Noncrop and Invasive Vegetation Management Weed Science

2015 Annual Research Report

UNIVERSITY
OF KENTUCKY

College of Agriculture
Department of Plant and Soil Sciences

J.A. Omielan and M. Barrett

University of Kentucky
College of Agriculture
Department of Plant and Soil Sciences
Lexington, KY 40546-0312

INFORMATION NOTE 2015 NCVM-1

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Forward

The information provided in this document represents a collaborative effort between the Roadside Environment Branch of the Kentucky Transportation Cabinet and the Department of Plant and Soil Sciences in the College of Agriculture at the University of Kentucky. The main priority of this project was to collect and disseminate information to the KTC REB to increase the efficiency of operations aimed at roadside environment management.

This report contains a summary of research conducted during the 2015 season. This document is primarily for the use of the Kentucky Transportation Cabinet. Other use is allowable if the authors are given proper credit.

Direct any questions, concerns, complaints, or praise regarding this publication to:

Dr. Joe Omielan
Research Scientist I

Dr. Michael Barrett
Professor, Weed Science

University of Kentucky
College of Agriculture
Department of Plant and Soil Science
105 Plant Science Building
Lexington, KY 40546-0312
859-257-5020

Acknowledgements

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Other personnel in the Weed Science group who also aided in this project in terms of labor, equipment, and ideas include Charlie Slack, Sara Carter, Dr. J.D. Green, and Dr. Jim Martin. Appreciation is also given to the farm crews at Spindletop Research Station for equipment and plot maintenance.

I owe a special thank you to everyone who helped and supported me (Joe) during my recovery after the operation in the early spring. Without your help and support I would not have been able to complete this field season. Thank-you!!

We could not have performed the research without the generous contributions of products. Contributors of products used include:

BASF Corporation
Bayer Crop Science
Dow AgroSciences
DuPont
Nufarm
PBI Gordon

We received external funding for research projects from Dow AgroSciences LLC. The financial support of this organization is greatly appreciated.

We sincerely appreciate the effort and continued support of all our cooperators and look forward to future endeavors.

Species List

The following is a list of plant species discussed in the following document.

Scientific Name	Common Name
Ambrosia artemisiifolia L.	Common Ragweed
Ambrosia trifida L.	Giant Ragweed
Daucus carota L.	Wild Carrot
Digitaria sanguinalis (L.) Scop.	Large Crabgrass
Erigeron canadensis (L.) Cronquist	Marestail
Festuca arundinaceum (Schreb.) S.J. Darbyshire	Tall Fescue
Iva annua L.	Annual Marsh Elder
Lespedeza cunueata (Dum. Cours.) G. Don	Sericea Lespedeza
Medicago lupulina L.	Black Medic
Pueraria montana (Lour.) Merr.	Kudzu
Setaria faberi Herrm.	Giant Foxtail
Setaria pumila (Poir.) Roem. & Schult.	Yellow Foxtail
Sorghastrum nutans (L.) Nash	Indian Grass
Sorghum halepense (L.) Pers.	Johnsongrass

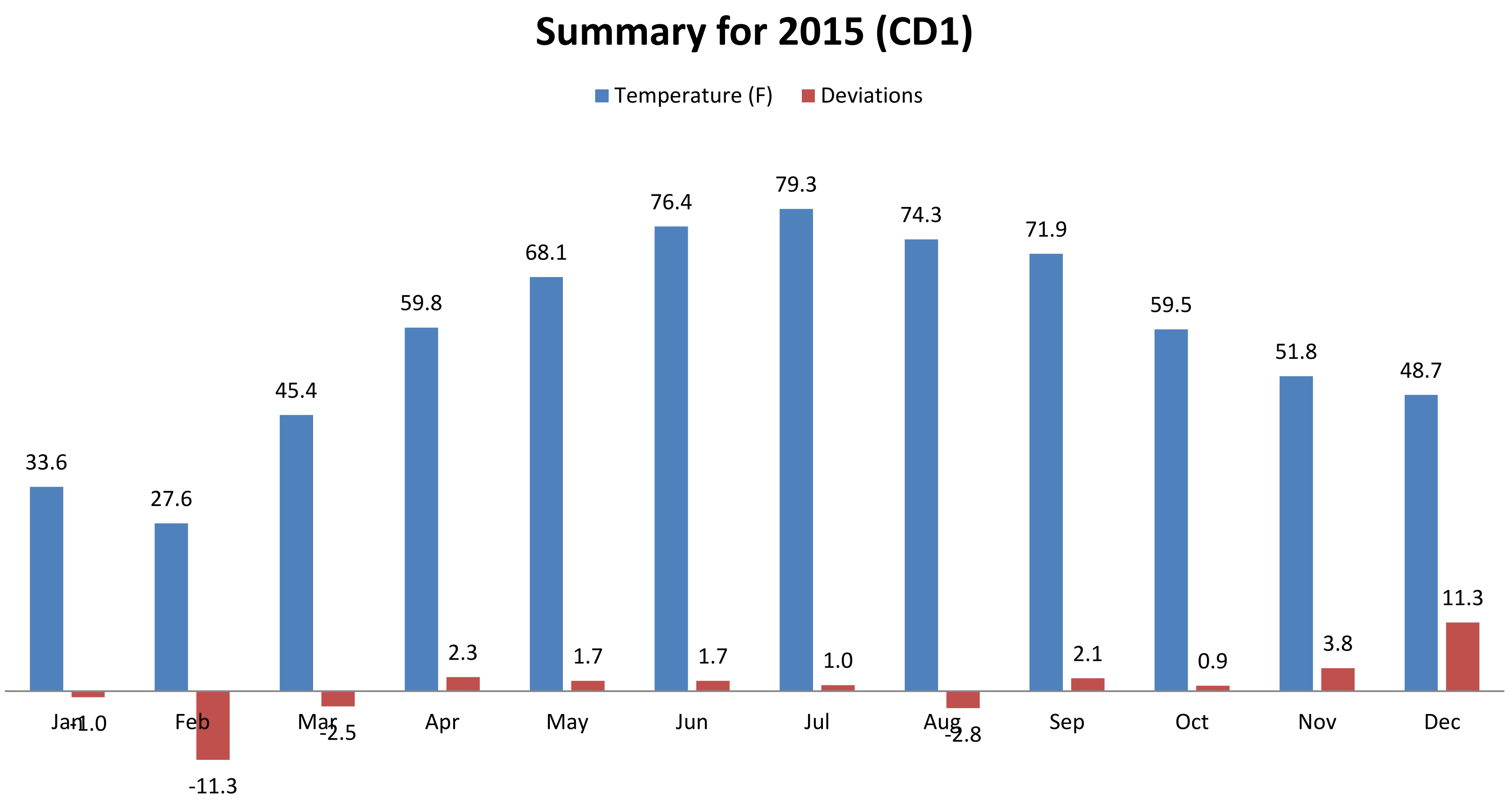
Herbicide List

The following is a list of herbicides discussed in the following document.

