

Table of Contents

2011/2012 Fall Spring Tall Fescue Seedhead Suppression Trial 1
2012 Guardrail Trial in Paintsville 7
2012 Bareground Trial on I-65 near Sonora..... 9
2012 Johnsongrass Control Trials.....11
Sidewalk Crack Vegetation Control17

2011/2012 Fall Spring Tall Fescue Seedhead Suppression Trial

Introduction

Seasonal management of cool season grasses in rights-of-way includes mowing and herbicide applications to meet safety and aesthetic requirements. Application of plant growth regulators (PGRs) to suppress seedhead development and growth can reduce the number of time consuming and costly mowings. Some herbicides also have seedhead suppression effects, depending on the rate and timing of application. However, these products can injure the turf causing discoloration, which is undesirable but in many cases is temporary. These products are normally applied in the spring, before seedhead emergence. Can fall applications also result in seedhead suppression the following spring?

Materials and Methods

For the second year, a trial was established at Spindletop Research Farm in Lexington KY with 21 treatments and 3 replications arranged in a randomized complete block design. Plots were 10 ft by 30 ft with running unsprayed checks (5 ft) between each of the plots. The treatment list included 10 products or tank mixes applied in the fall (December 3, 2011) and the same 10 treatments applied in the spring (March 27, 2012) plus an unsprayed control. All applications were at 20 gallons per acre and included a non-ionic surfactant at 0.25% v/v. Table 1 lists the herbicide treatments with their active ingredients and application rates. The manufacturer (Dow AgroSciences) has asked that we only identify the compound as GF-2703 in treatments 8 and 18. In most treatments a synthetic auxin (2,4-D, aminopyralid, or aminocyclopyrachlor) was included to increase the weed control spectrum but also as a “safener” to reduce damage to the grasses. Many of the treatments included metsulfuron methyl as the herbicide with seedhead suppression activity. There was a 5 fold difference in application rate between treatments 1 & 11 and 10 & 20. Metsulfuron methyl suppresses seedheads in tall fescue but not in other cool season grasses like orchard grass. The Plateau and Stronghold treatments are industry standards for seedhead suppression and growth reduction.

The tall fescue was 9 inches tall (2 green leaves per tiller) at the fall application and 12 inches, with 3 green leaves per tiller, at the spring application. At the fall application there was also buckhorn plantain at 4 inches and red clover at 4 inches. At the spring application the orchard grass was 10 to 13 inches tall while the Kentucky bluegrass was at 7 inches. The red clover was at 8 inches and buckhorn plantain was 6 to 8 inches tall.

Visual percent seedhead density was assessed by comparison to the running check strips 16 (4/12/2012), 31 (4/27/2012), 54 (5/20/2012), and 83 (6/18/2012) days after spring application (DASA). Tall fescue color was assessed by comparison to the running check strips 16, 31, 54, and 83 DASA. The color rating ranges from 0 (dead) to 9 (full green). The color of the check strips was set at 8. Canopy and seedhead heights were measured at all assessment dates. Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at $p = 0.05$.

Results and Discussion

There were no visible seedheads 16 DASA, seedheads were beginning to emerge 31 DASA, and were fully emerged 54 DASA (Table 2). The spring applications resulted in greater seedhead suppression than the fall applications (Table 2) in both years (previous trial results not shown here). Fall applications of four effective treatments ranged from 92 to 73% seedhead suppression (8 to 27% seedhead density) 54 DASA. These were Opensight without a safener (Trt. 4), Plateau (Trt. 5), GF-2703 (Trt. 8) and Streamline (Trt. 10). These same four treatments applied in the spring reduced seedheads from 100 to 85% (0 to 15% seedhead density) 54 DASA. The two spring applied treatments with 100% tall fescue seedhead suppression, in both years, were GF-2703 + aminopyralid (Trt. 18) and imazapic + 2,4-D (Trt. 15). Whether or not less than complete seedhead suppression is acceptable and a mowing cycle can be avoided would depend on factors such as the other grass species present and the degree of broadleaf weed control.

Most of the treatments effective at seedhead suppression also resulted in lower green color ratings (Table 3). 16 DASA Trt. 14 (Opensight without extra safener) had lower color ratings than Trt. 13 (Opensight with 2,4-D as safener). Green color of the two most effective spring applied treatments (Trt. 15 & 18) was less than the check strips 16 and 31 DASA. Sometimes turf that has been seedhead suppressed exhibits deeper green color later in the season. This was the case for the spring applied Plateau treatment (Trt. 15) 83 DASA.

Non-Crop and Invasive Vegetation Management Weed Science
2012 Annual Research Report

Table 1. Treatments, Active Ingredients and Application Rates for Tall Fescue Seedhead Suppression Trial

Trt. No.	Product Name	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)
1 & 11	Escort XP Formula 40	0.2 2	OZ/A QT/A	metsulfuron methyl 2,4-D amine	0.12 oz 1.84 lb ae
2 & 12	Opensight Formula 40	2 1	OZ/A PT/A	aminopyralid + metsulfuron methyl 2,4-D amine	1.05 oz ae + 0.19 oz 0.46 lb ae
3 & 13	Opensight Formula 40	2.5 1	OZ/A PT/A	aminopyralid + metsulfuron methyl 2,4-D amine	1.31 oz ae + 0.24 oz 0.46 lb ae
4 & 14	Opensight	2.5	OZ/A	aminopyralid + metsulfuron methyl	1.31 oz ae + 0.24 oz
5 & 15	Plateau Formula 40	4 2	FL OZ/A QT/A	imazapic 2,4-D amine	1.00 oz ae 1.84 lb ae
6 & 16	Stronghold Hi-Dep IVM	12 2	FL OZ/A QT/A	mefluidide + imazethapyr + imazapyr 2,4-D amine	2.20 oz ae + 0.53 oz ae + 0.01 oz ae 1.90 lb ae
7 & 17	Roundup Pro Formula 40	6 2	FL OZ/A QT/A	glyphosate 2,4-D amine	2.26 oz ae 1.84 lb ae
8 & 18	GF-2703 Milestone VM	0.57 7	OZ/A FL OZ/A	aminopyralid	0.29 oz 1.76 oz ae
9 & 19	Perspective	4.76	OZ/A	aminocyclopyrachlor + chlorsulfuron	1.89 oz + 0.75 oz
10 & 20	Streamline	4.76	OZ/A	aminocyclopyrachlor + metsulfuron methyl	1.89 oz + 0.60 oz

