	17.3c
Cleary's 16-2-4	64.4ab	76.9c-e	52.1bc	68.0cd	56.1b	54.8b	52.6cd	18.9bc
Oxamide	46.2b	59.8ef	60.5ab	106.6a	103.5a	91.7a	86.0a	32.7a
FLUF + Trugreen	67.3ab	78.2c-e	54.9bc	73.5b-d	58.0b	55.9b	56.1cd	23.1a-c
Formolene	76.0a	100.6b	62.4ab	82.6bc	67.6b	57.6b	62.7bc	26.3a-c
Mello 15-3-6	82.4a	99.5b	61.6ab	84.2bc	64.9b	60.8b	62.4bc	22.9a-c
Nitroform	61.1ab	69.3ef	61.7ab	73.1b-d	57.0b	54.5b	60.6c	24.4a-c
CIL-SCU	75.6a	135.2a	76.5a	116.8a	91.7a	79.9a	76.6ab	28.6ab
Control	48.1b	55.8f	38.4c	56.5d	40.9c	40.7c	45.1d	17.8c

(continued)

Table 2. Clipping weight response of Kentucky bluegrass to various fertilizer treatments applied June 21 and August 24 (continued).[1]

Treatments	Clipping Weights in Grams						
	8/23	8/31	9/7	9/14	9/21	9/28	10/5
Super 60	52.5a-c	130.4bc	87.5c-e	53.2c-e	39.9cd	21.3d	12.3c-e
Urea	49.7bc	138.3a-c	88.2c-e	54.1c-e	46.3c	23.1cd	14.4b-e
FLUF	51.1bc	123.9bc	76.6e	45.9ef	39.8cd	21.9cd	10.8de
FAN*	46.5bc	138.5a-c	90.6c-e	50.4de	43.8c	22.6cd	13.1c-e
Cleary's 16-2-4	48.1bc	118.4c	79.5de	48.2de	40.6cd	21.3d	13.5c-e
Oxamide	66.0a	120.3c	80.4de	71.7b	64.0b	34.3ab	25.6a
FLUF + Trugreen	51.4bc	130.8a-c	91.3b-e	51.9c-e	46.7c	21.9cd	16.5b-d
Formolene	55.3a-c	160.5a	100.8bc	65.4bc	54.3bc	26.2cd	18.9a-c
Mello 15-3-6	52.9a-c	150.3ab	108.5b	58.1b-e	49.4c	25.3cd	15.1b-e
Nitroform	59.8ab	140.5a-c	94.9b-d	60.8b-d	53.0bc	29.0bc	21.2ab
CIL-SCU	58.1a-c	152.2ab	129.2a	93.2a	79.0a	36.8a	21.2a
Control	44.6c	82.0d	49.1f	33.0f	27.7d	11.7e	9.5e

[1]All values represent the mean of 4 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.

*FAN was applied initially on June 28, 1983.

THE EFFECTS OF SAND TOPDRESSING ON A HEAVILY THATCHED CREEPING BENTGRASS GREEN

T. W. Fermanian and J. E. Haley

INTRODUCTION

It is generally agreed that topdressing bentgrass greens is a valuable practice. However, opinions often vary as to what constitutes a good topdressing program. In recent years, interest has increased in a pure sand topdressing program developed by Dr. John Madison and his associates at the University of California. This involves the application of 100% sand to the surface of the turfgrass stand on a routine basis throughout the year.

The purpose of this study is to examine the effects of pure sand and modified high sand mixes as topdressing materials on the degradation of thatch, its influence on other soil properties and its influence on turfgrass quality.

MATERIAL AND METHODS

The study uses a split plot design with three replications per treatment. The main treatments consist of three replication intervals and a check.

They include:

1) biweekly applications, no cultivation
   2 cu ft material/1000 sq ft
2) monthly applications
   vertical mowing in April, May, Sept., Oct.
   4 cu ft material/1000 sq ft
3) bimonthly applications
   vertical mowing in April, Oct.
   4 cu ft material/1000 sq ft

The subplots consist of 5 materials. They are a fine sand, a medium sand, a 9:1 sand-soil mix, and 8:1:1 sand-soil-peat mix, and a 9:1 sand-soil mix with a wetting agent.

The fine sand is a washed blend sand with the following particle size analysis:

Very coarse	0.7%
Coarse	1.3%
Medium	59.8%
Fine	34.3%
Very fine	3.4%
Silt and clay	0.5%

The medium sand is a washed mason sand with the following particle size analysis:

Very coarse	3.9%
Coarse	14.3%
Medium	75.3%
Fine	6.5%
Very fine	0.0%
Silt and clay	0.0%

Both these sands have the minimum analysis of 75% of the particles in two adjacent size ranges. This is in accordance with Madison's recommendations for sands for topdressing and greens construction.

RESULTS

The first treatments were applied July 13, 1981 to a 'Washington' creeping bentgrass turf mowed at 1/4 inch. Plot size is 6' x 10'. All of the mixes were blended with the medium sand. The plots receive a total of 6 lbs N/1000 sq ft/year. The wetting agent, Aquagro, was applied at a rate equal to 32 oz/1000 sq ft/year.

Treatments for 1983 began May 16. Plot maintenance and treatment application followed the 1981 schedule. Turfgrass evaluations made during the 1983 growing season included quality and dollar spot infection (Table 1 and 2).

After three years of topdressing, no consistent differences were observed between plots receiving different topdressing materials. There were also no significant interaction between various topdressing programs and materials. In general, each topdressing program provided better overall quality than the non-treated control (Table 1.) When the disease, dollar spot, did appear on the plots, all topdressed plots showed a greater level of infection than did the untreated plots during the month of August.

Due to the integration of topdressing materials into the thatch layer, physical measurements of thatch were no longer possible. During June, representative samples, approximately 4" in depth, were taken from each plot for laboratory analysis of the percentage of organic matter. This technique was necessary to estimate the total reduction in thatch as compared to untreated turf. Each sample was burned in a furnace to remove all traces of organic matter. The loss of weight was then used to determine the percent of organic matter in the original sample (Table 3). All treatments evaluated showed a significant reduction in organic matter as compared to the non-treated sample. To express this as a reduction in the total thatch on the green, each organic matter determination was compared to the percent organic matter remaining in the untreated greens and expressed as a percentage. The results indicate that the pure sand materials were equally effective in removing thatch from the upper profile of the greens.

Table 1. Evaluation of sand topdressing programs.[1]

Timing	Quality[2] 5/10	6/13	7/11	8/22	All Dates[3]	Dollar Spot[4] 6/22	8/22
1 application/2 weeks; 2 cu ft material/1000 sq ft	5.5a	6.5a	6.3a	5.9a	6.0a	5.0a	6.2b
1 application/month vertical mowing Apr May Sept Oct 4 cu ft material/1000 sq ft	5.6a	6.7a	6.3a	5.6a	6.0a	5.1a	5.4b
1 application/2 months vertical mowing Apr Oct 4 cu ft material/1000 sq ft	6.1a	6.5a	5.9a	5.6a	6.0a	5.1a	6.5b
control no applications made	3.5b	3.5b	5.4a	5.8a	4.5b	5.7a	8.1a

[1]All values represent the mean of 15 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]Values represent the mean of 60 scores obtained from 15 replications and 4 evaluation dates.

[4]Disease evaluations are made on a 1-9 scale where 9 = no visible evidence of disease and 1 = complete necrosis.

Table 2. Evaluation of sand topdressing materials.[1]

Materials	Quality[2]				All Dates[3]	Dollar Spot[4]	
	5/10	6/13	7/11	8/22		6/22	8/22
fine sand	5.8a	5.7bc	5.8a	5.5a	5.7ab	4.8b	6.5a
medium sand	4.7b	5.3c	5.7a	5.8a	5.4b	5.2ab	6.7a
sand:soil, 9:1	5.3ab	6.0ab	6.2a	5.6a	5.8ab	5.6ab	6.3a
sand:soil:peat, 8:1:1	5.0b	5.6bc	5.6a	5.7a	5.5b	4.8b	6.2a
sand:soil, 9:1 + wetting agent	5.0b	6.4a	6.6a	6.0a	6.0a	5.9a	7.0a

[1]All values represent the mean of 12 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]Values represent the mean of 48 scores obtained from 12 replications and 4 evaluation dates.

[4]Disease evaluations are made on a 1-9 scale where 9 = no visible evidence of disease and 1 = complete necrosis.

Table 3. Oxidation of thatch from samples taken from a sand topdressing materials evaluation.

Material	% OM	% Reduction in OM*
fine sand	5.9b	71
medium sand	4.5b	78
sand:soil, 9:1	8.5b	58
sand:soil:peat, 8:1:1	7.5b	63
sand:soil, 9:1 + wetting agent	7.3b	64
untreated putting green soil	20.3a	--

Flsd .05 = 3.2

*Determined of %reduction = (1-(treated OM/untreated OM)) x 100.

GROWTH RETARDATION OF KENTUCKY BLUEGRASS TURF

T. W. Fermanian and J. E. Haley

INTRODUCTION

In recent years, many new chemical compounds have been evaluated for their ability to regulate turfgrass growth. The two components of growth most affected are vegetative shoot growth and seedhead production. For many compounds, the regulating effects on these two components have been inconsistant. In a continuing effort to evaluate potential growth retardants, an experiment was developed to determine the efficacy of mefluidide (Embark), PP-333, MON 4621, MON 4623 and EL-500 on retarding Kentucky bluegrass growth.

METHODS AND MATERIALS

Growth retardants were applied on May 16, 1983. Treatments and rates are listed in Table 1. All Fluid materials were applied with a CO_2 propelled backpack sprayer at a spray volume of 40 gallons per acre. Granular materials were applied by hand. Individual plots were mowed at two inches when the turf reached three inches in height. Plot size was 3 x 10 feet and plots were irrigated as required throughout the season to prevent wilt. The area was fertilized June 14 with 1 lb N/1000 sq ft.

To evaluate the effect surfactants have on the efficacy of growth retardants, Embark was applied in solutions using the surfactant X77 or XM12. To further investigate the effect time of application has on growth retardant efficacy additional plots were treated with MON 4621, MON 4623 and Embark on June 7, 1983.