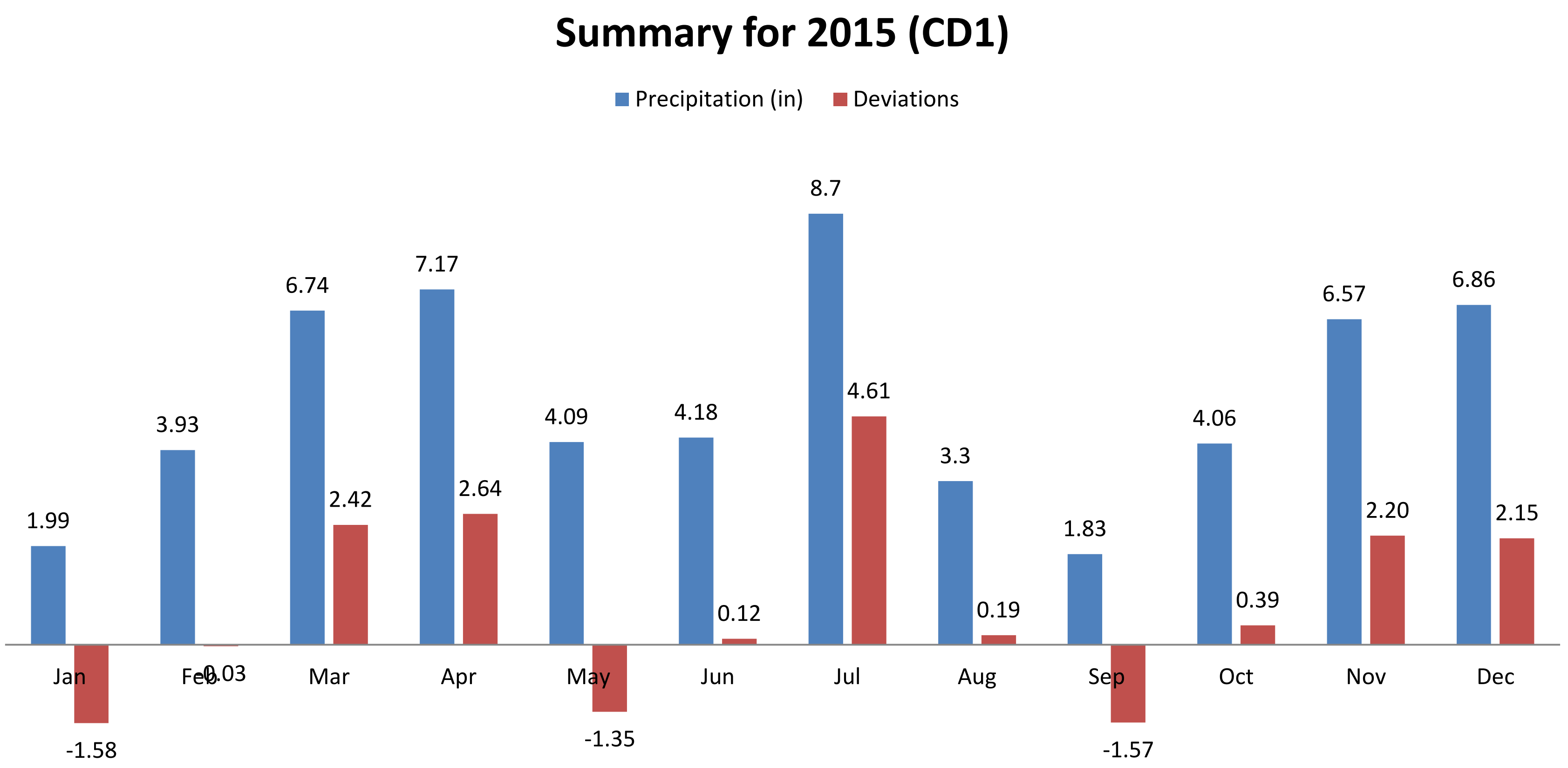
Product	Active Ingredient(s)	Concentration	Manufacturer
Acclaim Extra	fenoxaprop	0.57 lb per gallon	Bayer
Aneuw	prohexadione calcium	27.5% w/w	Nufarm
BK 800	2,4-D + 2,4-DP + dicamba	1.89 lb ae + 0.94 lb ae + 0.47 lb ae per gallon	PBI Gordon
Embark 2-S	mefluidide	2.0 lb ae per gallon	PBI Gordon
Escort XP	metsulfuron	60% w/w	DuPont
Esplanade	indaziflam	1.67 lb per gallon	Bayer
Formula 40	2,4-D	3.67 lb ae per gallon	Nufarm
Fusilade II	fluazifop	2 lb per gallon	Syngenta
Garlon 3A	triclopyr amine	3 lb ae per gallon	Dow AgroSciences
Garlon 4 Ultra	triclopyr ester	4 lb ae per gallon	Dow AgroSciences
Milestone VM	aminopyralid	2 lb ae per gallon	Dow AgroSciences
Opensight	aminopyralid + metsulfuron	0.525 lb ae + 0.0945 lb ae per gallon	Dow AgroSciences
Oust XP	sulfometuron	75% w/w	DuPont
Outrider	sulfosulfuron	75% w/w	Monsanto
PastureGard HL	triclopyr + fluroxypyr	3.0 lb ae + 1.0 lb ae per gallon	Dow AgroSciences
Patron 170	2.4-D + 2,4-DP	1.71 lb ae + 0.87 lb ae per gallon	Nufarm
Plateau	imazapic	2 lb ae per gallon	BASF
Rodeo	glyphosate	4 lb ae per gallon	Dow AgroSciences
Roundup ProMax	glyphosate	4.5 lb ae per gallon	Monsanto
Streamline	aminocyclopyrachlor + metsulfuron methyl	39.5% + 12.6% w/w	DuPont
Stronghold	mefluidide + imazethapyr + imazapyr	1.46 lb ae + 0.35 lb ae + 0.01 lb ae per gallon	PBI Gordon
Transline	clopyralid	3 lb ae per gallon	Dow AgroSciences

Map of Kentucky Climate Divisions

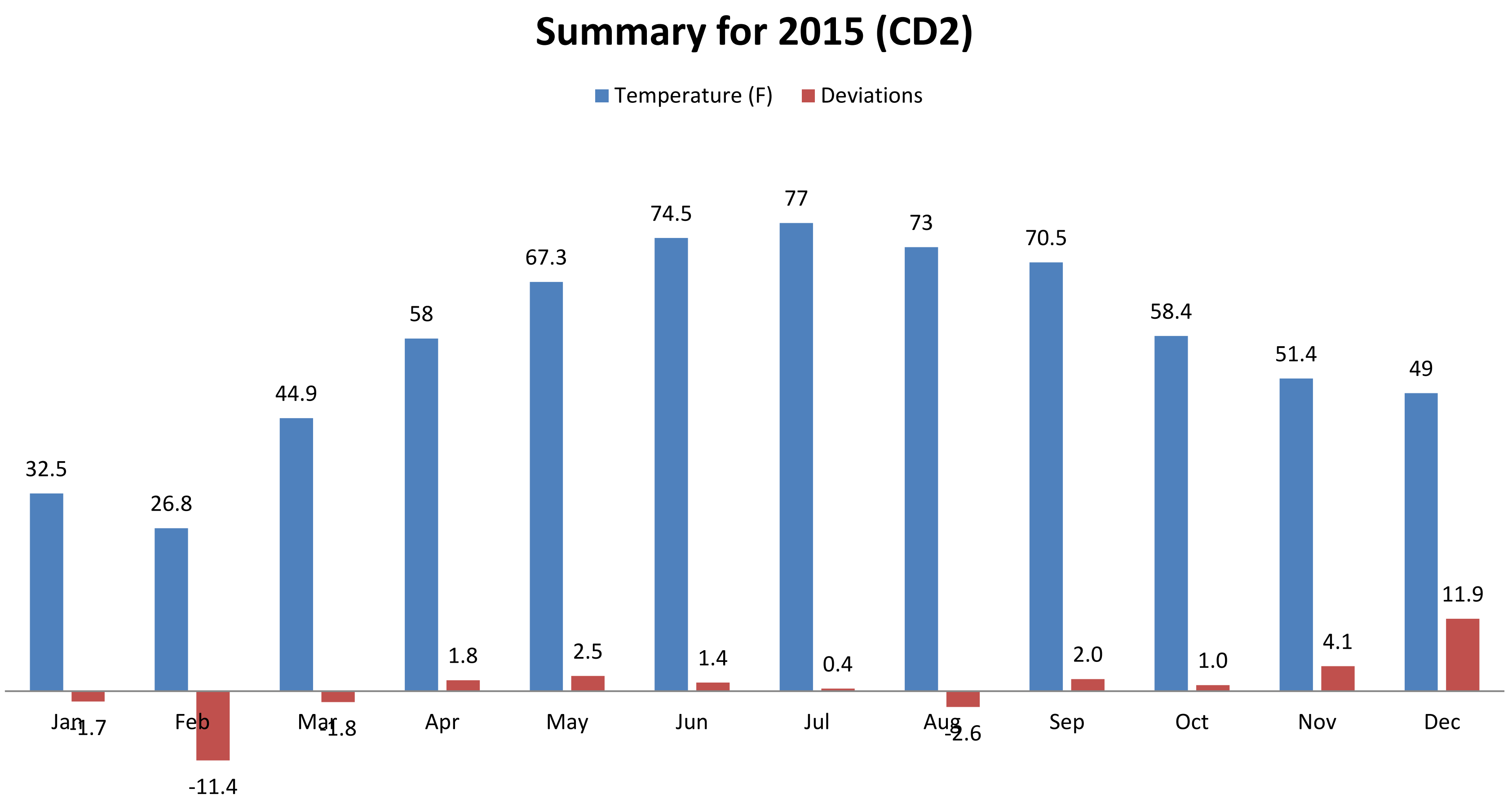
Western Region (CD1) Monthly Temperatures and Deviations from Normal (UKWAC)



