Effect of Tenacity (Mesotrione) on Preemergence and Postemergence Efficacy of Crabgrass (Digitaria spp) at Various Rates, Maturity Stages and Herbicide Combinations – 2008.

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Introduction

Crabgrass (Digitaria spp) continues to be the key target among annual grassy weeds in Ohio and the Midwest in spring and summer. In the last few years, there appear to be more considerable breaks in preemergence control and more significant populations of crabgrass occurring in lawns and landscapes. The strategy for germinated and tillered crabgrass is defensive by the use of postemergence herbicides. The present arsenal of postemergence herbicides include fenoxyprop p-ethyl (Acclaim Extra), quinclorac (Drive), and Dithiopyr (Dimension). The latter postemergence herbicides are reasonably effective under certain conditions. For example, Acclaim Extra does not provide good efficacy on mature crabgrass and under low soil moisture conditions. Dimension provides best efficacy on non-tillered crabgrass. Drive has been reported to exhibit variability in crabgrass control due to possible reduced efficacy in the intermediate stage of crabgrass maturity. Thus, the lack of reliability in crabgrass control has been evident with all the latter post crabgrass herbicides at times. A new herbicide, Mesotrione (Tenacity) has been reported to exhibit both preemergence and postemergence crabgrass activity and this has been confirmed in several OSU research trials in 2006 – 2007.

Objectives

The objectives of several 2008 research trials were to: (1) determine the efficacy of Tenacity for preemergence crabgrass control (study I), (2) determine the efficacy of Tenacity as a postemergence herbicide at various stages of crabgrass maturity (study II), and (3) determine the efficacy of Tenacity as a postemergence herbicide in combination with other postemergence herbicides and a surfactant.

Materials and Methods

Three Tenacity efficacy studies were conducted in the summer of 2008 for crabgrass control at the Ohio Turfgrass Foundation Research and Educational Facility. The experimental areas were all verticut in several directions to significantly thin the turf and then overseeded in mid April with two pounds of crabgrass seed per one thousand square feet to ensure adequate crabgrass populations and pressure. The soil type on all the areas was a silty clay loam with a pH of 7.4. Mowing was performed two times per week at a height of two inches and clippings removed. Irrigation was provided on a frequent, every day basis during crabgrass germination and establishment and thereafter, three times per week. No other herbicides were applied to the crabgrass studies. All herbicide treatments were applied with a CO_2 pressurized sprayer equipped with two flat fan nozzles

delivering two gallons of liquid per one thousand square feet. All Tenacity treatments contained MSO surfactant at 0.25% v/v.

In study I percent crabgrass cover is reported on a scale of 0% to 100% with 0% = no crabgrass cover and 100% = complete crabgrass cover. In studies II and III percent crabgrass control is reported and rated on a scale of 0% to 100% with 0% representing no control and 100% representing complete control.

Study I was initiated on April 24, 2008 for evaluation of Tenacity as a preemergence herbicide. Tenacity was evaluated at several rates and sequential applications (Table 1). Tenacity treatments at all rates and sequential applications were split with and without Barricade (prodiamine) at 0.65 lbs ai/A. Repeat or sequential applications were made on May 13 (19 days after initial treatment – DAIT). The statistical design was a randomized complete block with ten treatments and each replicated three times.

Study II evaluated the efficacy of Tenacity for crabgrass control at four different maturity stages (Table 2). Tenacity treatments were made on (1) May 29 early-post 3-5 leaf, (2) June 11 mid-post 1-2 tiller, (3) June 24 mid-post 3-4 tiller with sequential applications on July 8, and (4) August 11 late-post 5-7 tiller and beyond with sequential applications on August 26. Tenacity rates were 4, 8, 12, or 16 oz/A with repeat/sequential applications of 4oz + 4 oz and 8oz + 8oz at the 3-4 tiller and 5-7 tiller stages and beyond (Table 2).