RESULTS

When the plots were evaluated for quality two weeks after the application, Embark at both rates, PP 333 plus Embark at both rates, and most of the Embark surfactant combinations showed a reduction of quality as compared to the controls. Quality evaluations taken six weeks after application showed a great improvement for most treatments with only the MON 4623 treatment at 5 lb ai/A, Embark at .38 lb ai/A, and PP 333 plus Embark at .187 + .38 lb ai/A showing reduced quality (Table 2). All plots recovered fully at the end of the effective period of retardation, approximately 8 to 10 weeks after application.

The major value in applying a plant growth retardant is to reduce the volume of clippings removed from the turf and to lower the mowing requirements. An analysis of clippings removed over a 10 week period indicated significant reductions in the total length of clippings removed for all retardant treatments as compared to the check (Table 2). The range of this reduction was from 22 percent for both rates of MON 4623 to 47 percent for the PP 333 treatment. Mowing frequency, however is a better indicator of the true cost of a mowing operation. An analysis of the number of mowings that occurred over the same 10 week period is also listed in Table 2. Again, all treatments had a significant reduction in the number of mowings as compared to the control. These reductions ranged from 17 percent for MON 4623 to 47 percent for the PP 333 treatment.

All retardants evaluated in the study were effective in reducing the mowing requirements and providing slower growth to Kentucky bluegrass. However,

some reduced quality was also exhibited by many materials which should be a consideration for their use.

No significant differences in mowing frequency between treatments applied on May 16 and treatments applied June 7 were observed (Table 3). Increased clippings removed after the first application period reflected a faster growth rate early in the season.

Table 1. Materials and rates of application of growth retardants on a Kentucky bluegrass turf.

Materials Applied May 16, 1983	Rate lb ai/A	Materials Applied June 7, 1983	Rate lb ai/A
MON 4621	2.5	MON 4621	2.5
MON 4621	5.0	MON 4621	5.0
MON 4623	2.5	MON 4623	2.5
MON 4623	5.0	MON 4623	5.0
Embark	0.25		
Embark	0.38	Embark	0.38
EL-500	1.25		
PP-333	1.25		
PP-333 + Embark	0.125 + 0.38		
PP-333 + Embark	0.187 + 0.38		
Embark + XM12	0.2 + 0.5% v/v		
Embark + XM12	0.2 + 1.0% v/v		
Embark + X77	0.2 + 1.0% v/v		
Embark + XM12	0.38 + 0.5% v/v		
Embark + XM12	0.38 + 1.0% v/v		
Embark + X77	0.38 + 1.0% v/v		

Table 2. The evaluation of several plant growth retardants applied to a Kentucky bluegrass turf.[1]

Material	Rate lb ai/A	Clippings Removed[2] 5/16-7/25	Mowing Frequency[3] 5/16-7/25	Quality[4] 6/1 16 DAT	Quality[4] 6/29 44 DAT
Mon 4621	2.5	24.5d	7.7bc	6.7ab	5.7b-d
Mon 4621	5.0	28.1bc	7.7bc	7.0a	6.0a-c
Mon 4623	2.5	29.9b	8.3b	6.7ab	6.3ab
Mon 4623	5.0	29.9b	8.3b	6.3a-c	5.0cd
Embark	0.25	25.1c	7.0c	6.0b-d	5.7b-d
Embark	0.38	27.1bc	7.7bc	5.7cd	4.7d
EL-500	1.25	24.6c	6.7c	7.0a	6.3ab
PP-333	1.25	17.8d	5.3d	7.0a	7.0a
PP-333 + Embark	0.125 + 0.38	25.4c	7.0c	6.0b-d	5.7b-d
PP-333 + Embark	0.187 + 0.38	23.9c	6.7c	5.3d	5.0cd
Embark + XM12	0.2 + 0.5% v/v	27.5bc	7.3bc	6.3a-c	6.0a-c
Embark + XM12	0.2 + 1.0% v/v	27.3bc	7.7bc	6.3a-c	5.7b-d
Embark + X77	0.2 + 1.0% v/v	27.4bc	7.3bc	6.0b-d	5.7b-d
Embark + XM12	0.38 + 0.5% v/v	27.9bc	7.7bc	6.0b-d	5.3b-d
Embark + XM12	0.38 + 1.0% v/v	25.7bc	7.0c	5.3d	6.0a-c
Embark + X77	0.38 + 1.0% v/v	26.4bc	7.7bc	5.7cd	6.0a-c
Control	----	38.2a	10.0a	7.0a	6.3ab

[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]Clippings removed refers to the average total length in cm of shoot growth removed from 5/16 thru 7/25.

[3]Mowing frequency represents the average number of mowings performed per treatment from 5/16 thru 7/25.

[4]Quality evaluations are made on a 1-9 scale where 9 = excellent turfgrass quality and 1 = very poor turfgrass quality. Evaluations were 16 and 44 days after treatment (DAT).

Table 3. Evaluation of plant growth regulator application dates.[1]

Date Applied	Clippings Removed 7 weeks after treatment[2]	Mowing Frequency 7 weeks after treatment[3]
May 16	20.4a	5.3a
June 7	16.1b	5.1a

[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]Clippings removed refers to the average length in cm of shoot growth removed in the seven weeks following growth regulator application.

[3]Mowing frequency represents the average number of mowings performed per application date for seven weeks following growth regulator application.

GROWTH RETARDANTS FOR LOW AND MEDIUM MAINTENANCE TURFS

T. W. Fermanian and J. E. Haley

INRODUCTION

Turf growth retardants are generally applied to turfs under a low level of maintenance. That is, turfs receiving little irrigation and fertilization. To measure the effect of growth retardants on turf receiving routine irrigation a study was established to investigate the effects of EL-500 (1.25 lb ai/A), MON 4621 (2.5 lb ai/A), and Embark (0.38 lb ai/A) on an improved Kentucky bluegrass stand (cv. Baron) and on a nonirrigated common Kentucky bluegrass turf.

METHODS AND MATERIALS

Plot size was 6 x 10 feet and all materials were applied with a spray volume of 40 gallons per acre with a CO_2 propelled backpack sprayer. The plots are mowed at two inches when they reach three inches in height. The 'Baron' Kentucky bluegrass plots were irrigated, receiving a total of 2 inches of water per week.

RESULTS

When growth retardants were applied to common Kentucky bluegrass the turf exhibited little or no loss of quality over the period of activity. When the same retardants were applied to the improved Kentucky bluegrass stand, however, some reduction in quality was measured. The improved turf stand was growing very slowly. Therefore, quality losses were more prominent on the slow growing turf. The Embark treatment showed a significant reduction in quality throughout the entire study and MON 4621 treatments showed a delayed reduction beginning three weeks after application and continuing for several weeks. After the 10 week period of activity, all plots recovered from any reductions in quality.

Since turfgrass growth was very slow on all plots in the improved Kentucky bluegrass trials, including the control, no significant reduction in growth rates were measured for any growth retardant. On the common Kentucky bluegrass stand, however, all three retardants showed significant reductions in both the total length of clippings removed and the frequency of mowing (Table 2). There were, however, no differences between retardants.

General observations of the improved Kentucky bluegrass experiment was its general lack of growth. In comparison to the 38 centimeters of clippings removed from the control in the common Kentucky bluegrass trials, only 8 centimeters were removed from the control in the improved Kentucky bluegrass trial The observed slow growth is not typical of medium maintained Kentucky bluegrass turf, therefore, the results of this experiment are somewhat misleading. It also contributed to the injury observed on these plots (Table 1). No phytotoxicity was observed on the common Kentucky bluegrass turf due to the relatively rapid growth of both the treated and control plots.

Table 1. Injury to an improved 'Baron' Kentucky bluegrass from plant growth retardants.[1]

Materials	Rate lb ai/A	Phytotoxicity[2] 6/1 1 WAT	6/6 2 WAT	6/13 3 WAT	7/1 5 WAT
Embark	0.38	6.0b	6.0c	5.0c	5.0c
Mon 4621	2.5	8.3a	8.7a	6.7b	7.3b
EL-500	1.25	8.7a	7.7b	8.0a	9.0a
Control	---	9.0a	9.0a	9.0a	9.0a

[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 Least Significant Difference test.

[2]Phytotoxicity ratings are made on a scale of 1-9, where 9 = no visible injury to the turf and 1 = complete necrosis. Evaluations were made 1 to 5 weeks after treatment (WAT).

Table 2. Evaluation of three plant growth regulators on a nonirrigated common Kentucky bluegrass turf.[1]

Material	Rate lb ai/A	Clippings Removed[2] 5/24 - 7/25	Mowing Frequency[3] 5/24 - 7/25
Embark	0.38	28.5b	8.0b
Mon 4621	2.5	31.0b	8.7b
EL-500	1.25	30.6b	8.7b
Control	----	38.3a	10.3a

[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 Least Significant Difference test.

[2]Clippings removed refers to the average length in cm of shoot growth removed from 5/24 thru 7/25.

[3]Mowing frequency represents the average number of mowings performed per treatment from 5/24 thru 7/25.

KENTUCKY BLUEGRASS CULTIVAR RESPONSE TO THE APPLICATION OF MON 4621, A PLANT GROWTH RETARDANT

T. W. Fermanian and J. E. Haley

INTRODUCTION

While the response of several cultivars of Kentucky bluegrass to MON 4621 has been evaluated for the past several years, many cultivars of Kentucky bluegrass have not been tested. Because of the variability in growth habit and response to cultural practices exhibited by the wide range of bluegrass varieties, there is a need to also evaluate their response to growth retardants. Meeting these objectives would require the use of an area where multiple cultivars were growing in isolated plots.

The USDA Kentucky bluegrass trial planted in September 15, 1980 provided an ideal location to evaluate individual cultivar responses to the application of MON 4621. Due to space limitations, plot sizes were inherently small. This experiment, however, provided valuable information for future evaluation of cultivar response to plant growth retardants.

METHODS AND MATERIALS

The USDA Kentucky bluegrass trial consists of 84 cultivars each replicated three times. On May 5, 1983 half of each 6 x 5 foot plot was treated with MON 4621 at a rate of 2.0 lb ai/A. During the growing season the area was fertilized with 4 lb N/1000 sq ft. No preemergence crabgrass control herbicide was used. The area was irrigated as needed to prevent wilt.