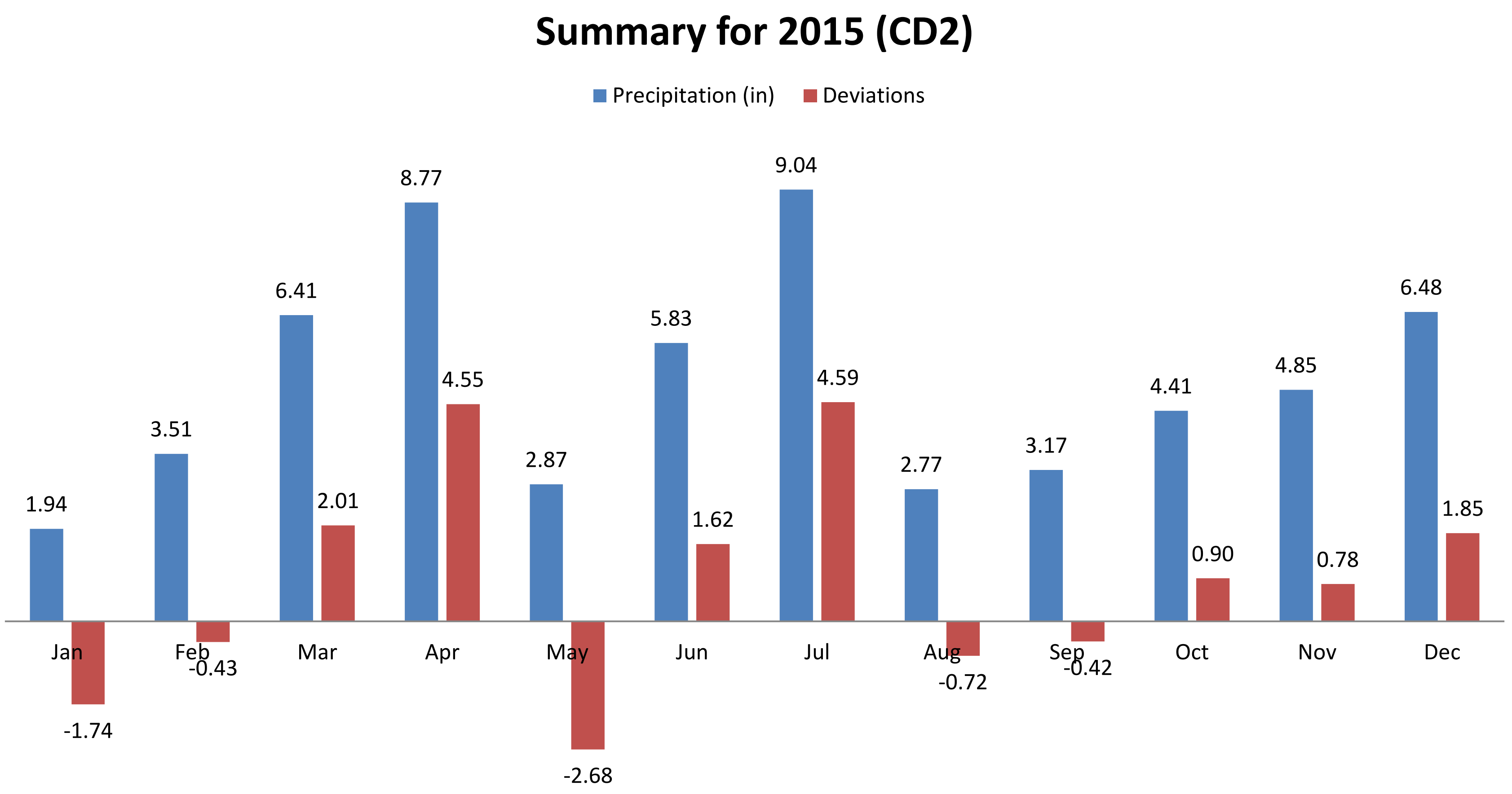
Western Region (CD1) Monthly Precipitation and Deviations from Normal (UKWAC)



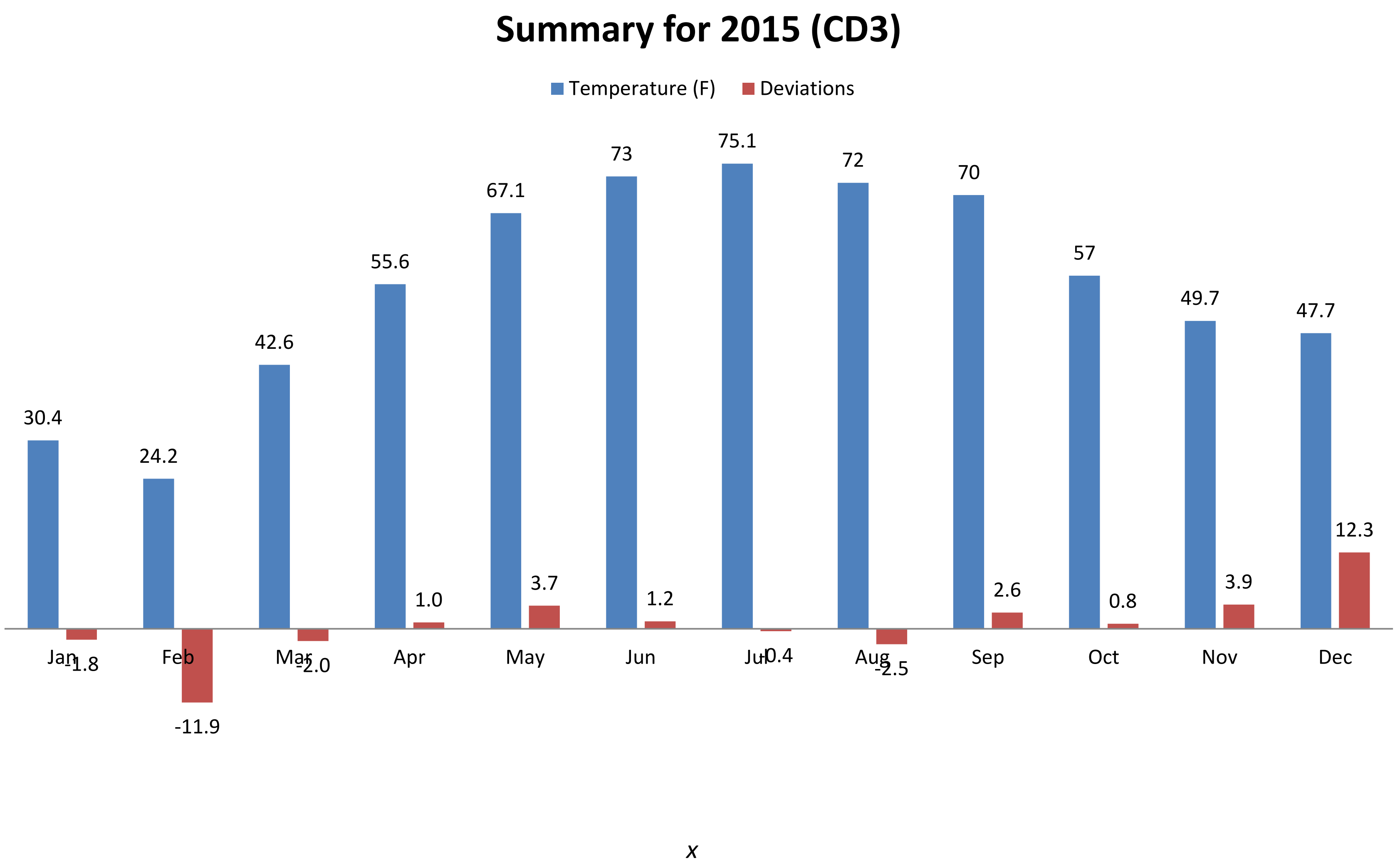
Central Region (CD2) Monthly Temperatures and Deviations from Normal (UKWAC)