Table 2. Treatments, Tall Fescue Heights and Seedhead Densities for Tall Fescue Seedhead Suppression Trial

Trt. No.	Product Name	Rate	Rate Unit	Application Timing	Tall Fescue Height (in)				Tall Fescue Seedhead (%)			
					16 DASA	31 DASA	54 DASA	83 DASA	16 DASA	31 DASA	54 DASA	83 DASA
1	Escort XP Formula 40	0.2 2	OZ/A QT/A	Fall	10 <i>bcd</i>	16 <i>ab</i>	46 <i>a</i>	47 <i>abcd</i>	0	12 <i>a</i>	100 <i>a</i>	100 <i>a</i>
2	Opensight Formula 40	2 1	OZ/A PT/A	Fall	10 <i>bc</i>	18 <i>a</i>	44 <i>ab</i>	47 <i>abcd</i>	0	12 <i>a</i>	100 <i>a</i>	100 <i>a</i>
3	Opensight Formula 40	2.5 1	OZ/A PT/A	Fall	10 <i>bcd</i>	16 <i>ab</i>	43 <i>ab</i>	48 <i>abc</i>	0	5 <i>abc</i>	100 <i>a</i>	100 <i>a</i>
4	Opensight	2.5	OZ/A	Fall	10 <i>bc</i>	14 <i>abc</i>	41 <i>abc</i>	47 <i>abcd</i>	0	3 <i>abc</i>	27 <i>ef</i>	27 <i>de</i>
5	Plateau Formula 40	4 2	FL OZ/A QT/A	Fall	8 <i>f</i>	11 <i>bcde</i>	41 <i>abcd</i>	43 <i>bcde</i>	0	2 <i>bc</i>	12 <i>fg</i>	17 <i>efgh</i>
6	Stronghold Hi-Dep IVM	12 2	FL OZ/A QT/A	Fall	9 <i>bcde</i>	15 <i>abc</i>	41 <i>abcd</i>	48 <i>abc</i>	0	3 <i>abc</i>	93 <i>a</i>	97 <i>a</i>
7	Roundup Pro Formula 40	6 2	FL OZ/A QT/A	Fall	10 <i>ab</i>	18 <i>a</i>	45 <i>ab</i>	51 <i>a</i>	0	10 <i>ab</i>	100 <i>a</i>	100 <i>a</i>
8	GF-2703 Milestone VM	0.57 7	OZ/A FL OZ/A	Fall	9 <i>cdef</i>	8 <i>de</i>	39 <i>abcde</i>	44 <i>abcd</i>	0	0 <i>c</i>	8 <i>fg</i>	20 <i>ef</i>
9	Perspective	4.76	OZ/A	Fall	9 <i>bcdef</i>	14 <i>abc</i>	41 <i>abc</i>	42 <i>cde</i>	0	5 <i>abc</i>	87 <i>ab</i>	77 <i>b</i>
10	Streamline	4.76	OZ/A	Fall	9 <i>bcdef</i>	10 <i>bcde</i>	31 <i>efg</i>	45 <i>abcd</i>	0	3 <i>abc</i>	18 <i>fg</i>	18 <i>efg</i>
11	Escort XP Formula 40	0.2 2	OZ/A QT/A	Spring	10 <i>bcd</i>	14 <i>abcd</i>	40 <i>abcd</i>	47 <i>abcd</i>	0	2 <i>bc</i>	93 <i>a</i>	100 <i>a</i>
12	Opensight Formula 40	2 1	OZ/A PT/A	Spring	8 <i>def</i>	8 <i>de</i>	37 <i>bcdef</i>	40 <i>defg</i>	0	0 <i>c</i>	70 <i>bc</i>	77 <i>b</i>
13	Opensight Formula 40	2.5 1	OZ/A PT/A	Spring	8 <i>def</i>	9 <i>cde</i>	36 <i>bcdef</i>	41 <i>def</i>	0	1 <i>c</i>	53 <i>cd</i>	50 <i>c</i>
14	Opensight	2.5	OZ/A	Spring	8 <i>f</i>	7 <i>e</i>	26 <i>g</i>	36 <i>efg</i>	0	0 <i>c</i>	15 <i>fg</i>	13 <i>efgh</i>
15	Plateau Formula 40	4 2	FL OZ/A QT/A	Spring	8 <i>ef</i>	7 <i>e</i>	6 <i>h</i>	17 <i>h</i>	0	0 <i>c</i>	0 <i>g</i>	2 <i>gh</i>
16	Stronghold Hi-Dep IVM	12 2	FL OZ/A QT/A	Spring	8 <i>f</i>	7 <i>e</i>	29 <i>fg</i>	36 <i>efg</i>	0	0 <i>c</i>	5 <i>g</i>	8 <i>fgh</i>
17	Roundup Pro Formula 40	6 2	FL OZ/A QT/A	Spring	8 <i>f</i>	7 <i>e</i>	32 <i>defg</i>	36 <i>efg</i>	0	0 <i>c</i>	42 <i>de</i>	40 <i>cd</i>
18	GF-2703 Milestone VM	0.57 7	OZ/A FL OZ/A	Spring	8 <i>ef</i>	7 <i>e</i>	6 <i>h</i>	9 <i>i</i>	0	0 <i>c</i>	0 <i>g</i>	0 <i>h</i>
19	Perspective	4.76	OZ/A	Spring	8 <i>def</i>	6 <i>e</i>	33 <i>cdefg</i>	34 <i>fg</i>	0	0 <i>c</i>	5 <i>g</i>	10 <i>efgh</i>
20	Streamline	4.76	OZ/A	Spring	8 <i>def</i>	7 <i>e</i>	26 <i>g</i>	34 <i>g</i>	0	0 <i>c</i>	5 <i>g</i>	7 <i>fgh</i>
21	Nontreated Check				12 <i>a</i>	15 <i>abc</i>	43 <i>a</i>	50 <i>ab</i>	0	2 <i>bc</i>	100 <i>a</i>	100 <i>a</i>

