

Pendimethalin and Corn Gluten Meal Combinations for Weed Control in Turfgrass

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

These field experiments were conducted at the Iowa State University Horticulture Research Station in an area of common Kentucky bluegrass (*Poa pratensis* L.) that had been established in 1968. The soil was a Nicollet with a pH of 6.2, 6.5 mg P kg⁻¹, 77 mg K kg⁻¹, and 22 g kg⁻¹ of organic matter. Twenty treatments consisting of four rates of corn gluten meal combined in a factorial arrangement with five rates of pendimethalin 60 DG were applied individually to 20 plots. Each plot was 5 x 5 ft, and plots were arranged in a randomized complete block design with two rows of ten plots per block and 2.5 ft barrier rows between each of the three blocks.

Powdered corn gluten meal was hand-applied on 13 April 1995 and 24 April 1996, at single application rates of 0, 49, 98, or 147 g m⁻². A carbon dioxide backpack sprayer, with a pressure of 30 psi using 8006 nozzles, was used to apply pendimethalin on 25 April 1995 and 1 May 1996 at single application rates of 0, 29, 59, 88, or 117 mg ai m⁻². The rates of pendimethalin tested were 1/6, 1/3, 1/2, and 2/3 of the minimum recommended application rate, and the rates of corn gluten meal tested were 1/2, 1, and 2 times the recommended application rate of corn gluten meal. The test plots were mowed and supplemental irrigation was used as necessary throughout the summer so that the turfgrass did not go dormant. No other fertilizer was applied during the study.

In both years, data were collected as average visual estimates of two researchers as combined percentage cover of smooth crabgrass and large crabgrass 15 weeks after application of corn gluten meal. Estimates of turfgrass visual quality were made 5, 7, 11, and 15 weeks after application of corn gluten meal. Turfgrass visual quality was evaluated on a 9 to 1 scale: 9 = best quality, 6 = acceptable quality, and 1 = poorest quality based on overall color, density, and uniformity.

Data were analyzed by using the Statistical Analysis System (SAS) and the general linear models (GLM) procedure. Data collected from the two years of field data were pooled. Fisher's least significant difference (LSD) test was used to compare main effect means and means over all treatments.

The analysis showed differences among studies at the P_{0.05} level between years and replications. An additive effect on crabgrass cover was observed when corn gluten meal and pendimethalin were applied in combination to turfgrass in the field. Each 49 g m⁻² increase in applied corn gluten meal reduced crabgrass cover but the level of reduction over the previous rate decreased as rate increased (Table 1). Analysis of the main effects showed that there was no increase in crabgrass control at rates higher than 59 mg ai m⁻² pendimethalin.

The application of 49 g m⁻² corn gluten meal and 88 mg ai m⁻² pendimethalin provided 75-85% control as did either 98 g m⁻² corn gluten meal and 59 mg ai m⁻² pendimethalin or 147 g m⁻² corn gluten meal and 29 mg ai m⁻² pendimethalin. There was no increase in crabgrass control in plots that received larger amounts of corn gluten meal and pendimethalin. Crabgrass reduction in plots that received 49 g m⁻² corn gluten meal and 59 mg ai m⁻² pendimethalin were not different from the plots that received 49 g m⁻² corn gluten meal and 88 mg ai m⁻² pendimethalin. However, they were different from the plots that received 98 g m⁻² corn gluten meal and 59 mg ai m⁻² pendimethalin.

For each increase of 49 g m⁻² corn gluten meal, turfgrass visual quality was improved by approximately one unit on the 9 to 1 scale after 5 and 7 weeks (Table 2). The fertilizer effects of

corn gluten meal application were visible for 11 weeks. After 11 weeks, turfgrass quality did not differ among plots that received different rates of corn gluten meal. Pendimethalin did not affect turfgrass visual quality.

The results the field experiments suggest that crabgrass control may be improved by applying a sublethal rate of pendimethalin in combination with corn gluten meal. Crabgrass control was improved over that of corn gluten meal applied alone by using the three combinations of corn gluten meal and pendimethalin. There was no difference in crabgrass control among these rate combinations (Table 1). The previously documented fertilizer effect caused by corn gluten meal (Christians, 1993) was also observed in our field experiment. Increased turfgrass vigor caused by the fertilizer effect may contribute to the reduction in crabgrass observed on plots treated with corn gluten meal (Christians, 1993).

References

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Table 1. Percentage reduction in crabgrass cover compared with the control by using different combinations of corn gluten meal and pendimethalin tested in the field during 1995 and 1996¹.

Corn gluten meal applied	Pendimethalin applied (mg ai m ⁻²)					Mean ²
	0	29	59	88	117	
– (g m ⁻²) –	% Reduction					
0	0§	15	45	54	53	33
49	25	40	61	77	75	56
98	42	57	84	84	86	71
147	55	79	84	87	95	80
Mean ³	31	48	69	76	77	

ANOVA			
Source	d.f.	M.S.	Pr > F
Year	1	1864.4	0.0007
Year*Rep	4	2429.3	0.0001
Treatment	19	1863.8	0.0001
Corn Gluten Meal (CGM)	3	5554.9	0.0001
Pendimethalin (Pend)	4	4400.7	0.0001
CGM x Pend	12	95.4	0.8080
Year*Treatment	19	114.2	0.7474
Year*CGM	3	54.0	0.7833
Year*Pend	4	96.3	0.6365
Year*CGM*Pend	12	135.2	0.5537
Error	76	150.7	

¹ Values are the average of visual estimates of two researchers.

² Corn gluten meal means are the average of three replications of five rates of pendimethalin applied in combination with each rate of corn gluten meal observed over two years (n=30). LSD_(0.05) = 9% for the comparison of corn gluten meal means according to Fisher's least significant difference test.

³ Treatment means are the average of three replications observed over two years (n=6). LSD_(0.05) = 21% for the comparison of all treatments according to Fisher's least significant difference test.

³ Pendimethalin means are the average of three replications of four rates of corn gluten meal in combination with each rate of pendimethalin observed over two years (n=24). LSD_(0.05) = 11% for the comparison of pendimethalin means according to Fisher's least significant difference test.

Table 2. Mean weekly turfgrass visual quality ratings during 1995 and 1996 for Kentucky bluegrass in response to increasing corn gluten meal rates (n=30)¹.

Corn gluten meal applied	Time after corn gluten meal application (wk)			
	5	7	11	15
– (g m ⁻²) –	Turfgrass Visual Quality Rating ²			
0	5	5	6	6
49	7	7	7	6
98	8	8	7	6
147	9	9	8	6
LSD _(0.05) ³	1	1	1	1

¹ Means are the average of three replications of five rates of pendimethalin applied in combination with each rate of corn gluten meal observed over two years. Values given are the average of visual estimates of two researchers.

² Turfgrass visual quality was evaluated on a 9 to 1 scale: 9 = best quality, 6 = acceptable turfgrass, and 1 = poorest quality based on overall color, density, and uniformity.

³ According to Fisher's least significant difference test.