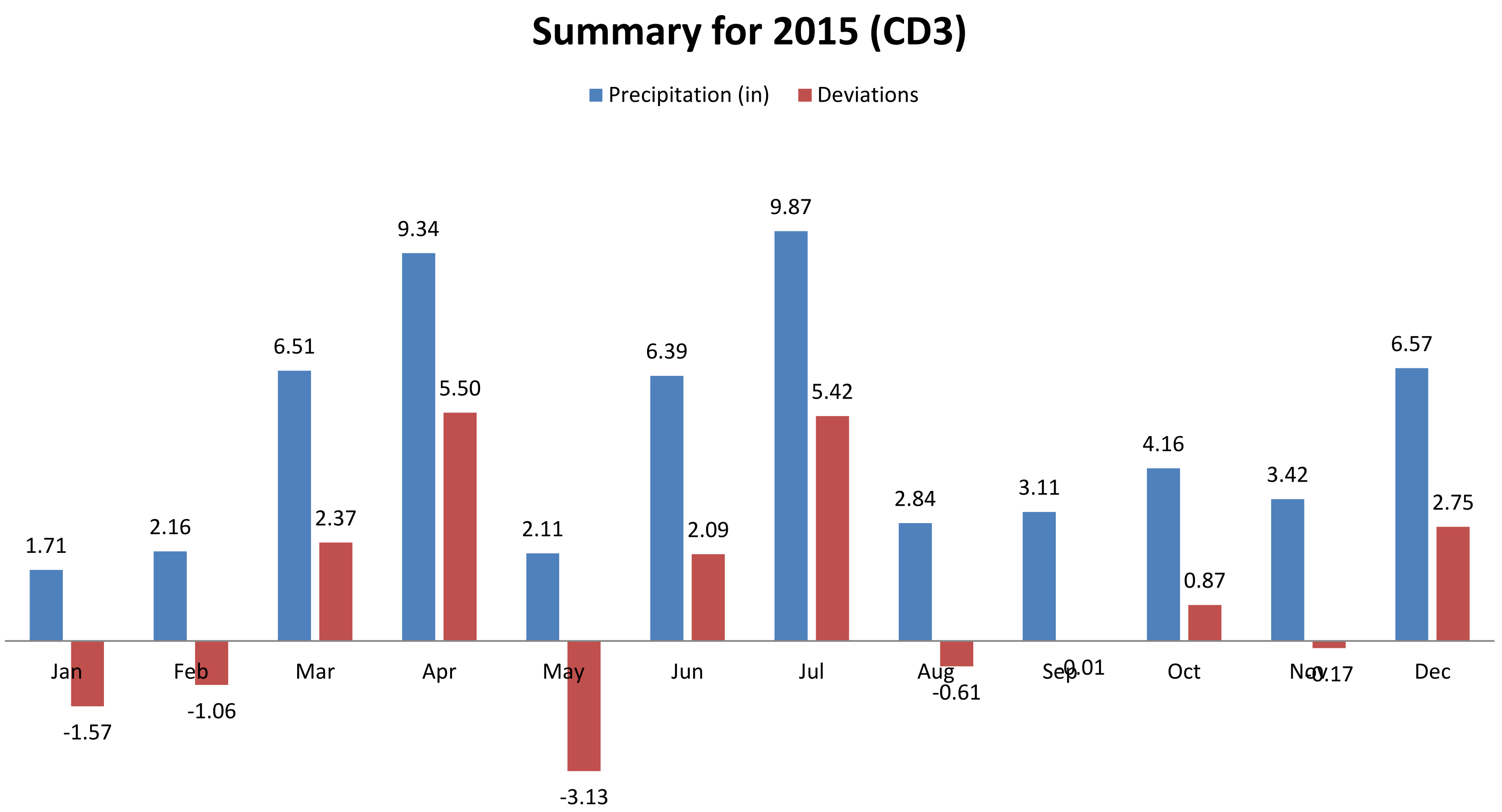
Central Region (CD2) Monthly Precipitation and Deviations from Normal (UKWAC)



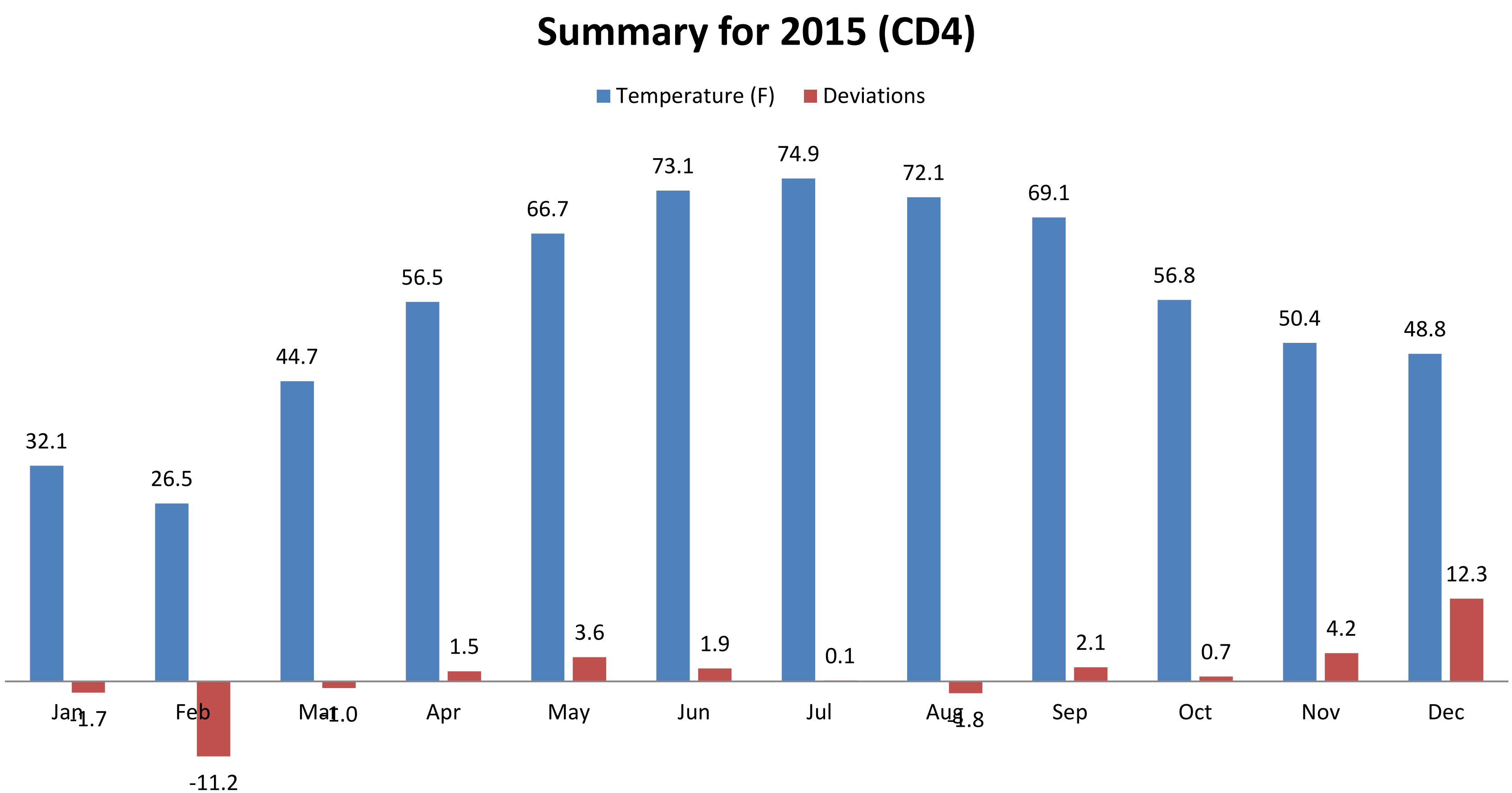
Bluegrass Region (CD3) Monthly Temperatures and Deviations from Normal (UKWAC)