* * * * ns * *

Abbreviations: DASA: Days After Spring Application

** Means within column followed by the same letter are not different according to Fisher's Protected LSD at $P < 0.05$.*

ns Means within column followed by the same letter are not different according to Fisher's LSD at $P < 0.05$.

All herbicide treatments contained the adjuvant, Activator 90 at 0.25% v/v.

Non-Crop and Invasive Vegetation Management Weed Science
2012 Annual Research Report

Table 3: Tall Fescue Color Ratings for Tall Fescue Seedhead Suppression Trial

Trt. No.	Product Name	Rate	Rate Unit	Application Timing	Tall Fescue Color (0-9)			
					16 DASA	31 DASA	54 DASA	83 DASA
1	Escort XP Formula 40	0.2 2	OZ/A QT/A	Fall	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>ab</i>	8.0 <i>b</i>
2	Opensight Formula 40	2 1	OZ/A PT/A	Fall	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>ab</i>	8.0 <i>b</i>
3	Opensight Formula 40	2.5 1	OZ/A PT/A	Fall	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>ab</i>	8.0 <i>b</i>
4	Opensight	2.5	OZ/A	Fall	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>ab</i>	8.0 <i>b</i>
5	Plateau Formula 40	4 2	FL OZ/A QT/A	Fall	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>ab</i>	8.0 <i>b</i>
6	Stronghold Hi-Dep IVM	12 2	FL OZ/A QT/A	Fall	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>ab</i>	8.0 <i>b</i>
7	Roundup Pro Formula 40	6 2	FL OZ/A QT/A	Fall	7.7 <i>ab</i>	8.0 <i>a</i>	8.0 <i>ab</i>	8.0 <i>b</i>
8	GF-2703 Milestone VM	0.57 7	OZ/A FL OZ/A	Fall	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>ab</i>	8.0 <i>b</i>
9	Perspective	4.76	OZ/A	Fall	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>ab</i>	8.0 <i>b</i>
10	Streamline	4.76	OZ/A	Fall	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>ab</i>	8.0 <i>b</i>
11	Escort XP Formula 40	0.2 2	OZ/A QT/A	Spring	7.3 <i>bc</i>	7.7 <i>ab</i>	8.0 <i>ab</i>	8.0 <i>b</i>
12	Opensight Formula 40	2 1	OZ/A PT/A	Spring	7.7 <i>ab</i>	7.0 <i>bc</i>	8.0 <i>ab</i>	8.0 <i>b</i>
13	Opensight Formula 40	2.5 1	OZ/A PT/A	Spring	7.7 <i>ab</i>	6.7 <i>c</i>	8.0 <i>ab</i>	8.0 <i>b</i>
14	Opensight	2.5	OZ/A	Spring	7.0 <i>cd</i>	6.3 <i>cd</i>	8.0 <i>ab</i>	8.0 <i>b</i>
15	Plateau Formula 40	4 2	FL OZ/A QT/A	Spring	7.3 <i>bc</i>	4.3 <i>e</i>	8.3 <i>a</i>	8.3 <i>a</i>
16	Stronghold Hi-Dep IVM	12 2	FL OZ/A QT/A	Spring	7.0 <i>cd</i>	6.7 <i>c</i>	8.0 <i>ab</i>	8.0 <i>b</i>
17	Roundup Pro Formula 40	6 2	FL OZ/A QT/A	Spring	6.0 <i>f</i>	5.7 <i>d</i>	8.0 <i>ab</i>	8.0 <i>b</i>
18	GF-2703 Milestone VM	0.57 7	OZ/A FL OZ/A	Spring	6.7 <i>de</i>	6.3 <i>cd</i>	7.0 <i>c</i>	8.0 <i>b</i>
19	Perspective	4.76	OZ/A	Spring	7.3 <i>bc</i>	6.3 <i>cd</i>	7.7 <i>b</i>	8.0 <i>b</i>
20	Streamline	4.76	OZ/A	Spring	6.3 <i>ef</i>	4.3 <i>e</i>	8.0 <i>ab</i>	8.0 <i>b</i>
21	Nontreated Check				8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>ab</i>	8.0 <i>b</i>

Abbreviations: DASA: Days After Spring Application

Means within column followed by the same letter are not different according to Fisher's Protected LSD at P < 0.05.

Note: Color of unsprayed check strips was set at 8.0 (0 = dead and 9 = full green)

All herbicide treatments contained the adjuvant, Activator 90 at 0.25% v/v.

2012 Guardrail Trial in Paintsville

Introduction

For highway safety, guardrails need to be kept clear of visual obstructions. Usually that means maintaining a vegetation free zone underneath them. Applications of broad spectrum residual herbicides have become the mainstay for bareground maintenance operations in combination with a broad spectrum post-emergent herbicide like glyphosate. Ideally, the pre-emergent herbicides will last season long and not move off site, through leaching or erosion (movement of soil particles with adsorbed herbicide). A number of new products (Perspective, Viewpoint, Esplanade) have recently been introduced to this market. Evaluating the efficacy of these products and product combinations in comparison with older products is an ongoing effort.

