Sequential Applications of Preemergence Crabgrass Herbicides for Enhanced Control – Three Year Summary

PURDUE UNIVERSITY
TURFGRASS SCIENCE

Aaron Patton and Dan Weisenberger, Purdue University
Zac Reicher, University of Nebraska Lincoln

SUMMARY: Lawn care operators (LCOs) have the capability to make sequential applications because their lawn care programs are structured into various rounds of applications. One question that lawn care operators pose is whether or not acceptable crabgrass control can be achieved when the active ingredient used in the initial application is followed by a different active ingredient in the second (sequential) application. The objectives of this study where to 1) determine if switching the active ingredient in sequential preemergence herbicide applications affects crabgrass control, and 2) compare the effectiveness of sequential preemergence herbicide applications to single preemergence herbicide applications for crabgrass control. Data support that equivalent crabgrass control can be expected when prodiamine, pendimethalin, and dithiopyr are used as part of a split application strategy regardless of which herbicide is used for the first and/or second application. The data also support that when the same total a.i/A is applied, sequential (split) applications will more effectively and consistently control crabgrass than a single application. These results confirm that there is more flexibility in selecting and using preemergence herbicides than previously thought and that LCOs using multiple rounds can split their preemergence application from one into two and gain increased crabgrass control without additional costs.

Sequential applications (split-applications) are known to provide better control of crabgrass (*Digitaria* spp.) than single applications (Dernoeden, 1984). Lawn care operators have the capability to make sequential applications because their lawn care programs are structured into various rounds of applications. One question that lawn care operators pose is whether or not acceptable crabgrass control can be achieved when the active ingredient used in the initial application is followed by a different active ingredient in the second (sequential) application. Previous research in the early 1990's indicated that it was best to use the same active ingredient in both applications (Reicher et al., 1991). However, new active ingredients and/or different formulations of active ingredients are now available and this strategy needs reexamining. The objectives of this study where to 1) determine if switching the active ingredient in sequential preemergence herbicide applications affects crabgrass control, and 2) compare the effectiveness of sequential preemergence herbicide applications to single preemergence herbicide applications for crabgrass control.

ADDITIONAL INDEX WORDS:
Barricade; Dimension; dithiopyr; LCO; pendimethalin, Pendulum; prodiamine; split.

Patton, A., D. Weisenberger and Z. Reicher. 2012. Sequential Applications of Preemergence Crabgrass Herbicides for Enhanced Control – Three Year Summary. 2011 Annu. Rep. - Purdue Univ. Turfgrass Sci. Progr. p. 63-65.

Materials and Methods

The experiment was conducted at the W.H. Daniel Turfgrass Research and Diagnostic Center in West Lafayette, IN. The crabgrass area was a Kentucky bluegrass blend with a history of crabgrass pressure and the soil type was a silt loam with a pH of 7.2. Experimental design was randomized complete block with three replications and an individual plot size of 25 sq. ft. The crabgrass plot was mown at 1.5 inches in 2009 and 2010 and at 2.0 inches in 2011. The plots received no fertilization during the experiment, but had received 1.0 lb N/1000 ft^2 the previous fall using urea (46-0-0). Herbicides were applied to the crabgrass plots at the first of April (April 16, 9, and 12 in 2009, 2010, and 2011, respectively) with sequential applications made

at the first of June (June 2, 1, and 2 in 2009, 2010, and 2011, respectively). A different experimental location was used in each year. A full list of herbicide treatments is provided in Table 1. Herbicides were applied in 87 gpa water with a CO_2-pressurized sprayer at 30 psi and herbicides were watered in after applications. An untreated check was included for comparison. Percent crabgrass coverage was visually estimated. Percent control was calculated as control=[(1-(crabgrass coverage in treated plot/ crabgrass coverage in untreated check))*100]. All data were analyzed using SAS (SAS Institute, Inc.). Data were combined across three years and means across year are presented. Means were separated using Fisher's protected least significant difference when F tests were significant at α=0.05.

