MANAGING MIXED ANNUAL BLUEGRASS CREEPING BENTGRASS FAIRWAYS

M.G. HENDRICKS, B.E. BRANHAM, AND M. COLLINS
DEPT. CROPS AND SOIL SCIENCES M.S.U.

Introduction

Clipping removal on golf course fairways has been observed to result in a shift in species composition from annual bluegrass to creeping bentgrass. With this discovery, golf course superintendents now have the tool needed to better manage mixed annual bluegrass creeping bentgrass fairways.

Two field studies were initiated to examine management practices which will be helpful in the conversion of annual bluegrass fairways to creeping bentgrass fairways. The first study examined practices involved in overseeding annual bluegrass fairways with creeping bentgrass. The second study was designed to determine which management practices best control thatch in fairways and which cultivation practices lead to the most encroachment of annual bluegrass.

In both field studies reported here, the turf was maintained at 1/2 in. with a Toro Greensmaster Triplex mower. Irrigation and fungicide were applied as needed to maintain a healthy turf.

Field Experiment 1: The effects of nitrogen fertilization and cultivation practices on thatch development and encroachment of invading species.

A study was initiated at the Hancock Turfgrass Research Center (HTRC), during the fall of 1985 in two turfgrass species: Penncross and Penneagle creeping bentgrass, and annual bluegrass. At the beginning of this study all areas used were composed of nearly pure stands of the respective species. The purpose of this experiment was to examine which method of cultivation and rate of nitrogen fertilizer has the most effect on thatch development and the encroachment of another species, especially annual bluegrass, into Penncross and Penneagle creeping bentgrass.

The treatments for this study consisted of nitrogen fertilization at rates of 2,4, and 6 lb/M/yr, and cultivation treatments which consisted of coring in the spring, coring in the fall, coring in the spring and fall, vertical mowing 3 to 4 times in the spring and 3 to 4 times in the fall, and no cultivation.

The method for determining the thatch thickness consisted of taking a 3/4 in. diameter soil probe and removing three plugs chosen at random from each plot, then measuring the thatch thickness of each plug and averaging the three measurements. The average of the three measurements was used as the thatch thickness for the plot. To determine the amount of invasion of other species, a grid consisting of 90 points was placed on top of each plot. The plant species beneath each intersection was determined. An invading species was defined in this study as 1) an annual bluegrass plant invading into the Penncross or Penneagle (undesirable invasion), and 2) creeping bentgrass invading into the annual bluegrass (desirable invasion). This method was used to estimate the amount of invading species

present.

The results of this study are summarized in Tables 1-6. Table 1 indicates that there was a significant difference in thatch thickness due to species but not affected by method of cultivation, nitrogen fertilization, or the interactions of nitrogen fertilization and cultivation. Annual bluegrass had significantly less thatch than the Penncross or Penneagle (Table 2).

The analysis of variance (Table 3) indicates that cultivar had a significant influence on the amount of invasion. Penncross with 6.1% invasion had significantly less annual bluegrass than did Penneagle with 10.4% (Table 4). Neither cultivation nor the cultivation X cultivar interaction resulted in significantly more annual bluegrass invasion. It is interesting to note that Penncross had relatively the same amount of invasion regardless of cultivation treatment, while the Penneagle had more invasion with the coring in the spring and vertical mowing treatments (Figure 1).

The analysis of variance on the amount of creeping bentgrass invasion into annual bluegrass (Table 5) indicates that the method of cultivation influences the amount of creeping bentgrass invading annual bluegrass. Coring in the spring results in significantly more creeping bentgrass invasion than any of the other treatments (Table 6).

Coring in the spring may cause the canopy to open up more resulting in an increase in encroachment. The residual seed in the soil may also come into better contact with soil as a result of falling into the hole created by coring or by the soil which is brought up by coring. Vertical mowing may also cause many of the same things to occur, resulting in a greater increase of encroachment.

The amount of bentgrass present in the annual bluegrass was not determined at the beginning of the study. Therefore, it is not known if the amount of creeping bentgrass reported here is the result of the treatments applied or was present prior to treatment. For this reason, the results reported here are preliminary and represent an estimation of the beginning population. The treatments will be continued for a second year hopefully providing significant information.