Materials and Methods

The trial was established under and beside guardrail on KY 1107 along Levisa Fork near Paintsville, KY with 13 treatments and 3 replications arranged in a randomized complete block design. On April 25, 2012, treatments were applied at 25 gallons/acre with a spray swath on either side of the guardrail for a plot width of 6.5 ft and length of 12 ft (two areas between guardrail posts per plot). All herbicide treatments, except Trt. 1 (Roundup ProMax by itself), included Activator 90 at 0.25% v/v (Table 1). Roundup ProMax (glyphosate) has no residual activity so the other herbicides in the combinations were included to provide residual and pre-emergent control. The weeds present at application included perennial grasses (tall fescue), buckhorn plantain, and flowering Philadelphia fleabane. Visual % bareground ratings were taken 40 (6/4/2012), 85 (7/19/2012), and 160 (10/2/2013) days after treatment (DAT). Weeds present 160 DAT included large crabgrass, foxtails, buckhorn plantain, fleabane, and spurge. Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at $p = 0.05$.

Results and Discussion

All treatments had more bareground than the control 40 DAT (Table 1) while the Roundup ProMax treatment by itself (Trt. 1) was the same as the control 85 and 160 DAT. The treatment with only Oust XP (sulfometuron) as the residual (Trt. 4) was one of the least efficacious 160 DAT. This is the herbicide that has been used for many years at this location. Treatments with older, high use rate herbicides (Trt. 2 with Sahara (diuron + imazapyr); Trt. 3 with Hyvar (bromacil); Trt. 6 with Pendulum (pendimethalin); Trt. 9 with Endurance (prodiamine)) were among the best treatments 85 and 160 DAT. Treatments 6 and 9 were combinations with newer, low use rate herbicides (Milestone (aminopyralid) and Perspective (aminocyclopyrachlor + chlorsulfuron)). The other top treatments 160 DAT were low use rate herbicides by themselves or as combinations. They were Trt. 5 with Payload (flumioxazin); Trt. 8 with Perspective (aminocyclopyrachlor + chlorsulfuron) and Esplanade (indaziflam), and Trt. 12 with Esplanade (indaziflam) and Oust (sulfometuron).

Non-Crop and Invasive Vegetation Management Weed Science
2012 Annual Research Report

Table 1: Treatments and Results from 2012 Paintsville Guardrail Trial

Trt. No.	Product Name	Rate	Rate Unit	% Bareground		
				40 DAT	85 DAT	160 DAT
1	Roundup ProMax	1.3	QT/A	92 <i>b</i>	47 <i>d</i>	57 <i>ef</i>
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	99 <i>a</i>	96 <i>a</i>	81 <i>abc</i>
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	98 <i>a</i>	97 <i>a</i>	90 <i>ab</i>
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	97 <i>ab</i>	81 <i>c</i>	68 <i>de</i>
5	Roundup ProMax Payload	1.3 12	QT/A OZ/A	98 <i>ab</i>	95 <i>a</i>	83 <i>abc</i>
6	Roundup ProMax Pendulum AquaCap Milestone VM	1.3 4 7	QT/A QT/A FL OZ/A	97 <i>ab</i>	95 <i>a</i>	86 <i>ab</i>
7	Roundup ProMax Journey Milestone VM	1 1 7	QT/A QT/A FL OZ/A	96 <i>ab</i>	85 <i>bc</i>	78 <i>bcd</i>
8	Roundup ProMax Perspective Esplanade	1.3 9 3.5	QT/A OZ/A FL OZ/A	97 <i>ab</i>	96 <i>a</i>	92 <i>a</i>
9	Roundup ProMax Perspective Endurance	1.3 9 2.3	QT/A OZ/A LB/A	97 <i>ab</i>	96 <i>a</i>	90 <i>a</i>
10	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	97 <i>ab</i>	92 <i>ab</i>	78 <i>bcd</i>
11	Roundup ProMax Arsenal	1.3 4	QT/A PT/A	98 <i>ab</i>	83 <i>bc</i>	72 <i>cd</i>
12	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	96 <i>ab</i>	93 <i>ab</i>	85 <i>ab</i>
13	Nontreated Check			53 <i>c</i>	47 <i>d</i>	45 <i>f</i>

Means within a column followed by the same letter are not different according to Fisher's Protected LSD at P < 0.05. All herbicide treatments (except trt. #1) contained the adjuvant, Activator 90 at 0.25% v/v.

2012 Bareground Trial on I-65 near Sonora

Introduction

Maintaining vegetation free zones in areas such as electrical substations, under guardrails and along railway right-of-way is required for safety reasons. Applications of broad spectrum residual herbicides have become the mainstay for bareground maintenance operations in combination with a broad spectrum post-emergent herbicide like glyphosate. Ideally, the pre-emergent herbicides will last season long and not move off site, through leaching or erosion. A number of new products (Perspective, Viewpoint, Esplanade) have recently been introduced to this market. Evaluating the efficacy of these products and product combinations in comparison with older products is an ongoing effort.

Materials and Methods

This trial was established on May 17, 2012 along I-65 near Sonora on a former rest area with 13 treatments and 3 replications arranged in a randomized complete block design. Treatments were applied at 25 gallons /acre onto 5 ft by 20 ft plots with 5 ft wide unsprayed strips between each of the plots. The warm season bermudagrass turf had recently been mowed and was 6 to 8 inches tall at application. All herbicide treatments, except Trt. 1 (Roundup ProMax by itself), included Activator 90 at 0.25% v/v (Table 1). Roundup ProMax (glyphosate) has no residual activity so the other herbicides in the combinations were included to provide residual and pre-emergent control. Vegetation control was assessed 67 (7/23/2012) days after treatment (DAT) while the proportion of bareground was rated 140 (10/4/2013) DAT. Weeds present, other than the bermudagrass, included johnsongrass, giant foxtail, yellow foxtail, sweet clover, wild carrot, and common ragweed. Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at $p = 0.05$.