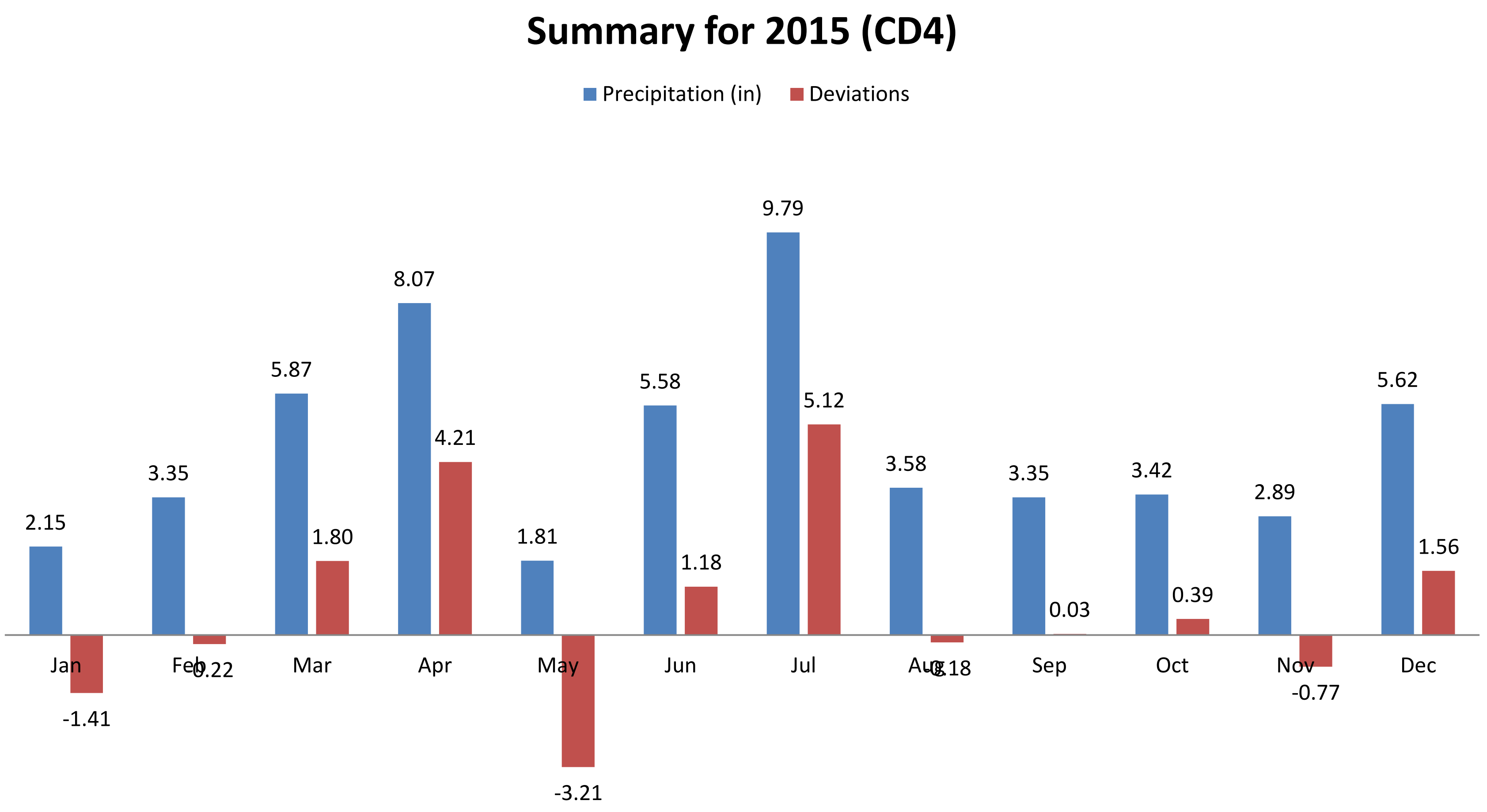
Bluegrass Region (CD3) Monthly Precipitation and Deviations from Normal (UKWAC)



Eastern Region (CD4) Monthly Temperatures and Deviations from Normal (UKWAC)



Eastern Region (CD4) Monthly Precipitation and Deviations from Normal (UKWAC)



2014 / 2015 Johnsongrass Control x Mowing Timing Trials

Introduction

Johnsongrass (*Sorghum halepense*) is a perennial warm season grass, listed as a noxious weed in Kentucky (Kentucky Revised Statutes http://www.lrc.state.ky.us/KRS/176-00/051.PDF), and is a common problem on right-of-ways. There are a number of herbicides labeled and available to control johnsongrass on right-of-ways. A key to achieving high levels of johnsongrass control is translocation of the herbicide from the leaves to the rhizomes. However, routine mowing, as part of roadside management, could reduce johnsongrass control by removing leaf material along with the herbicide applied to it before translocation occurs. A practical question from managers is "How long after a herbicide application do we need to wait before mowing without reducing herbicide efficacy on johnsongrass?" We conducted a study in 2014 and repeated it in 2015 to answer this question.

Materials and Methods

The study was initiated August 14, 2014 and repeated August 24, 2015 at an interchange near Bardstown KY. Four herbicide treatments (Outrider [sulfosulfuron] 0.25 oz/A, Fusilade II [fluazifop] 6 oz/A, Acclaim Extra [fenoxaprop] 2.8 oz/A, and Acclaim Extra plus Fusilade II [0.5 and 3.5 oz/A] were applied to 10 ft x 60 ft strips. Applications were made at 30 gallons per acre carrier volume and included either a surfactant or a crop oil concentrate (Table 1). The herbicide treatments were applied when johnsongrass plants were, on average, 36 inches tall with a range from 20 to 48 inches in 2014 while the average height was 36 inches with a range from 30 to 48 inches in 2015. Six mowing treatments, the same day as herbicide treatment, one day after herbicide treatment (AHT), 2 days AHT, one week AHT, two weeks AHT, or no mowing (Table 2) were performed as 10 ft x 40 ft strips across the herbicide treatments in a split block design, replicated three times in 2014 and four times in 2015. Mowing height was 4 inches. Visual assessments of percent johnsongrass control were done 34 (9/17/2014), 70 (10/23/2014), and 350 (7/30/2015) days after herbicide treatment (DAT) for the 2014 trial. Assessments were done 32 (9/25/2015), 45 (10/8/2015), and 53 (10/16/2015) DAT for the 2015 trial. Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at p = 0.05.

Results and Discussion

In the 2014 trial, differences in johnsongrass regrowth between herbicide treatments were visible by 14 DAT (Figure 1). There was also an interaction between herbicide treatments and mowing after treatment. These differences were more evident 34 DAT (Table 3). Outrider provided greater control (83%) than the other three herbicides when the johnsongrass was mowed the same day as treatment. Because Outrider can be taken up from the soil as well as the leaves, delaying mowing may not be as critical as for Acclaim and Fusilade II which are only active (absorbed) through the leaves. In addition, it is possible the Outrider was translocated to the rhizomes more rapidly than Acclaim Extra or Fusilade II. However, Outrider provided less control than the other herbicide treatments 34 DAT when the johnsongrass was not mowed.

Control with Acclaim Extra was the most sensitive to mowing. Only by waiting two weeks before mowing was the control with Acclaim equivalent to no mowing 34 DAT. On the other hand, control 34 DAT with Fusilade II or Fusilade II plus Acclaim Extra was the same as the unmowed treatment if mowing was delayed for only one day.

Johnsongrass regrowth was visible in some of the treatment combinations 70 DAT and resulted in lower control ratings than 34 DAT, particularly in plots treated with Acclaim Extra, Fusilade II and Acclaim Extra plus Fusilade II that were mowed the same day as treatment (Table 4). However, there was no difference in control with Outrider between the mowing treatments. As at 34 DAT, mowing the same day as treatment did not reduce control with Outrider. Among the four herbicide treatments, the mowing delays needed for maximum control were as follows: Outrider, 0 days, Fusilade II and Fusilade II plus Acclaim Extra, 1 day, and Acclaim Extra, two weeks. With an appropriate delay in mowing, all treatments provided 88% or better control 70 DAT.

The next year, 350 DAT, the growth between replications for individual treatments was very variable making it difficult to statistically separate treatment effects. Control ranged between 43 to 92% for the top group of treatments (Table 5). Outrider gave the numerically highest control (55%) when mowing was done the same day as treatment. Some plots that had good johnsongrass control earlier had a smaller number of individual plants but they were larger and this resulted in lower visual control ratings. While not statistically significant, it appeared that a 1 or 2 day mowing delay after Fusilade II and Fusilade II plus Acclaim Extra application or a 1 to 2 week mowing delay after Acclaim Extra treatment were necessary for best johnsongrass control.