RESULTS

Each Kentucky bluegrass cultivar growth response to the application of MON 4621 was evaluated by measuring the total plant height prior to mowing, four weeks after treatment was applied. In general, most cultivars showed a significant reduction in the growth rate as compared to their untreated half. In the case of BA-61-91, Baron, Birka, Bristol, Enmundie, Glade, Harmony, Holiday, Merit, Nugget, PSU 191, S. D. Common, Vanessa, Victa, Welcome, and 1528T, no differences in growth rate could be measured. Quality ratings were recorded both three weeks and seven weeks after treatment. With a few exceptions, most cultivars did not show any loss in quality as compared to their untreated half. A20-6, MER PP 300, and Piedmont showed a significnat reduction in quality for both dates of evaluation. While the disease dollar spot was observed after the period of activity had ended, no differences were found between treated and untreated portions of the same cultivar.

The results of this study indicate that there is tremendous variation among Kentucky bluegrass cultivars for susceptibility to the effect of plant growth retardants. This study will be followed up in future years to evaluate the long range effects of plant growth retardant use.

Table 1. The effect of Mon 4621 on 84 Kentucky bluegrass cultivars.

Cultivar	Treatment	Height[1]	Quality[2]		Dollar Spot[3]
		5/31	5/25	6/21	7/25
		4 WAT	3 WAT	7 WAT	11 WAT
A-34	Mon 4621	6.2*	5.7	6.3	6.3
	check	8.4	6.7	6.3	6.0
Adelphi	Mon 4621	5.7*	5.3	6.3	6.7
	check	7.2	7.0	6.3	6.3
Admiral	Mon 4621	6.2*	5.7	4.7	6.3
	check	8.3	6.7	6.0	6.7
America	Mon 4621	5.4*	5.0	5.0	5.7
	check	7.5	6.3	5.3	5.0
Apart	Mon 4621	6.1*	4.7*	5.3	5.7
	check	8.6	6.7	6.0	5.7
Argyle	Mon 4621	7.4*	4.0*	5.3	6.0
	check	8.9	5.3	5.7	6.7
Aspen	Mon 4621	5.9*	5.3	4.7	5.0
	check	8.2	6.3	5.3	5.0
A20	Mon 4621	6.2*	6.7	4.0	4.0
	check	8.6	8.3	5.7	5.0
A20-6	Mon 4621	5.9*	6.7*	3.0*	3.3
	check	7.9	8.7	4.3	4.0
A20-6A	Mon 4621	6.3*	7.0	4.7	4.0
	check	8.2	8.3	5.7	4.3
BA-61-91	Mon 4621	5.5	4.3	5.0*	6.3
	check	7.1	5.3	6.7	6.7
Banff	Mon 4621	6.0*	6.0	5.3	6.0
	check	8.6	7.7	5.7	5.3
Barblue	Mon 4621	5.7*	5.3*	4.3	5.7
	check	7.8	7.0	6.0	5.3

(continued)

Table 1. The effect of Mon 4621 on 84 Kentucky bluegrass cultivars (continued).

Cultivar	Treatment	Height[1] 5/31 4 WAT	Quality[2] 5/25 3 WAT	Quality[2] 6/21 7 WAT	Dollar Spot[3] 7/25 11 WAT
Baron	Mon 4621	5.6	5.3	6.3	7.3
	check	7.9	6.0	7.3	7.0
Bayside	Mon 4621	7.5*	5.7	5.0	6.0
	check	9.2	6.3	6.0	6.7
Birka	Mon 4621	6.7	6.0	5.0	6.3
	check	8.0	7.7	6.3	7.3
Bonnieblue	Mon 4621	5.8*	6.3	5.0	5.7
	check	8.1	7.3	6.0	5.7
Bono	Mon 4621	6.7*	6.7	5.3*	5.3
	check	8.5	7.7	6.7	6.3
Bristol	Mon 4621	5.5	5.0	4.7	5.7
	check	8.2	6.3	5.7	6.0
CEB VB 3965	Mon 4621	6.2*	6.3	5.7*	5.0
	check	8.0	7.3	7.0	5.7
Cello	Mon 4621	6.1*	6.3	4.7	4.7
	check	8.2	8.0	6.0	5.0
Charlotte	Mon 4621	5.7*	5.7	4.3	4.7
	check	8.3	7.3	4.7	4.7
Cheri	Mon 4621	5.4*	5.7	5.0	6.7
	check	7.5	6.7	6.0	6.7
Columbia	Mon 4621	5.7*	6.3	4.7	6.0
	check	8.7	7.0	5.7	6.0
Dormie	Mon 4621	6.8*	5.0	4.7	4.7
	check	8.1	5.7	4.3	4.3
Eclipse	Mon 4621	6.1*	7.0	7.3	7.7
	check	8.4	8.0	7.3	7.7
Enmundi	Mon 4621	7.4	7.0	6.7	6.7
	check	9.0	7.7	7.7	6.7

(continued)

Table 1. The effect of Mon 4621 on 84 Kentucky bluegrass cultivars (continued).

Cultivar	Treatment	Height[1] 5/31 4 WAT	Quality[2] 5/25 3 WAT	Quality[2] 6/21 7 WAT	Dollar Spot[3] 7/25 11 WAT
Enoble	Mon 4621	6.3*	5.7	3.7	4.7
	check	8.3	7.0	5.3	5.7
Escort	Mon 4621	6.3*	7.0	4.7	5.3
	check	8.6	7.7	5.3	4.3
Fylking	Mon 4621	6.1*	6.3*	5.7	6.3
	check	8.8	7.7	6.3	6.3
Geronimo	Mon 4621	6.7*	5.7	5.0	5.3
	check	8.8	6.7	5.7	5.7
Glade	Mon 4621	6.3	5.0	5.7	7.3
	check	8.0	6.3	6.7	7.0
H-7	Mon 4621	7.0*	7.7	5.0	6.0
	check	8.6	7.7	5.7	6.3
Harmony	Mon 4621	6.4	5.0	4.0	4.3
	check	7.6	6.3	5.0	4.7
Holiday	Mon 4621	6.3	6.0	4.3	4.3
	check	7.4	6.3	5.0	5.0
I-13	Mon 4621	6.0*	8.0	4.7*	4.3*
	check	8.1	8.3	6.3	5.7
Kenblue	Mon 4621	7.7*	3.0*	4.7	5.3
	check	9.5	4.3	5.0	5.3
Kimono	Mon 4621	6.2*	6.0	4.3	3.3
	check	7.9	7.7	6.0	5.3
K1-152	Mon 4621	6.2*	6.3	5.0	5.7
	check	8.0	7.0	5.7	6.0

(continued)

Table 1. The effect of Mon 4621 on 84 Kentucky bluegrass cultivars (continued).

Cultivar	Treatment	Height[1] 5/31 4 WAT	Quality[2] 5/25 3 WAT	Quality[2] 6/21 7 WAT	Dollar Spot[3] 7/25 11 WAT
K3-162	Mon 4621	7.2*	4.0	6.0	7.0
	check	9.5	5.0	6.0	6.7
K3-178	Mon 4621	6.1*	6.0	5.3	6.3
	check	9.1	7.0	6.0	6.0
K3-179	Mon 4621	5.9*	6.0	6.0	7.0
	check	8.1	7.0	6.7	5.7
Lovegreen	Mon 4621	6.7*	6.0	5.3	4.7
	check	8.3	7.7	6.0	5.0
Majestic	Mon 4621	5.8*	5.3	4.7	5.3
	check	8.3	6.3	5.7	5.3
MER PP 300	Mon 4621	5.5*	4.3*	5.3*	6.0
	check	7.3	6.0	6.7	6.7
MER PP 43	Mon 4621	6.7*	5.3	3.3	4.0
	check	9.0	6.7	5.0	5.0
Merion	Mon 4621	6.1*	6.3*	5.3	7.3
	check	9.3	7.7	6.3	7.3
Merit	Mon 4621	5.1	5.3	5.0	6.0
	check	6.7	6.0	6.3	6.3
MLM 18011	Mon 4621	6.0*	5.7	5.3*	7.0
	check	8.0	6.7	6.7	7.3
Mona	Mon 4621	6.1*	6.7	5.0	5.3
	check	8.8	7.3	5.3	4.7
Monopoly	Mon 4621	6.7*	6.7	6.0	6.7
	check	8.9	7.7	6.7	7.0
Mosa	Mon 4621	6.1*	6.0	6.3	6.0
	check	8.2	7.0	7.3	7.0

(continued)

Table 1. The effect of Mon 4621 on 84 Kentucky bluegrass cultivars (continued).

		Height[1]	Quality[2]		Dollar Spot[3]
		5/31	5/25	6/21	7/25
Cultivar	Treatment	4 WAT	3 WAT	7 WAT	11 WAT
NJ 735	Mon 4621	6.2*	6.7	5.0	6.0
	check	8.5	8.0	6.3	6.0
Nugget	Mon 4621	5.7	5.3	3.3	3.0
	check	6.8	6.0	3.7	3.3
N535	Mon 4621	5.4*	5.3*	5.3	5.7
	check	7.6	6.7	6.3	5.7
Parade	Mon 4621	6.8*	5.7*	6.0	7.3
	check	9.4	7.0	6.3	7.0
Piedmont	Mon 4621	6.8*	3.3*	5.0*	6.7
	check	8.5	4.7	6.3	7.3
Plush	Mon 4621	5.9*	5.7	6.3	6.7
	check	7.7	6.7	7.0	7.3
PSU 150	Mon 4621	6.2*	5.7*	5.7	6.7
	check	8.4	7.7	7.0	7.3
PSU 173	Mon 4621	6.3*	6.0	6.0	8.0
	check	8.7	7.7	8.0	8.3
PSU 190	Mon 4621	6.5	7.0	4.7	5.7
	check	7.9	7.7	5.7	5.7
P141	Mon 4621	5.6*	5.0	5.3	5.3
	check	7.3	6.3	5.7	5.3
Ram 1	Mon 4621	5.6*	6.0	5.0	7.0
	check	7.6	8.0	6.0	5.7
Rugby	Mon 4621	6.2*	7.3	5.3	6.0
	check	8.4	7.3	5.7	6.0
S. D. Common	Mon 4621	7.4	3.3	5.3	6.3
	check	9.4	4.3	6.0	7.0

(continued)

Table 1. The effect of Mon 4621 on 84 Kentucky bluegrass cultivars (continued).