Results and Discussion

A number of treatments were not effective at controlling the warm season bermudagrass 67 DAT (Table 1) and were not different from the control. The most effective treatments included Hyvar (bromacil) (Trt. 3); Oust (sulfometuron) (Trt. 4); and Arsenal (imazapyr) (Trt. 11). However, the only effective treatments 140 DAT were Hyvar (Trt. 3) and Arsenal (Trt. 11). While many of the treatments and treatment rates in this trial may be effective on cool season turf, other combinations and rates are required for bareground control when starting with warm season bermudagrass turf .

Non-Crop and Invasive Vegetation Management Weed Science
2012 Annual Research Report

Table 1: Treatments and Results from Sonora Bareground Trial

Trt. No.	Product Name	Rate	Rate Unit	% Vegetation Control		% Bareground	
				67 DAT	140 DAT		
1	Roundup ProMax	1.3	QT/A	28	<i>cde</i>	12	<i>b</i>
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	57	<i>bc</i>	8	<i>b</i>
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	99	<i>a</i>	68	<i>a</i>
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	70	<i>ab</i>	18	<i>b</i>
5	Roundup ProMax Payload	1.3 12	QT/A OZ/A	4	<i>de</i>	0	<i>b</i>
6	Roundup ProMax Pendulum AquaCap Milestone VM	1.3 4 7	QT/A QT/A FL OZ/A	8	<i>de</i>	0	<i>b</i>
7	Roundup ProMax Journey Milestone VM	1 1 7	QT/A QT/A FL OZ/A	48	<i>bc</i>	12	<i>b</i>
8	Roundup ProMax Perspective Esplanade	1.3 9 3.5	QT/A OZ/A FL OZ/A	12	<i>de</i>	2	<i>b</i>
9	Roundup ProMax Perspective Endurance	1.3 9 2.3	QT/A OZ/A LB/A	28	<i>cde</i>	3	<i>b</i>
10	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	37	<i>bcd</i>	5	<i>b</i>
11	Roundup ProMax Arsenal	1.3 4	QT/A PT/A	98	<i>a</i>	80	<i>a</i>
12	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	50	<i>bc</i>	18	<i>b</i>
13	Nontreated Check			0	<i>e</i>	0	<i>b</i>

Means within a column followed by the same letter are not different according to Fisher's Protected LSD at $P < 0.05$. All herbicide treatments (except trt. #1) contained the adjuvant, Activator 90 at 0.25% v/v.

2012 Johnsongrass Control Trials

Introduction

Johnsongrass is a perennial warm season grass, listed as a noxious weed, and a common problem on right-of-way sites. There are a number of herbicides labeled and available to control johnsongrass but some are nonselective or are selective for johnsongrass but can still damage desirable cool season turf, like tall fescue. One of the more selective herbicides is Fusion but a label change has made it unavailable for use on right-of-way sites. These trials were established to evaluate a range of control/suppression options (alternatives to Fusion) and how they affected tall fescue.

Materials and Methods

Trials were established July 18, 2012 at Spindletop Research Farm and at the Hwy 27/29 interchange south of Nicholasville. The trials had 15 treatments and 3 replications arranged in a randomized complete block design with 5 ft by 30 ft plots. Application was at 30 gallons /acre. At Spindletop, the johnsongrass was 12 to 20 inches tall with most of the plots at 12 inches and overall, about 10% of plants had emerged seedheads. At the Hwy 27/29 interchange, the plants were larger and had greater differences in growth among the plots and more vigorous growth overall than at Spindletop. They ranged in height from 12 to 36 inches, with 2/3 of plots at 12 inches and no heading while 1/3 were at 36 inches and 70% heading. These plots did not include tall fescue so a fescue damage trial was established Aug. 6, 2012 at Spindletop Research Farm. The plots were 5 ft x 20 ft with 5 ft unsprayed strips between each of the plots. The tall fescue canopy was at 7 inches (2 green fully expanded leaves per tiller). It was slower to resume growth after the drought than the johnsongrass so this trial was established later than the johnsongrass control trials. Johnsongrass control was assessed 23 (8/10/2012), 64 (9/20/2012), and 356 (7/9/2013) days after treatment (DAT) at Spindletop and 23, 64, and 348 (7/1/2013) DAT at the Hwy 27/29 interchange. Tall fescue damage (0 = dead to 9 = fully green; with unsprayed strips set at 8.0) was assessed 15 (8/21/2012), 31 (9/6/2012), 70 (10/15/2012), and 284 (5/17/2013) DAT. Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at $p = 0.05$.

Table 1 lists the treatments, active ingredients and application rates. The 2011 Fusion label rates for selective control of johnsongrass were 7 to 9 fl oz per acre (Trt. 1 & 2). The Fusilade II label has repeated applications at 6 fl oz per acre to suppress johnsongrass in fine turf (Trt. 3). Trt. 4 is double this rate. The Acclaim Extra label lists 20 fl oz per acre to control seedling johnsongrass 12 – 24 inches tall (Trt. 5); 39 fl oz per acre to control rhizome johnsongrass 24 to 60 inches tall (Trt. 6); and a combination of Acclaim and Fusilade for improved turfgrass tolerance to control rhizome johnsongrass 10 to 25 inches tall (Trt. 7). The Outrider label rates for selective control in tall fescue turf are 0.75 to 1 oz per acre (Trt. 8 & 9). Roundup (Trt. 10) and Journey (Trt. 13) are non-selective. Clearcast (Trt. 11) has an aquatic label and may be used close to waterways. The high rate of Plateau in Trt. 12 will severely damage tall fescue. Pastora (Trt. 14) is only labeled for warm season pastures.