Study III evaluated the efficacy of Tenacity for crabgrass control in combination with Dimension (dithiopyr), Acclaim Extra (fenoxyprop p-ethyl), Drive (quinclorac), and one surfactant (Dawn Ultra). All treatments were applied on August 22, 2008. Crabgrass was in the 5-7 tiller stage and beyond. In addition to percent crabgrass control, discoloration was rated on a scale of 1-9 with 1 representing severe discoloration/browning and 9 representing no discoloration relative to the untreated check.

Results and Discussion

Study I (Preemergence Efficacy)

Preemergence herbicide efficacy of Tenacity is presented as percent crabgrass cover in Table 1. All Tenacity treatments were initially applied on April 24, alone and in combination with Barricade. In the untreated check, crabgrass emergence/cover became noticeable in mid to late May and increased rapidly in June and July. All Barricade treatments alone and in combination with Tenacity resulted in minimal crabgrass emergence/cover or excellent season-long crabgrass control.

Tenacity at 4 oz/A resulted in noticeable crabgrass emergence in late May (May 27 - Table 1) that was not much different from the untreated check. A repeat/sequential application of Tenacity alone at 4oz + 4oz/A resulted in a significant reduction in crabgrass emergence/cover through June (i.e. ≤ 6.7% cover), and a significant reduction in season-long control relative to Tenacity at 4oz/A alone and the untreated check.

Tenacity alone at 8oz/A resulted in no crabgrass emergence/cover until early June, providing 30-40 days of pre activity. Crabgrass cover however after early June increased rapidly at Tenacity 8oz/A alone and also did not differ much from Tenacity 4oz/A alone. Tenacity alone at 8oz + 8oz/A provided a significant reduction in crabgrass emergence/cover through June (i.e. ≤ 13.3% cover). Results were relatively similar to Tenacity alone at 4oz + 4oz/A throughout the July 15 rating period.

Study II evaluated the efficacy of Tenacity at four different crabgrass maturity stages (Table 2). Dates of application for each crabgrass maturity stage are provided in Table 2 footnotes.

At early post 3-5 leaf, Tenacity provided good postemergence crabgrass control (~ 80%) at 4oz/A and excellent crabgrass control at 8,12, and 16oz/A.

Crabgrass control at the 1-2 tiller mid-post stage was unacceptable with Tenacity at 4, 8, and 12oz/A but provided good control at the single Tenacity 16oz/A rate (i.e. ~ 80%).

Crabgrass control at the 3-4 tiller stage was good to excellent at both the multiple (sequential) Tenacity rates of 4oz + 4oz/A and 8oz + 8oz/A. Crabgrass control at the higher single rates of 12oz/A and 16oz/A was unacceptable.

Crabgrass control at the late-post 5-7 tiller stage was excellent at all Tenacity treatments at 2-3 weeks after application (i.e. 98-100%).

Study III evaluated the efficacy of Tenacity on late-post crabgrass in combination with several other postemergence herbicides and a single surfactant treatment (Dawn Ultra 1%). Both crabgrass efficacy and discoloration ratings are provided in Table 3. Tenacity alone at 5oz/A in a single treatment resulted in poor control. However, considerable whitening/bleaching of the crabgrass foliage was apparent. Herbicide efficacy of the Tenacity combinations with Dimension, Acclaim Extra and Drive were unacceptable with an overall average of between 40-50%. Discoloration ratings within a few weeks after application suggested that potential crabgrass control might occur so a second sequential application was not made. Surprisingly, the Tenacity + Dawn Ultra (1%v/v) combination resulted in excellent late postemergence crabgrass control (i.e. > 90%) in a single application.

Research is suggested for 2009 to evaluate treatment strategies to determine the efficacy of Tenacity at various crabgrass maturity stages and in combination with other herbicides, surfactants and other additives. The objective of an efficacious single postemergence application of Tenacity is a key objective. The Tenacity + Dawn Ultra combination needs to be reevaluated for both potential benefit to Tenacity efficacy and desirable species safety/phytotoxicity.