		Height[1]	Quality[2]		Dollar Spot[3]
Cultivar	Treatment	5/31 4 WAT	5/25 3 WAT	6/21 7 WAT	7/25 11 WAT
S-21	Mon 4621	6.9*	4.0	5.0	5.3
	check	9.0	5.3	5.7	6.3
SH-2	Mon 4621	6.3*	6.3*	5.7	7.0
	check	8.7	7.7	5.7	6.3
Shasta	Mon 4621	6.4*	7.0	5.3	4.7
	check	8.8	7.7	6.0	5.3
SV-01617	Mon 4621	6.0*	6.3	5.3	6.0
	check	9.1	7.0	6.0	6.3
Sydsport	Mon 4621	5.7*	6.7	4.7	4.7
	check	7.7	7.7	5.7	5.0
Touchdown	Mon 4621	6.7*	7.0*	3.7	4.0
	check	8.3	8.3	5.7	5.3
Trenton	Mon 4621	5.8*	6.7	5.7	6.0
	check	8.6	7.3	6.3	7.0
Vanessa	Mon 4621	6.8	6.0	6.3	6.3
	check	8.2	7.0	7.0	6.0
Vantage	Mon 4621	7.0*	4.0*	5.7	6.0
	check	8.6	5.7	6.3	6.3
Victa	Mon 4621	5.4	5.0	6.0	7.0
	check	7.3	5.7	7.0	7.3
Wabash	Mon 4621	5.9*	3.0*	5.7	7.0
	check	9.0	4.7	6.3	7.3
Welcome	Mon 4621	6.9	5.7	5.7	6.0
	check	7.7	6.3	6.0	5.0
WW AG 463	Mon 4621	6.3*	7.0	6.0	5.3
	check	8.6	7.3	6.3	5.3

(continued)

Table 1. The effect of Mon 4621 on 84 Kentucky bluegrass cultivars (continued).

Cultivar	Treatment	Height[1] 5/31 4 WAT	Quality[2] 5/25 3 WAT	Quality[2] 6/21 7 WAT	Dollar Spot[3] 7/25 11 WAT
WW AG 478	Mon 4621	5.1*	5.3	6.0	6.3
	check	6.6	5.7	7.3	5.7
WW AG 480	Mon 4621	6.1*	6.3*	5.3	5.7
	check	8.8	7.7	6.0	6.0
1528T (Midnight)	Mon 4621	6.0	5.3	6.7	6.3
	check	7.0	5.7	7.3	6.7
225	Mon 4621	6.6*	6.3	5.3	5.7
	check	8.3	7.3	6.3	5.7
239	Mon 4621	6.1*	6.3	5.0	6.0
	check	8.8	7.3	5.3	6.3
243	Mon 4621	5.9*	4.7	5.0	6.7
	check	8.3	5.3	5.3	6.7

[1] Height is measured in centimeters.

[2] Quality evaluations are made on a 1-9 scale where 9 = excellent turfgrass quality and 1 = very poor turfgrass quality. Evaluations were made 3 and 7 weeks after treatment (WAT).

[3] Disease evaluations are made on a 1-9 scale where 9 = no visible evidence of disease and 1 = complete necrosis. Evaluations were made 11 weeks after treatment (WAT).

*Means are significantly different at the 0.05 level as determined by a T test of mean pairs.

THE USE OF GROWTH RETARDANTS ON TALL FESCUE

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

INTRODUCTION

Interest has increased in the use of growth retardants on sites where frequent mowing is not possible due to restricted budgets or hazardous mowing conditions. Tall fescue is the primary turf used in parks, playgrounds, and roadways where low maintenance is the key consideration. Growth retardants are needed that will control tall fescue growth and seedhead production while maintaining sufficient turf quality on low maintenance sites. The object of this study was to test several growth retardants to determine their potential for use on tall fescue.

METHODS AND MATERIALS

Among the products tested were Glean and DPX T6376 at rates of 0.125, 0.25, and 0.5 oz ai/A. Both are DuPont chemicals. Glean is registered for use in wheat and DPX T6376 is still being tested experimentally. Embark was tested at 3.0 and 4.0 oz ai/A alone and in combination with Glean or DPX T6376 at .25 oz ai/A. The Eli Lilly product EL-500 was tested at .75 lb ai/A. All materials were applied in a 0.1% v/v solution of the surfactant X-77. The plots measuring 3 x 10 feet were treated on April 21, 1983. The tall fescue was not mowed. The test was monitored for turf quality, growth retardant phytotoxicity, seedhead suppression and control of turf growth and seedhead height.

RESULTS

Ratings of leaf blade injury were taken weekly for a period of 10 weeks after treatment. Phytotoxicity ratings indicated significant injury to all treatments for the first five weeks, except for the EL-500 treated plots. Embark treated turf, at either rate, recovered from any injury after a five week period. The recovery of the DPX T6376 and Glean treated plots was slower with recovery beginning seven weeks following treatment. Phytotoxicity ratings are shown in Table 1.

Height measurements were made on all plots, 18 and 33 days following treatment (Table 2). Significant reduction in height was found for all retardant treatments as compared to the control. This reduction ranged from 35 to 70 percent.

The percentage of seedheads that developed was also measured and is reported in Table 3. All growth retardants, with the exception of EL-500, provided excellent seedhead control. EL-500 treated plots, while showing a significant reduction in seedheads, showed poor seedhead control. The best uniformity of seedhead control was found with the two Embark treatments. While the Embark, Glean or DPX T6376 combination treatments showed excellent seedhead control, the injury levels to the grass was unacceptable. Results of this study would indicate that while Glean and DPX T6376 are effective in reducing the height of tall fescue and preventing the development of seedheads, they are quite rate sensitive and significant injury can occur with over application. In general, all combinations of Glean or DPX T6376 and Embark caused an unreasonable amount of injury to the turf. The Embark treated plots showed the greatest seedhead reduction and growth control with the least amount of injury.

Table 1. The phytotoxicity of plant growth retardants to a tall fescue turf.[1]

Material	Rate oz ai/A	Phytoxicity[2] 4/29 1 WAT	5/6 2 WAT	5/12 3 WAT	5/18 4 WAT	5/26 5 WAT	6/1 6 WAT	6/7 7 WAT	6/13 8 WAT	6/22 9 WAT	7/1 10 WAT
Glean	0.125	7.7b	6.0cd	6.3c	6.0c	6.0c	8.0b	9.0a	9.0a	9.0a	9.0a
Glean	0.25	7.7b	6.3c	6.0c	6.0c	5.0d	6.0c	8.0b	9.0a	8.7a	9.0a
Glean	0.5	7.0cd	5.3de	5.0d	5.3cd	4.0e	3.3d	4.3c	5.7b	5.7b	7.7bc
DPX T6376	0.125	7.7b	6.0cd	6.0c	5.3cd	4.0e	2.7de	4.3c	5.3b	5.7b	8.7ab
DPX T6376	0.25	7.7b	6.3c	4.7de	4.3e	3.0fg	2.0e-g	2.3de	2.7d	3.3c	4.3e
DPX T6376	0.5	7 7b	6.0cd	4.3ef	4.0e	2.7g	1.3gh	1.7ef	1.0e	1.7d	3.3e
Glean + Embark	0.25 3.0	6.7d	5.0e	5.0d	5.3cd	4.0e	2.3ef	3.0d	4.0c	5.3b	6.7cd
Glean + Embark	0.25 4.0	6.7d	5.0e	4.7de	4.7de	3.3f	1.7f-h	2.7d	3.3cd	4.0c	6.3d
DPX T6376 + Embark	0.25 3.0	7.0cd	6.0cd	4.0f	3.0f	2.0h	1.0h	1.0f	1.0e	1.0d	1.3f
DPX T6376 + Embark	0.25 4.0	6.7d	5.3de	4.0f	3.0f	2.0h	1.0h	1.0f	1.0e	1.0d	1.0f
Embark	3.0	7.3bc	6.7bc	7.3b	7.7b	7.7b	8.7ab	9.0a	9.0a	9.0a	9.0a
Embark	4.0	7.7b	7.3b	7.0b	7.3b	7.7b	8.7ab	9.0a	9.0a	9.0a	9.0a
EL-500	0.75 lb ai/A	9.0a	9.0a	9.0a	9.0a	9.0a	8.3ab	9.0a	9.0a	9.0a	9.0a
Control	--	9.0a	9.0a	9.0a	9.0a	9.0a	9.0a	9.0a	9.0a	9.0a	9.0a

[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 Least Significant Difference test.

[2]Phytotoxicity ratings are made on a scale of 1-9, where 9 = no visible injury to the turf and 1 = complete necrosis. The evaluations were made 1 to 10 weeks after treatment (WAT).

Table 2. Height measurements of tall fescue 18 and 33 days following treatment and quality evaluation 39 days following treatment with plant growth retardants.[1]

Material	Rate	Height (cm.)[2]		Quality[3]
	oz ai/A	18 Days	33 Days	6/1
Glean	0.125	11.5c-e	12.8cd	7.0a
Glean	0.25	11.4c-e	11.3cd	5.7bc
Glean	0.5	12.3c-e	11.6cd	3.3d
DPX T6376	0.125	11.8c-e	11.6cd	2.7de
DPX T6376	0.25	11.2de	11.0cd	2.3ef
DPX T6376	0.5	11.7c-e	10.3d	1.7fg
Glean + Embark	0.25 3.0	10.9e	10.9cd	2.3ef
Glean + Embark	0.25 4.0	11.6c-e	11.3cd	1.7fg
DPX T6376 + Embark	0.25 3.0	11.1e	11.0cd	1.3g
DPX T6376 + Embark	0.25 4.0	11.5c-e	10.4d	1.0g
Embark	3.0	13.3c-e	13.9cd	7.7a
Embark	4.0	13.6cd	14.3c	7.3a
EL-500	0.75 lb ai/A	17.0b	22.3b	6.0b
Control	---	23.3a	34.3a	5.0c

[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 Least Significant Difference test.