Results and Discussion

At Spindletop all the treatments controlled johnsongrass to some extent 64 and 356 DAT (Table 2). The most effective treatments 64 DAT were the 2X Fusilade (Trt. 4), both Outrider treatments (Trt. 8 & 9), Clearcast (Trt. 11), Plateau (Trt. 12), and Journey (Trt. 13), ranging from 75 to 94%. The most effective treatments 348 DAT were one of the Outrider (0.75 oz/ac) (63%) (Trt. 8) and Journey (92%) (Trt. 13).

Similarly, at the Hwy 27/29 interchange all the treatments controlled johnsongrass to some extent 64 and 348 DAT (Table 3). The most effective treatments 64 DAT were Plateau (90%) (Trt. 12) and Journey (92%) (Trt. 13). These were still the most effective treatments 348 DAT along with the high Outrider rate (1oz/ac) treatment (Trt. 9). Many of the treatments were not as efficacious on the larger and more vigorous johnsongrass plants at this location as they were at Spindletop.

Severe fescue damage was evident 15 DAT with the Roundup, Clearcast and Journey treatments (Trt. 10, 11, 13) (Table 4) and became more severe for these treatments 31 DAT. The Pastora treatment (Trt. 14) was also exhibiting damage 31 DAT although the fescue had recovered somewhat by 70 DAT while the other three treatments still had severe damage. By 284 DAT, there were no color differences among the treatments but stand density may not have fully recovered.

Non-Crop and Invasive Vegetation Management Weed Science
2012 Annual Research Report

Table 1. Treatments and Active Ingredients for Johnsongrass Control Trials

Trt. No.	Product Name	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	1.75 oz + 0.49 oz
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	2.25 oz + 0.63 oz
3	Fusilade II Activator 90	6 0.25	FL OZ/A % V/V	fluazifop	1.5 oz
4	Fusilade II Activator 90	12 0.25	FL OZ/A % V/V	fluazifop	3 oz
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	fenoxaprop	1.4 oz
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	fenoxaprop	2.78 oz
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	fenoxaprop fluazifop	0.5 oz 3.5 oz
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	sulfosulfuron	0.563 oz
9	Outrider Activator 90	1 0.25	OZ/A % V/V	sulfosulfuron	0.75 oz
10	Roundup ProMax	22	FL OZ/A	glyphosate	12.4 oz ae
11	Clearcast MSO	32 1	FL OZ/A % V/V	imazamox	4 oz ae
12	Plateau MSO	8 1	FL OZ/A % V/V	imazapic	2 oz ae
13	Journey MSO	21.3 1	FL OZ/A % V/V	imazapic + glyphosate	2 oz ae + 4 oz ae
14	Pastora Activator 90	1 0.25	OZ/A % V/V	nicosulfuron + metsulfuron	0.562 oz + 0.15 oz
15	Nontreated Check				

Non-Crop and Invasive Vegetation Management Weed Science
2012 Annual Research Report

Table 2: Treatments and Results for Johnsongrass Control Trial at Spindletop

Trt. No.	Product Name	Rate	Rate Unit	% Control		
				23 DAT	64 DAT	356 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	22 <i>fg</i>	45 <i>e</i>	10 <i>ef</i>
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	63 <i>ab</i>	57 <i>cde</i>	58 <i>bc</i>
3	Fusilade II Activator 90	6 0.25	FL OZ/A % V/V	53 <i>abcd</i>	40 <i>e</i>	37 <i>bcde</i>
4	Fusilade II Activator 90	12 0.25	FL OZ/A % V/V	50 <i>abcde</i>	75 <i>abcd</i>	58 <i>bc</i>
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	53 <i>abcd</i>	52 <i>de</i>	45 <i>bcd</i>
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	62 <i>abc</i>	53 <i>de</i>	30 <i>cdef</i>
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	57 <i>abc</i>	57 <i>cde</i>	23 <i>def</i>
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	40 <i>bcdef</i>	88 <i>ab</i>	63 <i>ab</i>
9	Outrider Activator 90	1 0.25	OZ/A % V/V	27 <i>defg</i>	82 <i>abc</i>	55 <i>bc</i>
10	Roundup ProMax	22	FL OZ/A	35 <i>cdef</i>	45 <i>e</i>	33 <i>bcde</i>
11	Clearcast MSO	32 1	FL OZ/A % V/V	23 <i>efg</i>	85 <i>ab</i>	53 <i>bcd</i>
12	Plateau MSO	8 1	FL OZ/A % V/V	53 <i>abcd</i>	93 <i>ab</i>	53 <i>bcd</i>
13	Journey MSO	21.3 1	FL OZ/A % V/V	70 <i>a</i>	94 <i>a</i>	92 <i>a</i>
14	Pastora Activator 90	1 0.25	OZ/A % V/V	38 <i>bcdef</i>	67 <i>bcde</i>	30 <i>cdef</i>
15	Nontreated Check			0 <i>g</i>	0 <i>f</i>	0 <i>g</i>

Means within a column followed by the same letter are not different according to Fisher's Protected LSD at P < 0.05.