In the 2015 trial, regrowth of johnsongrass after mowing was slower than in 2014. One reason may be the timing of rainfall. There were 6.3 inches of rain in August 2014 but only 2.8 inches in August 2015 (long term rainfall average for August, for this region, is 3.5 inches). Environmental variability between years is one reason experiments should be conducted in more than one year. Overall control was higher in 2015 than 2014, especially for the Acclaim Extra treatment. Also, mowing after treatment in 2015, compared to 2014, had less effect on johnsongrass control from any treatment at any of the evaluation dates (32, 45 or 53 DAT). However, regrowth was less in 2015 45 DAT. A notable exception is loss of control from Acclaim Extra when mowed the same day (Tables 6 and 8). Final assessments will be done in 2016.

Table 1. Herbicide Treatments and Active Ingredients for Mowing x Johnsongrass Control Trial

Treatment	Product Name	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)
1	Outrider	1	OZ/A	sulfosulfuron	0.25 oz
	Activator 90	0.25	% V/V		
2	Fusilade II	24	FL OZ/A	fluazifop	6 oz
	Activator 90	0.25	% V/V		
3	Acclaim Extra	39	FL OZ/A	fexoxaprop	2.8 oz
	Activator 90	0.25	% V/V		
4	Acclaim Extra	7	FL OZ/A	fexoxaprop	0.5 oz
	Fusilade II	14	FL OZ/A	fluazifop	3.5 oz
	COC	1	% V/V		

Table 2. Timing of Mowing Treatments

Mowing Treatment	Timing of Mowing Treatment
1	Same day as herbicide application
2	1 Day after herbicide application
3	2 Days after herbicide application
4	1 Week after herbicide application
5	2 Weeks after herbicide application
6	No Mowing

Table 3: Johnsongrass Control (%) 34 Days Treatment in 2014

Mowing Time after Application	Outrider	Fusilade II	Acclaim Extra	Acclaim + Fusilade
Same day	83 *cd*[1]	39 *gh*	45 *g*	30 *h*
1 Day	97 *ab*	90 *abcd*	65 *f*	87 *bcd*
2 Days	98 *a*	91 *abcd*	68 *f*	91 *abcd*
1 Week	99 *a*	92 *abcd*	72 *ef*	93 *abc*
2 Weeks	99 *a*	95 *ab*	83 *cd*	93 *abc*
No Mowing	70 *f*	87 *bcd*	82 *de*	87 *bcd*

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

Table 4: Johnsongrass Control (%) 70 Days after Treatment in 2014

Mowing Time after Application	Outrider	Fusilade II	Acclaim Extra	Acclaim + Fusilade
Same day	88 *ab*[1]	0 *f*	17 *ef*	14 *ef*
1 Day	99 *a*	94 *a*	37 *de*	96 *a*
2 Days	100 *a*	97 *a*	47 *cd*	98 *a*
1 Week	100 *a*	97 *a*	67 *bc*	99 *a*
2 Weeks	100 *a*	100 *a*	94 *a*	99 *a*
No Mowing	93 *a*	99 *a*	92 *a*	97 *a*

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

Table 5: Johnsongrass Control (%) 350 Days after Treatment in 2014

Mowing Time after Application	Outrider	Fusilade II	Acclaim Extra	Acclaim + Fusilade
Same day	55 *abcdefgh*[1]	8 *h*	13 *gh*	40 *bcdefgh*
1 Day	75 *abcde*	78 *abc*	27 *efgh*	28 *defgh*
2 Days	68 *abcdef*	88 *ab*	35 *cdefgh*	50 *abcdefgh*
1 Week	72 *abcde*	92 *a*	43 *abcdefgh*	55 *abcdefgh*
2 Weeks	72 *abcde*	33 *cdefgh*	20 *fgh*	38 *cdefgh*
No Mowing	62 *abcdefg*	76 *abcd*	58 *abcdefg*	61 *abcdefg*

[1]Means followed by the same letter are not different according to Fisher's LSD at P < 0.05.

Table 6: Johnsongrass Control (%) 32 Days after Treatment in 2015

Mowing Time after Application	Outrider	Fusilade II	Acclaim Extra	Acclaim + Fusilade
Same day	89 *abcde*[1]	89 *abcd*	84 *cdef*	86 *bcdef*
1 Day	94 *ab*	92 *abc*	97 *a*	95 *ab*
2 Days	95 *ab*	94 *abc*	97 *a*	95 *ab*
1 Week	95 *ab*	94 *abc*	95 *ab*	97 *a*
2 Weeks	97 *a*	95 *ab*	97 *a*	98 *a*
No Mowing	80 *def*	76 *f*	80 *def*	78 *ef*

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

Table 7: Johnsongrass Control (%) 45 Days after Treatment in 2015

Mowing Time after Application	Outrider	Fusilade II	Acclaim Extra	Acclaim + Fusilade
Same day	90 *ab*[1]	90 *ab*	84 *b*	84 *b*
1 Day	90 *ab*	91 *ab*	92 *ab*	95 *a*
2 Days	92 ab	93 *ab*	94 *ab*	93 *ab*
1 Week	*96 a*	93 *ab*	93 *ab*	92 *ab*
2 Weeks	93 *ab*	93 *ab*	92 *ab*	87 *ab*
No Mowing	89 *ab*	89 *ab*	92 *ab*	84 *b*

[1]Means followed by the same letter are not different according to Fisher's LSD at P < 0.05.

Table 8: Johnsongrass Control (%) 53 Days after Treatment in 2015

Mowing Time after Application	Outrider	Fusilade II	Acclaim Extra	Acclaim + Fusilade
Same day	81 *abc*[1]	85 *abc*	72 *c*	75 *bc*
1 Day	83 *abc*	91 *a*	91 *a*	90 *ab*
2 Days	93 *a*	89 *ab*	90 *ab*	87 *ab*
1 Week	90 *ab*	86 *abc*	88 *ab*	93 *ab*
2 Weeks	87 *ab*	88 *ab*	89 *ab*	91 *a*
No Mowing	89 *ab*	87 *ab*	95 *a*	96 *a*

[1]Means followed by the same letter are not different according to Fisher's LSD at P < 0.05.

Figure 1: Strip Mowed Same Day as Treatment 14 Days Afterwards in 2014 Trial.

2014 / 2015 Kudzu Control Trial

Introduction

Kudzu (*Pueraria montana*) is an invasive deciduous twining, trailing, mat-forming, woody leguminous vine that forms dense infestations along forest edges, rights-of-way, old homesteads, and stream banks. It colonizes by vines rooting at nodes and spreads by seed dispersal. The plants have extensive root systems with large tuberous roots that can be 3 to 10 feet deep. Kudzu can dominate a site to the exclusion of other vegetation. Repeated herbicide applications, along with other management measures, are required to reduce the kudzu infestations. Vegetation managers in many states use picloram for kudzu control but it has not been used extensively in KY in recent years. This trial evaluated the efficacy of some potential alternate herbicide options to picloram for kudzu control.

Materials and Methods

This study was initiated on June 24, 2014 by mowing a kudzu-infested abandoned tobacco field near Beattyville KY. The field had been burned in March, 2014 and the dominant vegetation was a mix of kudzu and giant ragweed at the time of mowing. Plots that were 30 feet by 30 feet with 10 foot alleys separating them and were arranged in a 10 treatment randomized complete block design with three replications. On July 25, 2014, after kudzu regrowth, 9 herbicide treatments were applied in 30 gallons per acre carrier. The average kudzu canopy height was 14 inches with a range of 9 to 18 inches. Two of the treatments (Garlon 1.5 gal/A and Rodeo 4 qt/A) were reapplied on September 25, 2014. These same treatments were reapplied on July 23 and September 24 in 2015. We will take final assessments in 2016.

Table 1 lists the treatments, active ingredients and application rates. All treatments were applied at the maximum annual amount specified on the herbicide product label. Garlon 3A and Rodeo can be applied more than once per year so one treatment of each (Treatments 4 and 6) received half the maximum rate in July and again in September. Most treatments included a non-ionic surfactant (Activator 90) at 0.5% v/v except for the Streamline treatment that included methylated seed oil (MSO) at 1% v/v. Visual assessments of percent kudzu control and green vegetative cover (0-100%) were done 32 (8/26/2014) and 62 (9/25/2014) days after initial treatment (DAIT) in 2014. Visual assessments of percent green vegetative cover by kudzu, grasses, and other broadleaves, as well as percent bare ground, were done 363 (7/23/2015) and 426 (9/24/2015) DAIT in 2015. Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at p = 0.05.