[2]Height measurements are taken as centimeters 18 and 33 days after treatment.

[3]Quality evaluations are made on a 1-9 scale where 9 = excellent turfgrass quality and 1 = very poor turfgrass quality. For an unmowed tall fescue stand quality includes turf height and the number of seedheads present. Quality ratings were made 6 weeks after treatment.

Table 3. Percent seedheads and seedhead height in a tall fescue turf treated with various plant growth retardants.[1]

Material	Rate oz ai/A	% Seedheads[2] 5/25	Seedhead Height[3] (cm)
Glean	0.125	8.3c	38.1bc
Glean	0.25	5.0d	37.3bc
Glean	0.5	3.0de	33.4c
DPX T6376	0.125	2.7ef	33.1c
DPX T6376	0.25	0.7fg	32.6c
DPX T6376	0.5	0.7fg	---
Glean + Embark	0.25 3.0	0.0g	---
Glean + Embark	0.25 4.0	0.0g	---
DPX T6376 Embark	0.25 3.0	0.0g	---
DPX T6376 Embark	0.25 4.0	0.0g	---
Embark	3.0	1.3e-g	---
Embark	4.0	1.3e-g	38.0bc
EL-500	0.75 lb ai/A	76.7b	44.6b
Control	---	100.0a	65.6a

[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]Percent seedhead evalutations reflect the percent of the plot that is covered with seedheads. Evaluation was made 5 weeks after treatment.

[3]Seedhead height in cm reflects the height of seedheads in plots containing seedheads.

1983 TURFGRASS INSECT SITUATION IN ILLINOIS

Roscoe Randell

A mild winter ahead of a cold, late spring allowed some insects which do not overwinter in Illinois to survive, and also delayed some spring and summer insect activity.

Sod Webworm - This insect successfully overwintered under winter snow cover and above average winter soil temperatures in some areas of the state. Visible webworm damage appeared in April and May. First generation moth flight in June was light probably due to diseased larvae.

Annual White Grub - Adult emergence was delayed about 5 to 7 days with peak egg laying occurring in central Illinois form July 11 to 14. Most turfgrass areas at that time were deficient in soil moisture reducing egg laying. Japanese beetle adult activity continued to increase in the counties bordering the eastern edge of the state from Lake to Edgar County.

Black Turfgrass Ataenius - The beetles were a week late in egg laying and larval numbers were less than some past years.

Black Cutworm - This insect usually migrates into the state in April and May as a moth to lay eggs on green areas at that time. Migration was light this spring but many larvae survived the mild winter climate to reappear as large cutworms in May.

Bluegrass Billbug and Chinchbug - Some scattered reports of these two turfgrass pest have been received but there was no widespread activity.

INSECTICIDES FOR TURFGRASS INSECTS

There is now an adequate number of good turfgrass insecticides. Diazionon, Dursban, trichlorfon (Proxol or Dylox), Oftonol, Turcam, plus Sevin, and malathion for certain uses. Oftanol, both granular and liquid concentrate, has received a federal label for use on turfgrasses. When using any insecticide, timing of application is still necessary for the insecticide to be effective against a certain turfgrass insect pests.

PLANT PATHOLOGY RESEARCH

H. T. Wilkinson

The new turfgrass pathology research program completed its first full year of research during 1983. Several areas of research have been started and results are promising. With only one year of field data, the final analyses of this research is not possible at this time, but will be available in 1984. A brief description of the research program in progress will comprise the remainder of this progress report.

A major addition to the turfgrass pathology program is Mr. Robert Avenius as an Assistant Plant Pathologist. Mr. Avenius is a native of New York and received a B.S. degree in pest management and an M.S. degree in plant pathology from the University of Wisconsin, Madison, Wisconsin. Mr. Avenius also has considerable working experience in golf course operations and was a sod farm manager in Washington State.

RECOVERY OF BENTGRASS (AGROSTIS palustris) INFECTED WITH SCLEROTINIA homoeocarpa

The rate, extent and longevity of bentgrass recovery from infection by S. homoeocarpa was measured following combined treatments of fungicides and nitrogen fertilizers. The objective of this research is to establish a program to reduce the development of dollar spot and allow the grass plants to recover to a high quality turf. The optimum program should reduce chemical rates and have a reduced effect on the general soil microorganisms. To date, results indicate that bentgrass turf, with initial disease development of 30 - 40% (area) of dollar spot, can fully recover in 2 - 3 weeks with combined applications of 0.2 lb N/1000 sq ft and fungicides applied at less than one fourth the recommended rate for the therapeutic use. While additional research is necessary, I am optimistic that integrating disease control practices will both reduce disease effectively and promote a strong turfgrass ecosystem that will itself act to reduce future disease development.

INTERFACING OF SOD AND SOIL

An extensive and long term research program has started which is examining the factors involved with the interfacing of sod with Illinois soils. Using an apparatus that measures the root strength of laid sod, several questions are being addressed which could result in recommendations for establishing lasting sodded lawns. For example, is it more useful to use mineral sod on some soils and peat sod on other soils? Does the age of sod affect its ability to root? How does the sod temperature affect sod interfacing? This research will require a minimum of three years in order to establish sufficient information upon which recommendations can be offered.

DISEASE ETIOLOGIES

Four diseases are currently under investigation to determine their etiology.

Yellow ring of Poa pratensis is now known to be caused by Trechispora alnicola. This pathogen continues to be a problem in bluegrass turf older than 2

years and heavily thatched. Chemical and biological agents are being explored for their effectiveness in reducing the incidence and severity of this disease.

"Zoysia patch", a very new and unfamiliar disease of Zoysia japonicum occurs in the Mississippi valley area bordering southwestern Illinois. Research is being conducted to establish the cause of the disease and develop an effective control.

A "new" disease has appeared on Poa annua in Illinois. The causal agent has been isolated but, it has not been conclusively identified. Research is being conducted to determine the conditions under which this disease develops.

The fourth disease under investigation is an unknown blight on P. pratensis, first observed in Long Island, N.Y. The causal organism has been isolated but not definitively identified.

BIOLOGICAL CONTROL OF GRASS PATHOGENS

Pythium and Gaeumannomyces species which attack various grass species are antagonized by bacteria that inhabit the soil. These bacteria are being investigated for their potential use as control agents for these pathogens. This work is slow but could result in lasting, safe and inexpensive controls for these serious pathogens of turf.

WEATHER DATA FOR URBANA STATION

DATE	TEMPERATURE MAX	TEMPERATURE MIN	SOIL TEMPERATURE GRASS MAX	SOIL TEMPERATURE GRASS MIN	SOIL TEMPERATURE SOIL MAX	SOIL TEMPERATURE SOIL MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	RELATIVE HUMIDITY MIN	DEW
01APR83	50	41	41	38	45	41	0	100	84	
02APR83	51	46	47	43	43	40	1,03	100	96	NO DEW
03APR83	48	36	44	41	48	46	0,14	100	86	NO DEW
04APR83	40	33	50	45	47	42	0	100	70	
05APR83	48	42	42	38	46	44	0	100	76	NO DEW
06APR83	52	48	44	40	48	45	0,22	100	84	HEAVY
07APR83	55	41	48	44	53	48	0,19	100	82	NO DEW
08APR83	48	37	48	42	53	45	0,02	94	76	
09APR83	54	41	49	43	52	44	0,58	100	76	NO DEW
10APR83	50	37	46	44	49	47	0,2	100	88	
11APR83	43	34	45	40	49	44	0	100	74	NO DEW
12APR83	51	36	47	40	47	44	0	100	63	LIGHT
13APR83	61	48	47	41	50	43	0,49	100	58	NO DEW
14APR83	66	41	51	47	56	50	1,15	100	98	NO DEW
15APR83	43	32	50	41	53	43	0	94	78	LIGHT
16APR83	48	29	46	41	49	43	0	100	46	MODERATE
17APR83	53	30	47	41	51	43	0,04	96	56	LIGHT
18APR83	41	29	45	38	49	40	0	90	50	LIGHT
19APR83	40	23	43	36	49	39	0	90	46	MODERATE
20APR83	43	25	45	40	48	36	0	100	40	
21APR83	55	32	48	44	52	43	0	84	30	
22APR83	62	46	55	39	63	43	0	88	36	NO DEW
23APR83	64	47	51	47	60	52	0	98	40	NO DEW
24APR83	68	40	52	46	62	52	0	78	46	NO DEW
25APR83	58	32	54	49	56	43	0	100	35	
26APR83	69	45	55	44	69	50	0	76	26	NO DEW
27APR83	78	58	55	45	60	43	0	90	30	
28APR83	78	54	60	56	68	55	0,7	95	45	
29APR83	59	46	65	55	57	52	0	100	44	HEAVY
30APR83	63	49	55	52	59	54	0,79	100	100	LIGHT
TOTAL							5,55			
AVERAGE	54,6	39,3	49,2	43,3	53	45,1		95,8	62	
ACCUMULATIVE TOTAL							11,62			