Table 1. Preemergence Crabgrass Control with Tenacity Alone or with Barricade[a]

Treatment	Rate oz/A	% Crabgrass Cover[b]					
		27-May	8-Jun	18-Jun	30-Jun	7-Jul	15-Jul
1. Untreated	--	13.3a[c]	43.3a	70.0a	71.7a	78.3a	85.0a
2. Untreated + Barricade[d]		6.7ab	0.0d	0.0f	0.0e	0.3e	1.7e
3. Tenacity	4	8.3ab	30.0b	56.7b	60.0b	75.0a	83.3a
4. Tenacity + Barricade	4	3.3ab	0.0d	0.0f	0.0e	0.0e	0.7e
5. Tenacity	4 + 4[e]	0.0b	4.0d	5.0e	6.7de	20.0d	21.7d
6. Tenacity + Barricade	4 + 4[e]	0.0b	0.0d	0.0f	0.0e	0.0e	0.0e
7. Tenacity	8	0.0b	21.7c	40.0c	50.0c	65.0b	75.0b
8. Tenacity + Barricade	8	0.0b	0.0d	0.0f	0.7e	0.7e	1.7e
9. Tenacity	8 + 8[e]	0.0b	4.0d	11.7d	13.3d	26.7c	28.3c
10. Tenacity + Barricade	8 + 8[e]	0.0b	0.0d	0.0f	0.0e	0.0e	0.7e
LSD[f]		10.8	8.0	3.4	8.5	5.3	5.9

[a] All initial treatments applied on April 24, 2008 prior to crabgrass germination

[b] Crabgrass cover was rated on a scale of 0% to 100% where 0 represents no crabgrass cover and 100 represents complete crabgrass cover

[c] Numbers followed by the same letter are not significantly different within columns

[d] Treatments were applied alone and in a split plot with Barricade applied at 0.65 lb ai/A

[e] Repeat applications made on May 13 (19 DAIT)

[f] LSD = 0.05

Table 2. Postemergence Crabgrass Control at Four Crabgrass Maturity Stages[a]

Treatment	Rate oz/A	% Crabgrass Control[b]					
Early-post 3-5 leaf		**10-Jun**	**18-Jun**	**28-Jun**	**7-Jul**	**15-Jul**	
1. Untreated	--	0.0c	0.0c	0.0c	0.0c	0.0c	
2. Tenacity	4	88.0b	88.0b	78.0b	79.3b	77.3b	
3. Tenacity	8	100.0a	100.0a	99.7a	99.7a	99.3a	
4. Tenacity	12	100.0a	100.0a	100.0a	100.0a	99.3a	
5. Tenacity	16	100.0a	100.0a	100.0a	100.0a	100.0a	
LSD		0	0	8.6	6.2	8.0	
Mid-post 1-2 tiller		**20-Jun**	**25-Jun**	**30-Jun**	**7-Jul**	**15-Jul**	**28-Jul**
6. Untreated	--	0.0a	0.0c	0.0c	0.0b	0.0b	0.0d
7. Tenacity	4	0.0a	0.0c	47.7b	66.7a	61.0a	33.0c
8. Tenacity	8	0.0a	22.0b	54.7b	68.7b	53.3a	44.3bc
9. Tenacity	12	0.0a	26.7b	57.0b	71.0a	57.0a	52.0b
10. Tenacity	16	0.0a	57.0a	82.7a	81.3a	78.3a	79.3a
LSD		0	11.9	20.1	17.8	28.8	13.9
Mid-post 3-4 tiller		**30-Jun**	**7-Jul**	**15-Jul**	**28-Jul**	**10-Aug**	
11. Untreated	--	0.0b	0.0b	0.0c	0.0d	0.0d	
12. Tenacity	4+4[c]	0.0b	0.0b	77.0b	81.3b	83.3b	
13. Tenacity	8+8	0.0b	21.0b	100.0a	100.0a	99.7a	
14. Tenacity	12	6.7a	46.7a	66.7b	56.0c	53.0c	
15. Tenacity	16	8.3a	55.7a	77.0b	52.3c	52.3c	
LSD		3.4	22.9	14.3	6.1	12.5	
Late-post 5-7 tiller and beyond		**18-Aug**	**25-Aug**	**1-Sep**	**5-Sep**	**12-Sep**	
16. Untreated	--	0.0c	0.0c	0.0d	0.0c	0.0c	
17. Tenacity	4+4[d]	0.0c	20.0b	23.3c	98.7b	98.7b	
18. Tenacity	8+8	0.0c	36.7a	43.3b	100.0a	100.0a	
19. Tenacity	12	11.7b	43.3a	63.3a	98.7b	98.7b	
20. Tenacity	16	21.7a	50.0a	70.0a	100.0a	100.0a	
LSD		2.9	13.5	7.9	0.6	0.6	