Non-Crop and Invasive Vegetation Management Weed Science
2012 Annual Research Report

Table 3: Treatments and Results for Johnsongrass Control Trial at Hwy 27/29 Interchange

Trt. No.	Product Name	Rate	Rate Unit	% Control		
				23 DAT	64 DAT	348 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	48 <i>abcd</i>	23 <i>cd</i>	5 <i>ef</i>
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	45 <i>abcde</i>	15 <i>d</i>	13 <i>cdef</i>
3	Fusilade II Activator 90	6 0.25	FL OZ/A % V/V	37 <i>cde</i>	8 <i>d</i>	3 <i>f</i>
4	Fusilade II Activator 90	12 0.25	FL OZ/A % V/V	38 <i>bcde</i>	57 <i>b</i>	10 <i>cdef</i>
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	23 <i>def</i>	2 <i>d</i>	8 <i>def</i>
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	23 <i>def</i>	7 <i>d</i>	7 <i>def</i>
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	72 <i>a</i>	42 <i>bc</i>	15 <i>cdef</i>
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	38 <i>bcde</i>	58 <i>b</i>	23 <i>cdef</i>
9	Outrider Activator 90	1 0.25	OZ/A % V/V	25 <i>def</i>	57 <i>b</i>	57 <i>ab</i>
10	Roundup ProMax	22	FL OZ/A	25 <i>def</i>	8 <i>d</i>	32 <i>bcde</i>
11	Clearcast MSO	32 1	FL OZ/A % V/V	67 <i>ab</i>	60 <i>b</i>	37 <i>bc</i>
12	Plateau MSO	8 1	FL OZ/A % V/V	42 <i>bcde</i>	90 <i>a</i>	80 <i>a</i>
13	Journey MSO	21.3 1	FL OZ/A % V/V	58 <i>abc</i>	92 <i>a</i>	83 <i>a</i>
14	Pastora Activator 90	1 0.25	OZ/A % V/V	18 <i>ef</i>	53 <i>b</i>	33 <i>bcd</i>
15	Nontreated Check			0 <i>f</i>	0 <i>d</i>	0 <i>f</i>

Means within a column followed by the same letter are not different according to Fisher's Protected LSD at P < 0.05.

Non-Crop and Invasive Vegetation Management Weed Science
2012 Annual Research Report

Table 4: Treatments and Results for Fescue Damage Trial at Spindletop

Trt. No.	Product Name	Rate	Rate Unit	Tall Fescue Color (0-9)			
				15 DAT	31 DAT	70 DAT	284 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>a</i>	8.0
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	8.0 <i>a</i>	7.8 <i>a</i>	8.0 <i>a</i>	8.0
3	Fusilade II Activator 90	6 0.25	FL OZ/A % V/V	7.7 <i>a</i>	7.3 <i>ab</i>	7.7 <i>a</i>	8.0
4	Fusilade II Activator 90	12 0.25	FL OZ/A % V/V	7.5 <i>a</i>	7.7 <i>ab</i>	8.0 <i>a</i>	8.0
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	7.8 <i>a</i>	8.0 <i>a</i>	8.0 <i>a</i>	8.0
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	7.5 <i>a</i>	8.0 <i>a</i>	8.0 <i>a</i>	8.0
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	7.7 <i>a</i>	7.8 <i>a</i>	8.0 <i>a</i>	8.0
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	7.5 <i>a</i>	7.7 <i>ab</i>	8.0 <i>a</i>	8.0
9	Outrider Activator 90	1 0.25	OZ/A % V/V	7.5 <i>a</i>	7.2 <i>ab</i>	7.8 <i>a</i>	8.0
10	Roundup ProMax	22	FL OZ/A	4.3 <i>c</i>	2.7 <i>d</i>	2.0 <i>c</i>	8.0
11	Clearcast MSO	32 1	FL OZ/A % V/V	5.8 <i>b</i>	5.0 <i>c</i>	6.0 <i>b</i>	8.0
12	Plateau MSO	8 1	FL OZ/A % V/V	7.3 <i>a</i>	7.2 <i>ab</i>	7.7 <i>a</i>	8.0
13	Journey MSO	21.3 1	FL OZ/A % V/V	6.2 <i>b</i>	5.0 <i>c</i>	6.5 <i>b</i>	8.0
14	Pastora Activator 90	1 0.25	OZ/A % V/V	7.3 <i>a</i>	6.7 <i>b</i>	7.8 <i>a</i>	8.0
15	Nontreated Check			8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>a</i>	8.0

Means within a column followed by the same letter are not different according to Fisher's Protected LSD at P < 0.05.

Sidewalk Crack Vegetation Control Trial

Introduction

One of the maintenance tasks at locations such as highway rest areas is to keep sidewalk and parking lot expansion joints aesthetically pleasing and clear of vegetation. One can use glyphosate repeatedly during the season but including a residual herbicide should increase the period of control and reduce labor costs. However, because these are public areas, with greater opportunity for direct exposure, one may not be able to use some herbicides used for bareground control along roadsides. There are a number of pre-mixed products on the market such as Roundup Extended Control plus Weed Preventer, DuraZone, and Ground Clear (Table 1). This trial compares the efficacy of some of these products with mixtures of herbicides used for right-of-way applications.

Materials and Methods

The trial was established June 3, 2012 with 9 treatments and 3 replications arranged in a randomized complete block design, along I-71 near Carrollton on an abandoned parking lot. Plots were 25 ft long expansion joints in the pavement and the spray width was 0.5 ft at 150 gallons /acre. The canopy was 5 to 8 inches tall and the grasses already had mature seedheads while the green vegetation consisted of ragweed, black medic, and spurge. The proportion of the “crack” without green vegetation (% bareground) was assessed 50 (7/23/2012), 143 (10/24/2012), and 429 (8/6/2013) days after treatment (DAT). Unfortunately, part of the trial was covered up by piles of ground up asphalt at the last assessment.

Since some of the applied herbicide may be washed off the sidewalk to adjacent desirable turf areas, a turf damage stripe plot trial was established the same day with 6 treatments and 3 replications. Plots were 0.5 ft x 10 ft and treatments were applied at 75 gallons/acre. The tall fescue canopy was at 11 to 12 inches and seedheads had already emerged. Turf damage (0 = dead to 9 = fully green; with unsprayed strips set at 8.0) was assessed on the same dates as above. Data were analyzed using ARM software and treatment means were compared using Fisher’s LSD at $p = 0.05$.