Results and Discussion

What if I miss the first application? As expected due to the early postemergence activity of dithiopyr, sequential applications of an untreated treatment on 9 April followed by dithiopyr in the first week of June resulted in less crabgrass when evaluated in late June compared to an untreated treatment on 9 April followed by pendimethalin, prodiamine, or another untreated treatment on 1 June (Table 1). This treatment simulates a missed preemergence application or a lawn care operator adding a new client in late spring. Better results might be expected if the full label rate (0.5 lb a.i./A) of dithiopyr were used in June rather than the half rate (0.25 lb a.i./A) used in this treatment design.

Can I switch active ingredients from the first to the second application? When crabgrass control was evaluated in August, all nine preemergence herbicide combinations (with dithiopyr, pendimethalin, or prodiamine first or last in the sequential application strategy) were similar and had less crabgrass than the untreated check (Treatment #16) or those sequential applications with an untreated treatment in their factorial design. Therefore, the data supports that equivalent crabgrass control can be expected when prodiamine, pendimethalin, and dithiopyr are switched in a split application strategy, which is different than a previous report by Reicher et al. (1991).

Do split (also known as sequential) applications help me to control crabgrass better? When evaluated early in June there were no differences across years between a split application strategy (regardless of active ingredient). However, crabgrass control in August and September was improved by sequential applications. The full preemergence application rate of pendimethalin and dithiopyr provided 78 and 76% crabgrass control, respectively, in August (Table 1). While these treatments were statistically similar to some of the sequential application treatments, all sequential applications with dithiopyr, pendimethalin, or prodiamine first or last in the sequential application strategy provided ≥91% crabgrass control. When analyzed across herbicides, all sequential applications (except those with the first or last application as untreated) provided greater control in August and September compared to full rates (Prodiamine 4FL at 0.75 lbs ai/acre; Dithiopyr 2EW at 0.5 lbs ai/acre; Pendimethalin 3.8 at 3.0 lbs ai/acre) applied preemergence (Table 2). This is consistent with previous research by Dernoeden (1984) and confirms that control can be improved by using the same total rate of preemergence herbicide split across two application dates.

Summary. Data from 2009 (Reicher and Weisenberger, 2010), 2010 (Patton et al. 2011) and data from 2011 (this report) support that equivalent crabgrass control can be expected when prodiamine, pendimethalin, and dithiopyr are used as part of a split application strategy regardless of which herbicide is used for the first and/or second application, which is slightly different than findings in the early 1990's. The data also support that when the same total a.i/A is applied, sequential (split) applications will more effectively and consistently control crabgrass than a single application. These results confirm that there is more flexibility in selecting and using preemergence herbicides than previously thought and that LCOs using multiple rounds can split their preemergence application from one into two and gain increased crabgrass control without additional costs. Similar research was conducted in Nebraska in 2011 and their findings confirm the results from Indiana presented in this summary.

References

Dernoeden, P.H.. 1984. Management of preemergence herbicides for crabgrass control in transition-zone turf. HortScience 19:443-445.

Patton, A., D. Weisenberger, and Z. Reicher. 2011. Sequential applications of preemergence crabgrass herbicides: Does the active ingredient in the sequential application have to be the same as used in the initial application? - 2010

Results. 2010 Annual Report - Purdue University Turfgrass Science Program. Available at: http://www.agry.purdue.edu/turf/report/2010/2010ResearchReport.pdf

Reicher, Z.J., C.S. Throssell, and J.L. Lefton. 1991. Annual grass control in cool season turf with sequential applications of unlike preemergence herbicides. Weed Technol. 5:387-391.