a. Early postemergence treatments applied May 29, 2008 at 35-40% crabcover, 1-2 tiller on June 11 at 65-70% crabcover ,3-4 tiller on June 24 at 75-80% crabcover, and 5-7 tiller and beyond on August 11 at 75 - 80% crabcover

b. Crabgrass control rated on a scale of 0% to 100% where 0 represents no crabgrass kill or control and 100 represents complete crabgrass kill or control.

c. Sequential (repeat) applications at 3-4 tiller stage applied July 8.

d. Sequential applications at 5-7 tiller and beyond applied on August 26.

Table 3. Tenacity and Tenacity Herbicide Combinations on Late Postemergence Crabgrass Control - 2008[a]

Treatment[b]	Rate oz/A	% Crabgrass Control [c]						
		26-Aug	31-Aug	6-Sep	12-Sep	17-Sep	23-Sep	29-Sep
Tenacity	5	0.0a (9)[d]	3.3b (6)	16.7c (5.3)	21.7d (5)	13.3d (7)	10.0d (8)	10.0d (8)
Tenacity + Dimension	5 + 16	0.0a (9)	5.0b (6)	23.3c (4.7)	46.7c (3.3)	43.3c (3)	43.3c (3.3)	43.3c (3.3)
Tenacity + Acclaim Extra	5 + 20	0.0a (9)	10.0b (6)	33.3b (5)	43.3c (4)	43.3c (4)	40.0c (5)	43.3c (5)
Tenacity + Drive	5 + 8	0.0a 6.3)	41.7a (4.3)	63.3a (4)	66.7b (4)	63.3b (6)	53.3b (5.7)	53.3b (5.7)
Tenacity + Dawn Ultra	5 + 1%	0.0a (9)	0.0b (7)	70.0a (3.7)	86.7a (2.7)	91.7a (2)	91.7a (1)	93.3a (1)
Dawn Ultra Alone	1%	0.0a (9)	0.0b (9)	0.0d (9)	0.0e (9)	0.0e (9)	0.0e (9)	0.0e (8)
Untreated	--	0.0a (9)	0.0b (9)	0.0d (9)	0.0e (9)	0.0e (9)	0.0e (9)	0.0e (9)
LSD[f]		0	10.1	9.1	14.4	10.1	8.9	9.5

[a] All treatments were initiated on August 22, 2008 with crabgrass cover uniformly 95% and at the 5 to 7 tiller stage and beyond

[b] All treatments contained MSO surfactant at 0.25 % v/v

[c] Crabgrass control was rated on a scale of 0% to 100% with 0 representing no crabrass control/kill and 100% representing complete crabgrass control/kill

[d] Discoloration ratings are provided in parentheses on a scale of 1 to 9 with 1 representing severe discoloration browning and 9 representing no discoloration relative to the untreated check