DATE	TEMPERATURE MAX	TEMPERATURE MIN	SOIL TEMPERATURE GRASS MAX	SOIL TEMPERATURE GRASS MIN	SOIL TEMPERATURE SOIL MAX	SOIL TEMPERATURE SOIL MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	RELATIVE HUMIDITY MIN	DEW
01MAY83	63	50	57	54	56	53	0,19	100	98	NO DEW
02MAY83	68	57	56	54	60	58	1,97	100	76	NO DEW
03MAY83	60	43	61	52	66	56	0,12	100	74	NO DEW
04MAY83	53	41	53	49	58	51	0	100	68	
05MAY83	63	39	60	52	59	49	0	100	39	
06MAY83	67	50	59	46	70	50	0	98	42	NO DEW
07MAY83	77	62	60	55	70	54	0	88	40	NO DEW
08MAY83	73	40	65	55	65	50	0	100	65	
09MAY83	57	32	57	48	67	50	0	90	32	LIGHT
10MAY83	62	45	59	49	71	50	0	100	32	LIGHT
11MAY83	70	48	60	52	73	55	0	76	26	LIGHT
12MAY83	79	49	64	58	66	56	0	90	38	
13MAY83	70	62	61	58	69	66	0,03	96	66	HEAVY
14MAY83	75	61	66	60	69	59	1	100	65	HEAVY
15MAY83	65	49	63	53	62	53	0,4	100	90	WET
16MAY83	56	38	65	52	60	53	0	78	46	MODERATE
17MAY83	64	43	60	54	68	51	0	100	38	MODERATE
18MAY83	66	54	59	54	66	55	0	88	44	
19MAY83	64	52	58	52	64	58	1,01	100	68	NO DEW
20MAY83	67	50	59	54	65	53	0	100	74	MODERATE
21MAY83	73	50	64	56	70	58	0	100	50	LIGHT
22MAY83	73	58	61	59	66	61	0,09	100	74	MODERATE
23MAY83	72	52	63	60	74	62	0,04	100	66	MODERATE
24MAY83	72	52	64	57	65	62	0	100	44	MODERATE
25MAY83	75	57	65	52	77	59	0	94	30	LIGHT
26MAY83	67	41	67	41	73	60	0	100	40	LIGHT
27MAY83	65	45	60	56	75	55	0	100	39	
28MAY83	71	49	64	58	71	61	0,68	100	42	WET
29MAY83	70	57	60	58	68	62	0	100	48	MODERATE
30MAY83	71	46	64	57	71	59	0	100	40	MODERATE
31MAY83	65	48	59	56	66	58	0,03	100	50	MODERATE
TOTAL							5,56			
AVERAGE	67,5	49	61,1	53,9	67,1	56		96,7	53	
ACCUMULATIVE TOTAL							17,18			

WEATHER DATA FOR URBANA STATION

DATE	TEMPERATURE MAX	TEMPERATURE MIN	SOIL TEMPERATURE GRASS MAX	SOIL TEMPERATURE GRASS MIN	SOIL TEMPERATURE SOIL MAX	SOIL TEMPERATURE SOIL MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	RELATIVE HUMIDITY MIN	DEW
01JUN83	60	44	58	54	62	57	0	100	60	LIGHT
02JUN83	70	48	65	58	69	55	0	95	40	
03JUN83	66	55	59	58	65	63	1.2	100	80	NO DEW
04JUN83	71	58	60	58	67	62	0.1	100	60	NO DEW
05JUN83	79	57	66	60	70	65	0	100	50	LIGHT
06JUN83	78	54	66	62	75	67	0.13	100	60	
07JUN83	69	48	69	57	78	58	0	100	40	LIGHT
08JUN83	78	56	67	58	76	62	0	100	34	LIGHT
09JUN83	80	54	69	61	79	65	0	100	32	NO DEW
10JUN83	82	60	67	62	76	67	0	92	40	NO DEW
11JUN83	85	59	69	62	82	68	0	94	34	NO DEW
12JUN83	85	62	70	66	81	73	0	100	40	NO DEW
13JUN83	86	61	71	65	85	73	0	100	34	LIGHT
14JUN83	87	60	72	66	86	74	0	98	40	NO DEW
15JUN83	87	62	71	62	81	72	1.82	100	50	NO DEW
16JUN83	80	59	74	65	82	70	0	100	44	MODERATE
17JUN83	85	64	82	67	85	64	0	100	40	
18JUN83	86	67	75	68	85	71	0	88	36	NO DEW
19JUN83	85	61	74	69	84	76	4.25	100	54	
20JUN83	78	60	76	60	79	74	0	100	82	LIGHT
21JUN83	86	68	74	69	83	72	0	100	72	MODERATE
22JUN83	87	63	77	71	85	75	0	100	47	LIGHT
23JUN83	87	69	78	71	91	75	0	100	42	LIGHT
24JUN83	90	68	79	72	92	76	0	100	46	NO DEW
25JUN83	92	60	80	72	91	78	0	86	44	NO DEW
26JUN83	92	62	80	73	94	29	0	100	42	
27JUN83	94	70	82	74	93	77	0	100	50	MODERATE
28JUN83	84	68	83	76	86	72	0.12	96	64	
29JUN83	85	68	78	72	83	76	0.75	95	60	
30JUN83	85	69	80	70	85	73	0.83	100	60	
TOTAL							9.2			
AVERAGE	82	60.5	72.4	65.3	81	68		98.1	49.2	
ACCUMULATIVE TOTAL							26.38			

DATE	TEMPERATURE MAX	TEMPERATURE MIN	SOIL TEMPERATURE GRASS MAX	SOIL TEMPERATURE GRASS MIN	SOIL TEMPERATURE SOIL MAX	SOIL TEMPERATURE SOIL MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	RELATIVE HUMIDITY MIN	DEW
01JUL83	84	74	77	74	84	75	0	100	67	HEAVY
02JUL83	88	74	78	73	87	76	0	100	80	LIGHT
03JUL83	90	69	79	73	91	81	0	100	60	NO DEW
04JUL83	86	72	77	74	89	82	0.2	100	80	NO DEW
05JUL83	78	60	76	70	83	73	0	100	74	MODERATE
06JUL83	77	51	76	71	80	69	0	100	50	
07JUL83	74	51	70	68	81	70	0	100	70	MODERATE
08JUL83	78	55	75	67	88	70	0	100	42	MODERATE
09JUL83	85	59	76	69	89	73	0	100	44	NO DEW
10JUL83	88	64	78	71	91	81	0	100	44	MODERATE
11JUL83	89	65	79	72	95	82	0	100	46	LIGHT
12JUL83	90	69	79	72	92	80	0	100	48	LIGHT
13JUL83	91	69	80	74	93	61	0	78	66	NO DEW
14JUL83	91	72	80	74	94	81	0	100	52	NO DEW
15JUL83	90	70	80	75	92	83	0	100	56	LIGHT
16JUL83	90	71	79	72	91	82	0	100	50	LIGHT
17JUL83	90	72	81	75	93	84	0	100	62	LIGHT
18JUL83	91	70	82	76	95	85	0	100	52	LIGHT
19JUL83	93	72	86	81	95	85	0	100	56	LIGHT
20JUL83	95	69	83	75	96	84	0	100	58	NO DEW
21JUL83	96	74	83	72	96	86	0	100	50	NO DEW
22JUL83	97	73	84	77	98	85	0	100	48	NO DEW
23JUL83	98	73	84	78	98	85	0	96	57	
24JUL83	98	70	84	77	98	87	0.03	100	42	
25JUL83	88	68	83	75	97	85	0	100	46	NO DEW
26JUL83	87	62	86	75	90	74	0	100	45	
27JUL83	87	63	82	73	94	82	0	90	40	NO DEW
28JUL83	96	67	82	74	85	57	0	100	54	NO DEW
29JUL83	95	75	88	78	90	78	0	100	50	
30JUL83	93	68	83	75	94	81	1.45	100	60	NO DEW
31JUL83	91	70	85	78	88	75	0	100	55	
TOTAL							1.68			
AVERAGE	89.2	67.5	80.5	73.8	91.2	78.5		98.8	55	
ACCUMULATIVE TOTAL							28.06			

WEATHER DATA FOR URBANA STATION

DATE	TEMPERATURE MAX	TEMPERATURE MIN	SOIL TEMPERATURE GRASS MAX	SOIL TEMPERATURE GRASS MIN	SOIL TEMPERATURE SOIL MAX	SOIL TEMPERATURE SOIL MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	RELATIVE HUMIDITY MIN	DEW
01AUG83	90	63	83	56	88	78	0	100	60	LIGHT
02AUG83	84	61	82	74	91	76	0	100	48	LIGHT
03AUG83	84	64	82	74	93	77	0	100	52	LIGHT
04AUG83	88	72	81	75	92	78	0	100	54	LIGHT
05AUG83	85	69	79	75	85	81	0.36	100	80	MODERATE
06AUG83	89	69	81	76	90	80	0	100	76	LIGHT
07AUG83	86	66	80	75	91	81	0	100	76	LIGHT
08AUG83	87	65	81	75	94	81	0	100	54	LIGHT
09AUG83	91	71	82	75	95	81	0	100	82	NO DEW
10AUG83	85	68	82	72	93	81	0	100	90	NO DEW
11AUG83	89	69	80	72	100	82	0.4	100	90	NO DEW
12AUG83	77	64	76	61	82	75	0	100	70	LIGHT
13AUG83	84	60	80	72	88	68	0	100	40	
14AUG83	85	62	85	74	90	70	0	100	45	
15AUG83	83	49	78	71	99	74	0	100	44	NO DEW
16AUG83	88	64	80	72	92	77	0	100	46	NO DEW
17AUG83	92	75	82	74	94	79	0	100	48	LIGHT
18AUG83	84	74	74	73	83	79	1.85	100	82	LIGHT
19AUG83	95	72	81	74	88	76	0	100	66	MODERATE
20AUG83	95	71	81	77	92	79	0	100	56	NO DEW
21AUG83	97	72	83	78	96	86	0	100	56	LIGHT
22AUG83	93	70	81	77	94	84	0.14	100	48	NO DEW
23AUG83	93	67	80	75	94	77	0	100	64	NO DEW
24AUG83	83	67	81	74	87	80	0	100	90	
25AUG83	89	71	79	75	91	80	0	100	70	LIGHT
26AUG83	92	71	81	75	92	81	0.26	100	64	NO DEW
27AUG83	85	69	79	75	85	80	0.52	100	72	LIGHT
28AUG83	90	68	80	76	88	79	0.59	100	76	MODERATE
29AUG83	86	65	80	75	87	77	0	100	74	HEAVY
30AUG83	89	64	80	75	89	76	0	100	54	MODERATE
31AUG83	81	68	79	75	82	79	0	100	80	MODERATE
TOTAL							4.12			
AVERAGE	87.7	67.1	80.4	73.5	90.5	78.5		100	64.7	
ACCUMULATIVE TOTAL							32.18			