Field Experiment 2: The Effects of Cultivation, Seeding Rate, and Chemical Treatment on Successful Overseeding with Creeping bentgrass into Annual Bluegrass

A second study was initiated at HTRC, in August 1986 on an area consisting of annual bluegrass with small patches of wild type creeping bentgrass. The areas of wild type creeping bentgrass were treated with Fusilade at 0.35 lb ai/a to remove them from the study area. The study was a completely randomized block design with the following factors:

Factor 1: Seeding rate consisting of 1,2, and 4 lb. creeping bentgrass seed / M
Factor 2: Cultivation treatment consisting of vertical mowing, coring, and no cultivation
Factor 3: Chemical treatment which consisted of:

Embark at 0.25 lb ai/a
Embark + Prograss at 0.25 lb ai/a + 1.0 lb ai/a
Round-Up at 4.0 lb/a
Round-Up + Prograss at 4.0 lb/a + 1.0 lb ai/a
No Chemical

The Embark and Round-Up were applied on August 4, 1986 with Prograss treatments being applied 4 weeks following planting. The Prograss was applied in 2 applications, each at the rate given above and separated by thirty days. One week prior to seeding a complete fertilizer with an analysis of 12-12-12 was applied to the study area at a rate of 1/2 lb N/M.

The cultivation treatments were applied just prior to seeding. The vertical mowing treatment was done in two directions using a Ryan Ren-O-Thin walk behind vertical mower adjusted to penetrate the ground approximately 1/8 inch. The coring treatments (one pass) were done with a Ryan Greensaire aerifer with 1/2 inch tines. The cores were allowed to dry then reincorporated using the vertical mower with the blades set deep enough to break the cores, but not the soil surface.

The plots were overseeded by hand with Penncross creeping bentgrass on August 14, 1986. Following seeding a complete starter fertilizer was applied at a rate of 1/2 lb N/M. A drag mat was used to incorporate the seed into the soil, rolled to ensure good seed to soil contact, and irrigated to keep the soil moist.

The analysis of variance of percent cover of creeping bentgrass (Table 7) indicates that seeding rate and chemical treatment significantly influenced the amount of creeping bentgrass present. The 2 and 4 lb seeding rate resulted in significantly more creeping bentgrass than the 1 lb seeding rate (Table 8). However, the 2 and 4 lb. rates were not found to be significantly different. This would indicate that overseeding with the 2 lb rate would be as successful as the 4 lb rate.

Treating with Round-Up prior to seeding results in a greater percentage of creeping bentgrass cover due to overseeding. It should be noted however, that in some of the Round-Up plots there were large areas of bare ground which would be unacceptable to the golf course superintendent. Treatment with Embark resulted in less creeping bentgrass cover than did the plots receiving no chemical treatment.

Treatment with Embark was believed to reduce the competitiveness of the annual bluegrass, allowing the creeping bentgrass seed to germinate. Treatment with Prograss, which appears to have both preemergence and postemergence herbicidal activity on annual bluegrass, would further weaken the annual bluegrass and allow the creeping bentgrass to get the competitive advantage.

In both instances when Prograss was applied (Embark + Prograss and Round-Up + Prograss) there was a decrease in the amount of creeping bentgrass present when compared to the plots which received no chemical treatment. Initial greenhouse studies had indicated that Prograss could be applied 2 weeks following creeping bentgrass germination. Prograss was applied 4 weeks after planting which appeared to be too soon resulting in the death of some creeping bentgrass seedlings.

Initially, it appeared that vertical mowing resulted in greater germination of creeping bentgrass, the results did not support this observation.

TABLE 1 ANALYSIS OF VARIANCE OF THATCH THICKNESS FOR FAIRWAY MANAGEMENT STUDY

ANALYSIS OF VARIANCE TABLE

SOURCE	df	THATCH THICKNESS
REPLICATION	2	N.S.
SPECIES (A)	2	**
ERROR	4	N.S.
NITROGEN LEVEL (B)	2	N.S.
A X B	4	N.S.
CULTIVATION TRTM (C)	4	N.S.
A X C	8	N.S.
B X C	8	N.S.
A X B X C	16	N.S.
ERROR	84	N.S.

