1991 Corn Gluten Meal Crabgrass Control Study - Year 6

Barbara R. Bingaman, Nick E. Christians, and David S. Gardner

A study screening corn gluten meal (CGM) for efficacy as a natural product herbicide and fertilizer in turf was begun in 1991 and has been continued on the same plot for six consecutive years. It is being conducted at the Iowa State University Horticulture Research Station north of Ames, Iowa. The experiment is located in an area of 'Parade' Kentucky bluegrass. The soil in this experimental area is a Nicollet (fine-loamy, mixed, mesic Aquic Hapludoll) with an organic matter content of 3.5% a pH of 6.4, 11.2 ppm P, and 220 ppm K.

Individual experimental plots are 5 x 5 ft and there are five treatments with three replications. The experimental design is a randomized complete block. Corn gluten meal was applied at 0, 20, 40, 60, 80, 100, and 120 lbs/1000 ft^2 (Table 1). Because corn gluten meal is 10% N, these rates are equivalent to 0, 2, 4, 6, 8, and 10 lbs N/1000 ft^2. All treatments were made to the same plots as in previous years. The CGM was applied in a single early spring preemergence application on April 24, 1996 using 'shaker dispensers'. The materials were watered-in with the irrigation system. Supplemental irrigation was used to provide adequate moisture to maintain the grass in good growing condition.

The plot was evaluated for phytotoxicity on April 25 and periodically throughout the growing season. Visual quality data were taken on June 7, July 10, July 30, and August 23. Visual quality was measured using a 9 to 1 scale: 9 = best quality, 6 = lowest acceptable quality, and 1 = poorest quality (Table 1).

Crabgrass control was assessed by counting the number of crabgrass plants per individual plot. Control data were taken on August 23 (Tables 2 & 3). Crabgrass populations were quite low in 1996 (Table 2). The cool, wet spring delayed crabgrass germination and the grass and broadleaf weeds were able to become well established before the crabgrass emerged. There were only a few crabgrass plants on August 23 and they were quite small with only one to two tillers.

To determine the level of broadleaf weed control, dandelion and clover populations were surveyed. Overall estimations of percentage of broadleaf cover (dandelion and clover were the only broadleaf species present) were made on June 7, July 10, and July 30 (Table 3). On August 23, counts were made of the number of dandelions per plot and percentage of clover cover per plot were estimated (Table 4).

Data were analyzed with the Statistical Analysis System version 6.10 (SAS Institute, 1989) using the Analysis of Variance (ANOVA) procedure. Least Significant Difference (LSD) means comparison tests were used to assess CGM effects on bluegrass quality and weed control. Weed control data also were expressed as percent reductions (Tables 3, 4, & 8). These values were calculated as percentage reductions compared with the untreated controls.

There was no phytotoxicity observed in the Kentucky bluegrass treated with CGM. There were significant differences in turf quality among the CGM treatments and the untreated control (Table 1). The best quality was observed in turf that received either 80, or 100, or 120 lbs CGM/1000 ft^2.

There were significant reductions in the number of crabgrass plants in the treated as compared with the untreated turf (Table 2). Crabgrass reductions were ≥ 59% in all corn gluten meal-treated turf except at 20 lbs /1000 ft^2. At this CGM level, there were more crabgrass plants than in the untreated controls. Reductions were 97, 79, 59, 83, and 97% for 40, 60, 80, 100, and 120 lbs/1000 ft^2 CGM, respectively.

Crabgrass control data for 1991-1995 were compared with data from 1996 (Table 5). Percentage reductions in 1996 were generally higher than those recorded in 1995.

There were significant reductions in the percentage of broadleaf weed cover in the treated as compared with the untreated bluegrass plots (Table 3). Percent cover was significantly lower in all CGM treated plots as compared to the untreated controls.

Percentage of clover cover was significantly reduced by all CGM levels (Table 4). Mean percent cover data also indicated large reductions in treated versus untreated control turf. Reductions in percent clover

cover from 1996 were similar to those from 1994 at 20, 40, 60, 80, 100, and 120 lbs/1000 ft^2 and larger than those reported for 1995 at 20, 40, 80, and 100 lbs/1000 ft^2 (Table 6).

The number of dandelions was significantly reduced by all CGM levels except 20 lbs/1000 ft^2 (Table 5). In 1994, dandelion was controlled better than in 1995 and 1996 at 20, 40, and 60 lbs/1000 ft^2 (Table 6). Reductions were similar for all three years at 80, 100, and 120 lbs/1000 ft^2.

Table 1. Visual quality[1] of Kentucky bluegrass treated with granular corn gluten meal in the 1991 Corn Gluten Meal Weed Control Study.

	Material	lbs CGM /1000 ft^2	lbs N /1000 ft^2	June 7	July 10	July 30	Aug 23	Mean quality
1.	Untreated control	0	0	6	7	7	7	7
2.	Corn gluten meal	20	2	7	7	7	7	7
3.	Corn gluten meal	40	4	8	8	8	8	8
4.	Corn gluten meal	60	6	9	8	8	8	8
5.	Corn gluten meal	80	8	9	9	8	8	9
6.	Corn gluten meal	100	10	9	9	9	9	9
7.	Corn gluten meal	120	12	9	9	9	9	9
	$LSD_{0.05}$			1	1	1	1	1

[1] Visual quality was assessed using a 9 to 1 scale: 9 = best quality, 6 = lowest acceptable quality, and 1 = poorest quality.