DATE	TEMPERATURE MAX	TEMPERATURE MIN	SOIL TEMPERATURE GRASS MAX	SOIL TEMPERATURE GRASS MIN	SOIL TEMPERATURE SOIL MAX	SOIL TEMPERATURE SOIL MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	RELATIVE HUMIDITY MIN	DEW
01SEP83	83	64	73	72	86	75	0	100	70	HEAVY
02SEP83	83	60	76	71	88	79	0	100	62	MODERATE
03SEP83	86	60	79	72	90	72	0	100	50	MODERATE
04SEP83	87	56	77	71	88	78	0	100	46	MODERATE
05SEP83	89	63	76	71	87	72	0	100	50	LIGHT
06SEP83	90	76	75	71	86	77	0	94	44	MODERATE
07SEP83	90	52	79	70	82	68	0	95	50	
08SEP83	87	51	75	67	85	72	0	100	31	MODERATE
09SEP83	90	60	75	67	87	71	0	88	34	NO DEW
10SEP83	92	64	72	69	88	74	0	100	40	NO DEW
11SEP83	96	68	77	69	88	74	0	100	40	NO DEW
12SEP83	82	62	77	69	88	74	0	100	48	NO DEW
13SEP83	79	56	77	67	78	64	0	94	40	
14SEP83	82	47	74	66	82	69	0	96	87	NO DEW
15SEP83	76	53	75	70	80	67	0	95	30	
16SEP83	71	62	70	68	71	62	0.2	100	86	MODERATE
17SEP83	74	48	75	65	68	61	0	100	50	LIGHT
18SEP83	64	64	72	70	79	68	0	100	86	LIGHT
19SEP83	91	67	74	66	85	72	0	100	85	NO DEW
20SEP83	91	69	77	70	84	71	0	100	45	
21SEP83	76	39	72	59	79	68	0.43	100	100	MODERATE
22SEP83	55	32	60	54	62	53	0	100	91	LIGHT
23SEP83	56	31	57	52	62	52	0	100	88	MODERATE
24SEP83	60	36	59	52	68	52	0	100	90	MODERATE
25SEP83	69	52	61	57	70	54	0	90	88	NO DEW
26SEP83	65	55	58	55	63	60	0	100	90	LIGHT
27SEP83	76	51	65	58	73	62	0	100	90	MODERATE
28SEP83	81	56	67	59	77	63	0	100	88	LIGHT
29SEP83	82	52	69	61	79	66	0	100	88	LIGHT
30SEP83	84	53	70	62	80	66	0	100	88	LIGHT
TOTAL							0.63			
AVERAGE	79.6	55.3	71.4	65	79.4	67.2		98.4	65.8	
ACCUMULATIVE TOTAL							32.81			

WEATHER DATA FOR URBANA STATION

DATE	TEMPERATURE MAX	TEMPERATURE MIN	SOIL TEMPERATURE GRASS MAX	SOIL TEMPERATURE GRASS MIN	SOIL TEMPERATURE SOIL MAX	SOIL TEMPERATURE SOIL MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	RELATIVE HUMIDITY MIN	DEW
01OCT83	82	42	71	62	80	62	0	96	56	LIGHT
02OCT83	84	49	70	62	80	67	0	100	66	LIGHT
03OCT83	87	61	70	63	79	67	0	100	64	NO DEW
04OCT83	91	67	78	69	78	69	0,14	100	64	
05OCT83	70	54	74	68	58	57	0	100	80	
06OCT83	71	49	68	60	75	64	0	90	70	NO DEW
07OCT83	71	43	67	58	75	63	0	94	70	NO DEW
08OCT83	79	56	66	59	73	63	0	100	60	NO DEW
09OCT83	79	46	68	58	63	55	0,11	100	90	NO DEW
10OCT83	63	42	62	55	69	63	0	100	70	NO DEW
11OCT83	68	46	61	55	70	58	0	100	72	MODERATE
12OCT83	70	54	61	57	67	60	1,42	100	80	LIGHT
13OCT83	69	41	62	53	66	53	0,05	100	84	MODERATE
14OCT83	54	30	52	44	54	50	0,22	100	47	MODERATE
15OCT83	61	40	54	49	58	42	0	100	74	LIGHT
16OCT83	70	47	56	50	61	50	0	98	70	LIGHT
17OCT83	67	45	57	53	60	56	0	100	74	LIGHT
18OCT83	57	45	55	53	57	50	0,02	100	74	
19OCT83	62	45	62	45	63	55	0	100	74	NO DEW
20OCT83	53	44	56	54	55	50	1,37	100	80	
21OCT83	52	46	55	53	53	52	0,75	100	80	NO DEW
22OCT83	66	49	55	51	60	54	3,2	100	84	MODERATE
23OCT83	66	50	55	51	60	54	0,1	100	84	MODERATE
24OCT83	52	49	56	53	60	57	0,03	100	100	NO DEW
25OCT83	55	45	54	52	57	56	0	100	100	LIGHT
26OCT83	57	34	57	47	55	48	0	100	78	MODERATE
27OCT83	60	33	51	47	55	46	0	100	100	MODERATE
28OCT83	65	35	51	48	58	46	0	84	76	NO DEW
29OCT83	73	44	54	49	62	50	0	88	74	NO DEW
30OCT83	60	44	54	49	62	50	0	94	76	
31OCT83	60	48	51	49	59	51	0	84	72	NO DEW
TOTAL							7,41			
AVERAGE	66,9	45,9	60,1	54,1	63,9	55,4		97,7	75,6	
ACCUMULATIVE TOTAL							40,22			

WEATHER DATA FOR KILBOURNE STATION

DATE	TEMPERATURE MAX	MIN	SOIL TEMPERATURE GRASS MAX	MIN	SOIL MAX	MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	MIN	DEW
01MAY83	67	52	62	55	65	55	0	100	74	
02MAY83	69	48	58	56	58	53	1.48	100	60	
03MAY83	59	48	57	55	58	52	0.01	100	70	
04MAY83	60	46	57	52	58	49	0.12	100	56	
05MAY83	67	39	64	51	69	49	0	100	34	
06MAY83	73	59	69	52	75	49	0	82	37	
07MAY83	84	68	65	60	77	48	0	92	34	
08MAY83	71	44	71	57	69	51	0.04	100	58	
09MAY83	62	32	69	58	74	51	0	88	31	
10MAY83	67	42	68	58	73	54	0	100	32	
11MAY83	75	46	70	57	75	53	0	100	30	
12MAY83	82	64	68	60	74	57	0.04	100	44	
13MAY83	74	64	68	64	72	64	0.19	100	78	
14MAY83	77	62	63	59	70	60	0.28	100	62	
15MAY83	59	46	61	58	62	53	0.05	100	87	
16MAY83	62	37	67	56	69	51	0.18	100	44	
17MAY83	69	41	70	55	70	52	0	100	36	
18MAY83	67	58	62	57	66	54	0	80	49	
19MAY83	81	61	64	57	69	58	0	100	82	
20MAY83	66	51	63	60	66	56	0	100	64	
21MAY83	74	53	61	56	70	52	0	100	40	
22MAY83	70	56	60	57	65	58	0.6	100	70	
23MAY83	77	52	73	58	80	56	0.34	100	51	
24MAY83	74	45	73	60	78	57	0.26	100	36	
25MAY83	78	62	76	60	83	57	0	93	31	
26MAY83	74	42	78	67	84	61	0	100	39	
27MAY83	73	51	77	63	83	61	0	89	33	
28MAY83	67	53	61	57	70	54	0	100	65	
29MAY83	73	56	76	66	82	62	0.19	98	41	
30MAY83	69	45	65	58	70	54	0	100	31	
31MAY83	69	51	77	66	81	60	0	100	43	
TOTAL							3.78			
AVERAGE	70.6	50.8	66.9	58.2	71.5	54.9		97.5	49.7	
ACCUMULATIVE TOTAL							5.48 does not include March and April.			

DATE	TEMPERATURE MAX	MIN	SOIL TEMPERATURE GRASS MAX	MIN	SOIL MAX	MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	MIN	DEW
01JUN83	61	42	65	60	82	56	0	100	62	
02JUN83	74	55	66	56	73	54	0	100	30	
03JUN83	64	61	74	59	78	54	0.77	100	82	
04JUN83	71	54	68	61	72	65	0	100	70	
05JUN83	80	57	70	66	75	57	0	100	30	
06JUN83	77	55	80	64	85	60	0.07	100	45	
07JUN83	73	48	76	66	80	61	0	100	34	
08JUN83	82	52	72	64	86	63	0	98	32	
09JUN83	84	62	83	67	87	65	0	88	33	
10JUN83	88	58	84	70	88	64	0	98	38	
11JUN83	83	57	73	64	85	65	0	100	35	
12JUN83	84	64	73	64	86	65	0	95	40	
13JUN83	89	66	85	71	89	69	0	78	44	
14JUN83	89	72	84	76	89	74	0	78	50	
15JUN83	84	58	81	70	82	65	0.17	99	68	
16JUN83	88	60	79	64	90	66	0	99	32	
17JUN83	92	60	87	74	94	73	0	99	38	
18JUN83	86	57	74	46	82	68	0	100	32	
19JUN83	87	64	73	67	82	69	0	100	37	
20JUN83	92	60	88	74	92	71	0.75	100	39	
21JUN83	91	60	87	75	90	72	0	100	39	
22JUN83	94	67	91	75	97	73	0	98	44	
23JUN83	93	60	94	76	97	74	0	88	30	MODERATE
24JUN83	93	60	94	80	98	73	0	86	38	LIGHT
25JUN83	96	66	93	80	95	78	0	80	30	NO DEW
26JUN83	95	70	80	73	94	72	0	100	40	NO DEW
27JUN83	95	73	94	88	99	81	0	89	36	NO DEW
28JUN83	87	69	87	84	89	80	0.01	88	50	NO DEW
29JUN83	87	70	87	82	89	80	0	88	57	MODERATE
30JUN83	88	70	87	82	89	76	0.01	88	53	LIGHT
TOTAL							1.78			
AVERAGE	84.9	60.9	81	69.9	87.1	68.1		94.6	42.9	
ACCUMULATIVE TOTAL							7.26 does not include March and April			