** SIGNIFICANT AT 1 PERCENT LEVEL

TABLE 2 MEAN THATCH THICKNESS IN FAIRWAY MANAGEMENT STUDY

SPECIES	THICKNESS (cm)
ANNUAL BLUEGRASS (*Poa annua* .L)	0.8
PENNEAGLE CREEPING BENTGRASS (*Agrostis palustris cv.penneagle* Huds.)	1.5
PENNCROSS CREEPING BENTGRASS (*Agrostis palustris cv. penncross* Huds.)	1.5
LSD (0.05)	0.10

TABLE 3 ANALYSIS OF VARIANCE OF ANNUAL BLUEGRASS INVASION INTO PENNCROSS AND PENNEAGLE CREEPING BENTGRASS

ANALYSIS OF VARIANCE TABLE

SOURCE	df	% INVADING SPECIES
REPLICATION	2	N.S
SPECIES (A)	1	*
ERROR	2	N.S.
NITROGEN LEVEL (B)	2	N.S.
A X B	2	N.S.
CULTIVATION TRTM (C)	4	N.S.
A X C	4	N.S.
A X B X C	8	N.S.
ERROR	56	N.S.

* INDICATES SIGNIFICANCE AT THE 5 PERCENT LEVEL

TABLE 4 MEAN PERCENT ANNUAL BLUEGRASS INVASION INTO CREEPING BENTGRASS

CULTIVAR TYPE	% INVASION
PENNEAGLE	10.4
PENNCROSS	6.1

TABLE 5 ANALYSIS OF VARIANCE OF PERCENT INVASION OF CREEPING BENTGRASS INTO ANNUAL BLUEGRASS

SOURCE	DF	PERCENT INVASION
REPLICATION	2	N.S.
NITROGEN LEVEL (A)	2	N.S.
CULTIVATION	4	*
A X B	8	N.S.
ERROR	28	N.S.

* INDICATES SIGNIFICANCE AT 5 PERCENT LEVEL

TABLE 6 MEAN PERCENTAGE OF CREEPING BENTGRASS INVADING INTO ANNUAL BLUEGRASS DUE TO CULTIVATION TREATMENT

TREATMENT	MEAN
NO CULTIVATION	0.0
CORE SP & FA	0.5
CORE FALL	0.5
VERTICAL MOW	0.7
CORE SPRING	3.9
LSD (0.05)	2.44

TABLE 7 ANALYSIS OF VARIANCE FOR PERCENT COVER OF CREEPING BENTGRASS IN OVERSEEDING STUDY

ANALYSIS OF VARIANCE TABLE

SOURCE	df	% CREEPING BENTGRASS
REPLICATION	2	N.S.
CULTIVATION (A)	2	N.S.
SEEDING RATE (B)	2	**
A X B	4	N.S.
CHEMICAL TRMT (C)	4	**
A X C	8	N.S.
B X C	8	N.S.
A X B X C	16	N.S.
ERROR	88	N.S.

** SIGNIFICANT AT 1 PERCENT LEVEL

TABLE 8 MEAN PERCENT OF CREEPING BENTGRASS ON OVERSEEDED PLOTS

SEEDING RATE (LB/M)	% CREEPING BENTGRASS PRESENT
1	6.2
2	9.6
4	10.1
LSD (0.05)	2.44

TABLE 9 MEAN PERCENT CREEPING BENTGRASS ON OVERSEEDED PLOTS DUE TO CHEMICAL TREATMENT

CHEMICAL TREATMENT	% CREEPING BENTGRASS PRESENT
EMBARK (EMB)	3.2
EMB+PROGRASS (PRO)	2.3
ROUND-UP (RND)	20.3
RND+PRO	11.6
NO CHEMICAL	5.7
LSD (0.05)	3.15

FIGURE 1. PERCENT INVADING SPECIES

(ANNUAL BLUEGRASS)