Table 2. Number of crabgrass plants[1] in Kentucky bluegrass plots treated with granular corn gluten meal for the 1991 Corn Gluten Meal Weed Control Study.

	Material	lbs CGM /1000 ft^2	lbs N /1000 ft^2	August 23	% Reduction in Numbers[2]
1.	Untreated control	0	0	13	0
2.	Corn gluten meal	20	2	11	15
3.	Corn gluten meal	40	4	1	97
4.	Corn gluten meal	60	6	2	85
5.	Corn gluten meal	80	8	4	69
6.	Corn gluten meal	100	10	2	87
7.	Corn gluten meal	120	12	1	97
	$LSD_{0.05}$			8	60

[1] These values represent the actual number of crabgrass plants per plot.
[2] These values represent the percentage reductions in crabgrass plants per plot as compared with the untreated controls.

Table 3. Percentage of broadleaf cover[1] in Kentucky bluegrass treated with granular corn gluten meal in the 1991 Corn Gluten Meal Weed Control Study.

	Material	lbs N /1000 ft^2	June 7	July 10	July 30	Mean % cover	Percent reduction[2]
1.	Untreated control	0	43	53	58	52	0
2.	Corn gluten meal	2	23	23	28	25	52
3.	Corn gluten meal	4	10	7	10	9	83
4.	Corn gluten meal	6	4	2	4	3	94
5.	Corn gluten meal	8	4	1	7	4	93
6.	Corn gluten meal	10	4	4	7	5	91
7.	Corn gluten meal	12	1	4	4	3	95
	LSD0.05		18	10	13	10	20

[1] Dandelion and clover were the only broadleaf species detected in the plots. These percentages represent the amount of area per plot covered by dandelion and clover.
[2] These values represent the percentage reductions in crabgrass plants per plot as compared with the untreated controls.

Table 4. Percentage clover cover[1] and dandelion counts per plot[2] in Kentucky bluegrass treated with in the 1991 Corn Gluten Meal Weed Control Study.

			Percentage clover cover (%)[1]			Dandelion counts per plot[2]		
	Material	lbs N /1000 ft^2	May 9	August 23	Mean % cover	May 9	August 23	Mean number
1	Untreated control	0	15	27	21	19	20	19
2	Corn gluten meal	2	7	5	6	10	16	13
3	Corn gluten meal	4	5	2	4	4	5	5
4	Corn gluten meal	6	1	2	2	2	6	4
5	Corn gluten meal	8	4	1	2	1	1	1
6	Corn gluten meal	10	2	1	2	0	1	1
7	Corn gluten meal	12	1	2	2	0	0	0
	$LSD_{(0.05)}$		7	14	6	12	11	11

[1]Percentage clover cover represents the area per plot covered by clover.
[2]Dandelion counts are the actual number of dandelion per plot.

Table 5. Comparisons of the percentage crabgrass reductions[1] in Kentucky bluegrass treated with granular corn gluten meal in the 1991 Corn Gluten Meal Weed Control Study through 1996.

			Percent crabgrass reduction (%)					
	Material	lbs N/1000 ft^2	1991	1992	1993	1994	1995	1996
1	Untreated control	0	0	0	0	0	0	0
2	Corn gluten meal	2	58	85	91	70	36	15
3	Corn gluten meal	4	86	98	98	97	88	97
4	Corn gluten meal	6	97	98	93	98	93	85
5	Corn gluten meal	8	87	93	93	87	75	69
6	Corn gluten meal	10	79	94	95	86	75	87
7	Corn gluten meal	12	97	100	100	98	84	97
	$LSD_{0.05}$		26	44	31	39	40	60

[1] These values represent the percentage reductions in crabgrass plants per plot as compared with the untreated controls.

Table 6. Reductions in percentages clover cover[1] and number of dandelions per plot[2] for 1994-1996 in Kentucky bluegrass treated with corn gluten meal in the 1991 Corn Gluten Meal Weed Control Study.

			Percentage clover cover reduction[3]			Reduction in dandelion numbers[3]		
	Material	lbs N/1000 ft^2	1994	1995	1996	1994	1995	1996
1	Untreated control	0	0	0	0	0	0	0
2	Corn gluten meal	2	81	56	71	71	49	33
3	Corn gluten meal	4	90	64	82	100	77	75
4	Corn gluten meal	6	98	93	93	100	89	79
5	Corn gluten meal	8	100	76	90	98	96	95
6	Corn gluten meal	10	94	84	92	100	98	96
7	Corn gluten meal	12	90	93	93	100	100	100
	$LSD_{(0.05)}$		NS	48	29	50	65	60

[1] Percentage clover cover represent the area per plot covered by clover.
[2] Dandelion counts are the actual number of dandelions per plot.
[3] These values represent the percentage reductions in plants per plot as compared with the untreated controls.
NS = not significantly different at the 0.05 level.