Results and Discussion

In 2014, all the treatments, with the exceptions of Transline and Patron 170, controlled kudzu 98% or better 32 DAIT (Table 2). Control with Transline and Patron 170 was still good 32 DAIT, but only 92%. However, by 62 DAIT, control with Patron 170 declined to 72% while control with Transline was 96% (Table 2). Streamline, Garlon 3A (either as a single or split application), and Opensight all resulted in better control (99-100%) than Transline or Patron 170 62 DAIT. Control with Rodeo (either as a single or split application, 99 and 98%, respectively) and BK 800 (98%) 62 DAIT was higher than Patron 170 but not significantly different than the other treatments.

Transline and Patron 170 allowed for more regrowth of vegetation than the other treatments, 83 and 70% green vegetation cover, respectively, 32 DAIT (Table 2). However, by 62 DAIT, these treatments, as well as the split Garlon treatment, both Rodeo treatments, and BK 800 had green vegetation cover equal to that of the untreated plots (Table 2). Streamline was the most injurious to other vegetation (13% green cover) followed by Opensight (63% green cover) and the single application (1.5 gal/A) of Garlon (80% green cover).

At the time of the first assessment and reapplication of the treatments in 2015 (363 DAIT), Patron 170 had 83% kudzu cover (Table 3) while the other treatments ranged from 28 to 4% cover. Annual grasses and other broadleaf species covered the areas not dominated by kudzu. Streamline had the most bare ground (21%).

Sixty-three days after the 2015 applications and 426 days after the initial treatments in 2014, the kudzu cover was 67% in plots treated with Patron 170, 8% with Transline and 0-3% for the other herbicide treatments (Table 4). There was 77-93% annual grass cover in the Garlon 3A, Opensight, and BK 800 treatments. Broadleaf cover was highest (73-77%) in plots with either of the two Rodeo treatments. Streamline resulted in higher bare ground than with Transline, Garlon 3A, Opensight, BK800, the split Rodeo treatment or Patron 170 but not the Rodeo at 8 qt/A.

In summary, Transline, Streamline, Garlon 3A, Rodeo, Opensight, and BK 800 provided excellent kudzu control at the end of after two applications spaced one year apart. Patron 170 would not be a recommended treatment for kudzu control. We will make final assessments in 2016.

Minogue, P.J., S.F. Enloe, A. Osiecka, and D.K. Lauer. 2011 Comparison of aminocyclopyrachlor to common herbicides for kudzu (Pueraria montana) management. Invasive Plant Sci. Management. 4: 419-426.

Table 1. Treatments and Active Ingredients for Kudzu Control Trial

Treatment	Product Names	Rate	Rate Unit	2014/15 Application Dates	Active Ingredient(s)	ai Rate (per acre)
1	Transline	21	FL OZ/A	7/25/2014	clopyralid	7.9 oz ae
	Activator 90	0.5	% V/V	7/23/2015		
2	Streamline	11.5	OZ/A	7/25/2014	aminocylcopyrachlor + metsulfuron	4.5 oz + 1.4 oz
	COC	1	% V/V	7/23/2015		
3	Garlon 3A	3	GAL/A	7/25/2014	triclopyr	9 lb ae
	Activator 90	0.5	% V/V	7/23/2015		
4	Garlon 3A	1.5	GAL/A	7/25/2014	triclopyr	4.5 lb ae
	Activator 90	0.5	% V/V	7/23/2015		
	Garlon 3A	1.5	GAL/A	9/25/2014	triclopyr	4.5 lb ae
	Activator 90	0.5	% V/V	9/24/2015		
5	Rodeo	8	QT/A	7/25/2014	glyphosate	8 lb ae
	Activator 90	0.5	% V/V	7/23/2015		
6	Rodeo	4	QT/A	7/25/2014	glyphosate	4 lb ae
	Activator 90	0.5	% V/V	7/23/2015		
	Rodeo	4	QT/A	9/25/2014	glyphosate	4 lb ae
	Activator 90	0.5	% V/V	9/24/2015		
7	Opensight	3.3	OZ/A	7/25/2014	aminopyralid + metsulfuron	1.7 oz ae + 0.3 oz
	Activator 90	0.5	% V/V	7/23/2015		
8	BK 800	2	GAL/A	7/25/2014	2,4-D + 2,4-DP + dicamba	3.78 lb ae + 1.88 lb ae + 0.94 lb ae
	Activator 90	0.5	% V/V	7/23/2015		
9	Patron 170	6.9	PT/A	7/25/2014	2,4-D + 2,4-DP	1.47 lb ae + 0.75 lb ae
	Activator 90	0.5	% V/V	7/23/2015		
10	Untreated Check					

Table 2: Results for Kudzu Control Trial (2014)

Treatment	Product Names	Rate	Rate Unit	2014 Application Date	% Kudzu Control		% Green Vegetation Cover	
					32 DAT[1]	62 DAT	32 DAT	62 DAT
1	Transline	21	FL OZ/A	7/25	92 *b*[2]	96 *b*	83 *ab*	100 *a*
	Activator 90	0.5	% V/V					
2	Streamline	11.5	OZ/A	7/25	100 *a*	100 *a*	2 *e*	13 *d*
	COC	1	% V/V					
3	Garlon 3A	3	GAL/A	7/25	100 *a*	100 *a*	10 *de*	80 *b*
	Activator 90	0.5	% V/V					
4	Garlon 3A	1.5	GAL/A	7/25	98 *a*	100 *a*	38 *c*	97 *a*
	Activator 90	0.5	% V/V					
	Garlon 3A	1.5	GAL/A	9/25				
	Activator 90	0.5	% V/V					
5	Rodeo	8	QT/A	7/25	100 *a*	99 *ab*	25 *cde*	97 *a*
	Activator 90	0.5	% V/V					
6	Rodeo	4	QT/A	7/25	98 *a*	98 *ab*	30 *cd*	96 *a*
	Activator 90	0.5	% V/V					
	Rodeo	4	QT/A	9/25				
	Activator 90	0.5	% V/V					
7	Opensight	3.3	OZ/A	7/25	98 *a*	99 *a*	18 *cde*	63 *c*
	Activator 90	0.5	% V/V					
8	BK 800	2	GAL/A	7/25	99 *a*	98 *ab*	28 *cd*	98 *a*
	Activator 90	0.5	% V/V					
9	Patron 170	6.9	PT/A	7/25	92 *b*	72 *c*	70 *b*	100 *a*
	Activator 90	0.5	% V/V					
10	Untreated Check				0 *c*	0 *d*	100 *a*	100 *a*

[1] *DAT = Days after treatment*

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

Table 3: Results for Kudzu Control Trial (2015) (before 2015 applications 363 DAIT)

				% Vegetation Cover			
Treatment	**Product Names**	**Rate**	**Rate Unit**	**% Kudzu**	**% Grass**	**% Other Broadleaves**	**% Bare Ground**
1	Transline Activator 90	21 0.5	FL OZ/A % V/V	28 *b*[2]	38 *abc*	33 *abcd*	0 *b*
2	Streamline COC	11.5 1	OZ/A % V/V	4 *c*	36 *abc*	40 *abc*	21 *a*
3	Garlon 3A Activator 90	3 0.5	GAL/A % V/V	5 *c*	52 *ab*	30 *bcd*	13 *ab*
4	Garlon 3A Activator 90 Garlon 3A Activator 90	1.5 0.5 1.5 0.5	GAL/A % V/V GAL/A % V/V	17 *bc*	65 *a*	15 *cd*	3 *ab*
5	Rodeo Activator 90	8 0.5	QT/A % V/V	17 *bc*	15 *bc*	65 *a*	3 *ab*
6	Rodeo Activator 90 Rodeo Activator 90	4 0.5 4 0.5	QT/A % V/V QT/A % V/V	8 *bc*	30 *abc*	62 *ab*	0 *b*
7	Opensight Activator 90	3.3 0.5	OZ/A % V/V	20 *bc*	53 *ab*	17 *cd*	10 *ab*
8	BK 800 Activator 90	2 0.5	GAL/A % V/V	20 *bc*	68 *a*	10 *cd*	2 *ab*
9	Patron 170 Activator 90	6.9 0.5	PT/A % V/V	83 *a*	3 *c*	13 *cd*	0 *b*
10	Untreated Check			98 *a*	0 *c*	2 *d*	0 *b*