Table 1 presents information on three commercial products for vegetation control. Roundup Extended Control and DuraZone both include diquat to provide rapid visual symptoms on green vegetation. These treatments are included in the trial along with combinations that result in the same active ingredient application rates except that diquat was not included (Trt. 2 and 3; Trt. 4 and 5) (Table 2). Trt. 6 (Table 2) applies the same active ingredients as Ground Clear in Table 1. Treatments 7 and 8 are combinations used for bareground control. Table 3 lists the treatments for the turf damage trial as some of the residual herbicides may wash off the site of application onto adjacent turf.

Results

All treatments provided control 50 and 143 DAT (Table 2). By 143 DAT, three treatments had greater control than glyphosate by itself (Trt. 1). These were the treatments including Esplanade (indaziflam)

Non-Crop and Invasive Vegetation Management Weed Science
2012 Annual Research Report

(Trt. 5), Arsenal (imazapyr) (Trt. 6), and Karmex (diuron) (Trt. 7). When assessed 429 DAT, the treatment with Oust (sulfometuron) (Trt. 8) was the only one with less vegetation than untreated.

All the treatments damaged the turf 50 DAT except for Esplanade (Table 3). This treatment did not show turf damage at any assessment and this is probably because it has no post-emergence activity. The most severe damage 50 DAT was with the Arsenal and Karmex treatments. The Arsenal plots had dead turf 50 DAT and minimal regrowth 429 DAT. The choice of product or mixture should consider the efficacy, cost, risk of off-site damage, and any label restrictions on site of application.

Non-Crop and Invasive Vegetation Management Weed Science
2012 Annual Research Report

Table 1: Information on Commercial Products for Vegetation Control

Roundup Extended Control plus Weed Preventer (concentrate)

Control up to 4 months, may enter area after dried

32 fl oz container can treat 1600 sq. ft. (use 6 fl oz per gallon water)

Application equivalent to 145 gallons/acre

Active Ingredient	Rate per acre	Notes
glyphosate	9 lb ae	
diquat dibromide	7.1 oz	15 oz/ac max.
imazapic	3 oz ae	equivalent to max. annual application of Plateau

DuraZone (from Bayer Advanced)

Control up to 6 months, may enter area after dried

24 fl oz container can treat 1500 sq. ft. (use 8 fl oz per gallon water)

Application equivalent to 93 gallons/acre

Active Ingredient	Rate per acre	Notes
glyphosate	8 lb ae	
diquat dibromide	7.4 oz	15 oz/ac max.
indaziflam	0.75 oz	1.5 oz/ac max. single application (Esplanade is non-crop product)

Ground Clear (from Ortho)

Control up to 1 year

32 fl oz container can treat 75 sq. ft. (add qt. to 1 gallon water and treat)

Application equivalent to 726 gallons/acre

Active Ingredient	Rate per acre	Notes
glyphosate	44 lb ae	
imazapyr	11.7 oz ae	equivalent to 3 pt/ac Habitat

Non-Crop and Invasive Vegetation Management Weed Science
 2012 Annual Research Report

Table 2: Treatments and Results for Sidewalk Crack Vegetation Control Trial

Trt. No.	Product Name	Rate	Rate Unit	% Bareground		
				50 DAT	143 DAT	429 DAT
1	Roundup ProMax	2	GAL/A	86 a	78 b	58 ab
2	Roundup Extended Control	6.8	GAL/A	99.7 a	87 ab	70 ab
3	Roundup ProMax Plateau Activator90	2 12 0.25	GAL/A FL OZ/A %V/V	100 a	85 ab	53 ab
4	Dura Zone	5.45	GAL/A	99.7 a	88 ab	60 ab
5	Roundup ProMax Esplanade Activator90	2 3.6 0.25	GAL/A FL OZ/A %V/V	100 a	98 a	38 ab
6	Roundup ProMax Arsenal Activator90	2 3 0.25	GAL/A PT/A %V/V	100 a	96 a	55 ab
7	Roundup ProMax Karmex DF Activator90	2 10 0.25	GAL/A LB/A %V/V	100 a	99 a	68 ab
8	Roundup ProMax Oust XP Activator90	2 3 0.25	GAL/A OZ/A %V/V	100 a	91 ab	77 a
9	Nontreated Check			30 b	33 c	30 b

* * ns

* Means within column followed by the same letter are not different according to Fisher's Protected LSD at $P < 0.05$.

ns Means within column followed by the same letter are not different according to Fisher's LSD at $P < 0.05$.

Non-Crop and Invasive Vegetation Management Weed Science
2012 Annual Research Report

Table 3: Treatments and Results for Turf Damage Stripe Plot Trial

Trt. No.	Product Name	Rate	Rate Unit	Grass Color (0-9)		
				50 DAT	143 DAT	429 DAT
1	Plateau Activator90	12 0.25	FL OZ/A %V/V	6.0 <i>bc</i>	7.3 <i>ab</i>	7.0 <i>ab</i>
2	Esplanade Activator90	3.6 0.25	FL OZ/A %V/V	7.0 <i>ab</i>	8.0 <i>a</i>	8.0 <i>a</i>
3	Arsenal Activator90	3 0.25	PT/A %V/V	1.3 <i>d</i>	0.0 <i>d</i>	0.7 <i>c</i>
4	Karmex DF Activator90	10 0.25	LB/A %V/V	1.0 <i>d</i>	5.3 <i>c</i>	6.7 <i>b</i>
5	Oust XP Activator90	3 0.25	OZ/A %V/V	5.3 <i>c</i>	7.0 <i>b</i>	7.0 <i>ab</i>
6	Nontreated Check			8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>a</i>

Means within column followed by the same letter are not different according to Fisher's Protected LSD at P < 0.05.