WEATHER DATA FOR KILBOURNE STATION

DATE	TEMPERATURE MAX	MIN	SOIL TEMPERATURE GRASS MAX	MIN	SOIL MAX	MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	MIN	DEW
01JUL83	93	74	90	79	94	75	0	82	42	NO DEW
02JUL83	96	79	93	82	97	79	0	86	43	NO DEW
03JUL83	94	74	83	76	85	72	0	90	70	LIGHT
04JUL83	93	70	82	77	83	70	0,25	100	80	LIGHT
05JUL83	92	58	95	80	98	70	0,01	82	55	MODERATE
06JUL83	81	50	94	76	90	69	0	88	41	LIGHT
07JUL83	78	52	90	77	91	70	0	88	33	MODERATE
08JUL83	82	52	90	77	91	70	0	100	38	NO DEW
09JUL83	89	58	91	77	95	71	0	88	33	NO DEW
10JUL83	80	52	95	83	95	79	0	88	33	LIGHT
11JUL83	97	70	75	68	95	78	0	85	35	
12JUL83	92	68	95	70	90	77	0	100	50	
13JUL83	90	72	84	74	82	76	0	100	40	
14JUL83	95	77	88	74	98	80	0	80	47	
15JUL83	95	71	88	76	94	81	0	88	42	
16JUL83	93	69	84	79	93	72	0	100	45	NO DEW
17JUL83	93	70	87	77	95	78	0	100	48	NO DEW
18JUL83	96	72	95	88	96	82	0	84	35	NO DEW
19JUL83	97	74	90	75	95	90	0	88	44	NO DEW
20JUL83	100	74	98	86	97	84	0	83	40	NO DEW
21JUL83	103	76	100	88	99	84	0	84	39	NO DEW
22JUL83	102	74	100	88	99	88	0	84	44	NO DEW
23JUL83	101	76	90	81	98	80	0	96	42	
24JUL83	100	70	91	80	96	78	0,05	95	50	
25JUL83	98	70	102	85	98	78	0,07	88	45	MODERATE
26JUL83	88	63	96	84	99	78	0	88	44	
27JUL83	88	77	98	84	98	77	0	80	44	
28JUL83	98	75	98	84	92	78	0	77	45	
29JUL83	99	74	91	81	101	81	0	88	20	
30JUL83	96	70	90	76	92	77	0	100	50	
31JUL83	90	72	85	78	90	77	0	100	60	
TOTAL							0,38			
AVERAGE	93,2	68,8	90,9	79,4	94,1	77,4		89,7	44,4	
ACCUMULATIVE TOTAL							7,64 does not include March and April			

DATE	TEMPERATURE MAX	MIN	SOIL TEMPERATURE GRASS MAX	MIN	SOIL MAX	MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	MIN	DEW
01AUG83	92	65	90	78	93	72	0	100	50	
02AUG83	89	58	94	80	99	75	0	89	58	HEAVY
03AUG83	88	64	87	82	99	78	0	88	64	MODERATE
04AUG83	92	68	94	84	99	77	0,01	82	38	HEAVY
05AUG83	86	68	87	84	88	78	0	82	50	WET
06AUG83	90	65	83	75	87	75	0	100	45	
07AUG83	86	64	83	75	88	75	0	100	60	
08AUG83	91	58	89	79	100	78	0	100	55	LIGHT
09AUG83	96	70	95	84	100	80	0	84	30	LIGHT
10AUG83	90	66	95	83	98	81	0	70	35	NO DEW
11AUG83	96	66	95	83	95	80	0	77	38	
12AUG83	84	60	92	83	95	80	0	90	44	NO DEW
13AUG83	82	54	90	72	88	68	0	100	40	
14AUG83	86	65	85	84	90	70	0	100	45	
15AUG83	87	60	92	83	94	77	0	89	38	LIGHT
16AUG83	94	66	93	80	92	76	0	88	36	LIGHT
17AUG83	98	66	94	82	95	79	0	88	34	NO DEW
18AUG83	100	76	92	86	91	83	0	80	41	NO DEW
19AUG83	101	76	95	85	95	82	0	83	42	
20AUG83	95	68	87	79	92	77	0	83	42	
21AUG83	92	67	88	78	95	77	0	95	40	
22AUG83	100	72	95	86	96	83	0,01	88	35	HEAVY
23AUG83	95	69	92	81	94	79	0,06	88	80	HEAVY
24AUG83	80	65	86	81	89	75	0	83	62	HEAVY
25AUG83	92	66	89	75	91	78	0	82	40	HEAVY
26AUG83	88	61	97	85	98	78	0	80	38	NO DEW
27AUG83	87	72	85	74	95	74	0	90	50	
28AUG83	86	70	86	72	97	85	0,72	80	38	
29AUG83	88	61	87	85	99	79	0	84	43	HEAVY
30AUG83	93	68	88	79	92	75	0	95	45	
31AUG83	85	68	84	78	85	74	0,2	100	60	
TOTAL							1			
AVERAGE	90,6	65,9	89,6	80,5	93,8	77,4		88,3	45,7	
ACCUMULATIVE TOTAL							8,64 does not include March and April			

WEATHER DATA FOR KILBOURNE STATION

DATE	TEMPERATURE MAX	TEMPERATURE MIN	SOIL TEMPERATURE GRASS MAX	SOIL TEMPERATURE GRASS MIN	SOIL TEMPERATURE SOIL MAX	SOIL TEMPERATURE SOIL MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	RELATIVE HUMIDITY MIN	DEW
01SEP83	86	60	89	82	90	75	0	90	44	HEAVY
02SEP83	86	56	91	81	92	75	0	90	40	HEAVY
03SEP83	86	56	85	73	90	72	0	100	50	
04SEP83	88	58	84	75	88	72	0	100	40	
05SEP83	90	65	82	74	88	72	0	100	40	
06SEP83	94	69	91	80	92	75	0	88	30	NO DEW
07SEP83	86	45	91	80	88	74	0	84	40	HEAVY
08SEP83	86	50	89	76	89	73	0	78	18	LIGHT
09SEP83	92	70	91	78	90	74	0	80	33	NO DEW
10SEP83	96	70	83	76	88	74	0	98	45	
11SEP83	95	61	86	76	91	72	0,75	95	44	
12SEP83	76	58	93	77	91	71	0,01	88	46	LIGHT
13SEP83	82	56	91	75	85	69	0	86	34	LIGHT
14SEP83	72	42	82	74	84	65	0	90	38	HEAVY
15SEP83	73	52	82	70	84	65	0	88	28	NO DEW
16SEP83	62	54	74	70	68	65	0,11	90	84	HEAVY
17SEP83	70	50	70	59	70	60	0	100	55	
18SEP83	78	65	74	59	80	64	0	100	50	
19SEP83	93	68	90	60	84	68	0	87	45	LIGHT
20SEP83	90	65	75	70	84	70	0,04	100	55	
21SEP83	72	39	81	60	74	51	0,03	90	70	HEAVY
22SEP83	55	33	64	44	66	57	0	80	28	HEAVY
23SEP83	58	33	60	47	60	53	0	100	42	
24SEP83	63	36	68	53	71	45	0	89	39	HEAVY
25SEP83	67	46	62	57	64	55	0	95	40	
26SEP83	60	54	69	57	73	46	0,04	90	85	HEAVY
27SEP83	79	51	73	52	75	58	0	89	42	
28SEP83	83	62	76	70	79	64	0	82	39	NO DEW
29SEP83	86	55	79	67	83	62	0	89	35	NO DEW
30SEP83	85	53	79	68	83	63	0	89	31	LIGHT
TOTAL							0,98			
AVERAGE	79,6	54,4	80,1	68	81,5	65,3		90,8	43,7	
ACCUMULATIVE TOTAL							9,62 does not include March and April			

DATE	TEMPERATURE MAX	TEMPERATURE MIN	SOIL TEMPERATURE GRASS MAX	SOIL TEMPERATURE GRASS MIN	SOIL TEMPERATURE SOIL MAX	SOIL TEMPERATURE SOIL MIN	PRECIPITATION (INCHES)	RELATIVE HUMIDITY MAX	RELATIVE HUMIDITY MIN	DEW
01OCT83	81	43	72	62	75	60	0	100	35	
02OCT83	81	53	70	62	76	60	0	100	30	
03OCT83	86	63	70	65	74	62	0	90	35	
04OCT83	82	58	73	67	75	65	0	100	45	
05OCT83	75	51	70	60	79	77	0	87	42	
06OCT83	75	51	76	67	80	63	0	92	43	LIGHT
07OCT83	73	47	75	66	78	60	0	77	27	NO DEW
08OCT83	80	60	73	66	76	60	0	88	31	NO DEW
09OCT83	67	38	72	63	72	56	0	97	39	
10OCT83	67	38	72	63	72	56	0	97	39	LIGHT
11OCT83	72	57	70	61	73	54	0	85	50	NO DEW
12OCT83	76	45	70	62	73	57	0,07	91	53	NO DEW
13OCT83	56	36	69	56	64	49	0	93	38	MODERATE
14OCT83	51	33	57	50	57	44	0,01	93	54	MODERATE
15OCT83	64	49	58	43	60	50	0	100	45	
16OCT83	72	52	60	52	62	48	0	100	40	
17OCT83	66	50	60	55	62	50	0	100	55	
18OCT83	60	38	60	58	61	50	0	95	48	HEAVY
19OCT83	65	50	63	55	68	49	0	85	32	NO DEW
20OCT83	51	49	62	55	54	52	0,04	92	88	HEAVY
21OCT83	51	48	52	51	57	54	0,06	91	87	HEAVY
22OCT83	54	49	55	52	54	50	0,8	100	85	
23OCT83	55	50	54	53	55	52	0,2	100	80	
24OCT83	53	50	57	54	58	50	0,16	90	81	HEAVY
25OCT83	54	47	55	54	55	52	0	100	83	
26OCT83	56	36	56	52	57	47	0	95	45	
27OCT83	64	40	56	43	57	52	0	100	46	
28OCT83	71	49	53	49	58	45	0	89	40	
29OCT83	73	30	56	52	62	49	0	79	47	
30OCT83	59	45	53	51	57	48	0	100	47	
31OCT83	57	45	63	50	67	44	0	94	49	HEAVY
TOTAL							1,34			
AVERAGE	66	46,8	63,3	56,4	65,4	53,7		93,5	50,3	
ACCUMULATIVE TOTAL							10,96 does not include March and April			