Reicher, Z.J. and D.V. Weisenberger. 2010. Sequential applications of preemergence crabgrass herbicides: Does the active ingredient in the sequential application have to be the same as used in the initial application? Purdue Turfgrass Research Annual Report. Available at: http://www.agry.purdue.edu/turf/report/2009/PDF/13_Reicher.pdf

Table 1. Crabgrass control after initial applications of preemergence herbicides on April followed by sequential applications in June in West Lafayette, Indiana. Means across 3 years.

					Crabgrass control [a]	
Treatment	Herbicide applied on 9 Apr	Rate of application	Herbicide applied on 1 June [b]	Rate of application	16 June	11 August
		lbs ai/acre		lbs ai/acre	----------%----------	
1	Prodiamine 4FL	0.38	Prodiamine 4FL	0.38	98 a [c]	95 a
2	Prodiamine 4FL	0.38	Pendimethalin 3.8	1.5	98 a	93 abc
3	Prodiamine 4FL	0.38	Dithiopyr 2EW	0.25	100 a	91 abc
4	Prodiamine 4FL	0.38	Untreated		94 ab	71 de
5	Pendimethalin 3.8	1.5	Prodiamine 4FL	0.38	99 a	94 ab
6	Pendimethalin 3.8	1.5	Pendimethalin 3.8	1.5	100 a	93 ab
7	Pendimethalin 3.8	1.5	Dithiopyr 2EW	0.25	100 a	96 a
8	Pendimethalin 3.8	1.5	Untreated		97 ab	64 ef
9	Dithiopyr 2EW	0.25	Prodiamine 4FL	0.38	98 a	93 ab
10	Dithiopyr 2EW	0.25	Pendimethalin 3.8	1.5	99 a	91 abc
11	Dithiopyr 2EW	0.25	Dithiopyr 2EW	0.25	100 a	97 a
12	Dithiopyr 2EW	0.25	Untreated		90 ab	51 fg
13	Untreated		Prodiamine 4FL	0.38	42 c	30 hi
14	Untreated		Pendimethalin 3.8	1.5	39 c	16 ij
15	Untreated		Dithiopyr 2EW	0.25	84 b	37 gh
16	Untreated		Untreated		0 d	0 j
17	Prodiamine 4FL	0.65 [d]			99 a	88 abcd
18	Pendimethalin 3.8	3.0			100 a	78 bcde
19	Dithiopyr 2EW	0.5			99 a	76 cde
20	Prodiamine 4FL	0.75 [d]			98 a	89 ab

[a] Crabgrass control was calculated as control=[(1-(crabgrass coverage in treated plot/crabgrass coverage in untreated check))*100].
[b] Treatments were a split application with the second application being 1 June.
[c] Within columns, means followed by the same letter are similar. In each case except Prodiamine 4FL at 0.75 lbs ai/A, the mean is of three replications across three years.
[d] Prodiamine 4FL was applied at the full rate of 0.75 lbs active ingredient per acre in 2010 and 2011, but not in 2009. In all three years Prodiamine 4FL was applied at the rate of 0.65 lbs active ingredient per acre, which was slightly less than the full rate based on a miscalculation in 2009.

Table 2. Crabgrass control from preemergence herbicide application timings and sequentially applied preemergence herbicides in West Lafayette, Indiana in 2010 and 2011.

	Crabgrass control [a]		
Herbicide application strategy	June	August	September
	----------%----------		
Preemergence timing: Preemergence herbicides (Prodiamine [b], Pendimethalin, and Dithiopyr) applied at label rate on 9 April	99 a [c]	82 b	73 b
Sequential timings: Preemergence herbicides (Prodiamine, Pendimethalin, and Dithiopyr) applied at half the label rate on 9 April and at half the label rate on 1 June	99 a	93 a	87 a

[a] Crabgrass control was calculated as control=[(1-(crabgrass coverage in treated plot/crabgrass coverage in untreated check))*100].
[b] Only the 0.75 lbs ai/acre rate was included in this analysis.
[c] Within columns, means followed by the same letter are similar.