[1] *DAIT = Days after initial treatment*

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

Table 4: Results for Kudzu Control Trial (2015) (63 days after 2015 applications 426 DAIT)

Treatment	**Product Names**	**Rate**	**Rate Unit**	**2015 Application Date**	**% Vegetation Cover**			
					% Kudzu	**% Grass**	**% Other Broadleaf**	**% Bare Ground**
1	Transline	21	FL OZ/A	7/23	8 *c*	65 *b*	23 *b*	3 *b*
	Activator 90	0.5	% V/V					
2	Streamline	11.5	OZ/A	7/23	0 *d*	35 *c*	3 *c*	44 *a*
	COC	1	% V/V					
3	Garlon 3A	3	GAL/A	7/23	0 *d*	77*ab*	10 *bc*	13 *b*
	Activator 90	0.5	% V/V					
4	Garlon 3A	1.5	GAL/A	7/23	0 *d*	88 *ab*	7 *bc*	3 *b*
	Activator 90	0.5	% V/V					
	Garlon 3A	1.5	GAL/A	9/24				
	Activator 90	0.5	% V/V					
5	Rodeo	8	QT/A	7/23	3 *cd*	2 *d*	73 *a*	22 *ab*
	Activator 90	0.5	% V/V					
6	Rodeo	4	QT/A	7/23	2 *cd*	7 *d*	77 *a*	13 *b*
	Activator 90	0.5	% V/V					
	Rodeo	4	QT/A	9/24				
	Activator 90	0.5	% V/V					
7	Opensight	3.3	OZ/A	7/23	0 *d*	93 *a*	2 *c*	5 *b*
	Activator 90	0.5	% V/V					
8	BK 800	2	GAL/A	7/23	2 *cd*	80 *ab*	9 *bc*	8 *b*
	Activator 90	0.5	% V/V					
9	Patron 170	6.9	PT/A	7/23	67 *b*	20 *cd*	13 *bc*	0 *b*
	Activator 90	0.5	% V/V					
10	Untreated Check				95 *a*	0 *d*	5 *bc*	0 *b*

[1] DAIT = Days after initial treatment

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

2015 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 pre-emergent residual herbicides, in combination with a broad-spectrum post-emergent herbicide like glyphosate, are the mainstay for bare ground maintenance operations. Ideally, the pre-emergent herbicides will all last season long. The guardrails in District 12 were looking good early in the 2014 season but later in the season had unacceptable amounts of grasses, such as yellow foxtail, present and flowering under the guardrails. We established this trial to answer the following questions. Would higher rates of residual herbicides extend late season foxtail control? Would some other herbicide combinations provide reliable season long foxtail control?

Materials and Methods

The trial was established under and beside guardrail, that had not been sprayed in 2015, near and along KY 321 near Paintsville, KY with 9 treatments and 3 replications arranged in a randomized complete block design. On June 29, 2015, 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 Roundup ProMax alone (Trt. 1), included Activator 90 at 0.25% v/v (Table 1).

The treatment list (Table 1) was chosen to answer some of the questions posed. The Roundup ProMax by itself (Trt. 1) has no residual control. The Roundup + Esplanade + Oust combination (Trt. 2) is one that has performed well in our trials. The first Roundup + Esplanade + Perspective combination (Trt 3) is what was used in 2014 and resulted in poor late season foxtail control. The other Roundup + Esplanade + Perspective combinations had more Esplanade (Trt 4) or more Perspective (Trt 5). The first Roundup + Esplanade + Streamline + Plateau combination (Trt 6) was used for the 2016 season. The addition of Plateau was recommended to extend foxtail control. The remaining Roundup + Esplanade + Streamline + Plateau combinations had more Esplanade (Trt 7), more Streamline (Trt 8), or more Plateau (Trt 9).

The weeds present at application included perennial grasses (tall fescue), large crabgrass, ragweed, marestail, wild carrot, and black medic. Visual % bare ground and % vegetation ratings were taken 46 (8/14/2015), 99 (10/6/2015), 141 (11/17/2015), and 331 (05/25/2016) days after treatment (DAT). The site was mowed and sprayed by others sometime after the last rating so another rating was not possible. Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at p = 0.05.

Results and Discussion

At the first assessment, 46 DAT, all the treatments had similar bare ground and perennial grass cover ratings (Table 1). At 99 DAT, all the treatments had more bare ground and less grass and broadleaf cover than the Roundup alone treatment. It was the same story 141 DAT except that the Roundup + Esplanade + Oust combination (Trt 2) was not in the top group for bare ground. There were not many yellow foxtail plants in the plots or along nearby roadsides in 2015. At the final assessment (Table 3), the Roundup by itself (Trt. 1) had the least bare ground and the most grass cover. All the residual treatments (Trt. 2-9) had good control into the start of the next season.

We were not able to answer the original questions as heavy yellow foxtail populations were not present in 2015.. However, we did find that many of the residual herbicide combinations gave us good extended control under guardrails.

Table 1. Treatments and Active Ingredients for Guardrail Trial in Paintsville

Treatment	Product Names	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)
1	Roundup ProMax	25	FL OZ/A	glyphosate	14 oz ae
2	Roundup ProMax	25	FL OZ/A	glyphosate	14 oz ae
	Esplanade	3.5	FL OZ/A	indaziflam	0.7 oz
	Oust XP	3	OZ/A	sulfometuron	2.3 oz
3	Roundup ProMax	25	FL OZ/A	glyphosate	14 oz ae
	Esplanade	4	FL OZ/A	indaziflam	0.8 oz
	Perspective	8	OZ/A	aminocyclopyrachlor + chlorsulfuron	3.2 oz + 1 oz
4	Roundup ProMax	25	FL OZ/A	glyphosate	14 oz ae
	Esplanade	6	FL OZ/A	indaziflam	1.3 oz
	Perspective	8	OZ/A	aminocyclopyrachlor + chlorsulfuron	3.2 oz + 1 oz
5	Roundup ProMax	25	FL OZ/A	glyphosate	14 oz ae
	Esplanade	4	FL OZ/A	indaziflam	0.8 oz
	Perspective	10	OZ/A	aminocyclopyrachlor + chlorsulfuron	4 oz + 1.3 oz
6	Roundup ProMax	25	FL OZ/A	glyphosate	14 oz ae
	Esplanade	5	FL OZ/A	indaziflam	1 oz
	Streamline	8	OZ/A	aminocyclopyrachlor + metsulfuron	3.2 oz + 1 oz
	Plateau	5	FL OZ/A	imazapic	1.3 oz ae
7	Roundup ProMax	25	FL OZ/A	glyphosate	14 oz ae
	Esplanade	7	FL OZ/A	indaziflam	1.5 oz
	Streamline	8	OZ/A	aminocyclopyrachlor + metsulfuron	3.2 oz + 1 oz
	Plateau	5	FL OZ/A	imazapic	1.3 oz ae
8	Roundup ProMax	25	FL OZ/A	glyphosate	14 oz ae
	Esplanade	5	FL OZ/A	indaziflam	1 oz
	Streamline	10	OZ/A	aminocyclopyrachlor + metsulfuron	4 oz + 1.3 oz
	Plateau	5	FL OZ/A	imazapic	1.3 oz ae
9	Roundup ProMax	25	FL OZ/A	glyphosate	14 oz ae
	Esplanade	5	FL OZ/A	indaziflam	1 oz
	Streamline	8	OZ/A	aminocyclopyrachlor + metsulfuron	3.2 oz + 1 oz
	Plateau	7	FL OZ/A	imazapic	1.8 oz ae

All herbicide treatments (except trt. #1) contained the adjuvant, Activator 90 at 0.25% v/v.

Table 2: Results for Guardrail Trial in Paintsville (2015)

				% Bare Ground[2]	% Per. Grass[2]	% Broadleaves[2]	% Bare Ground	% Grass	% Broadleaves	% Bare Ground	% Grass	% Broadleaves
	Product Name	**Rate**	**Rate Unit**		**46 DAT**			**99 DAT**			**141 DAT**	
1	Roundup ProMax	25	FL OZ/A	93 *ab*[1]	3 *ab*	4 *a*	48 *b*	20 *a*	32 *a*	17 *c*	28 *a*	55 *a*
2	Roundup ProMax Esplanade Oust XP	25 3.5 3	FL OZ/A FL OZ/A OZ/A	95 *ab*	2 *b*	3 *ab*	95 *a*	3 *b*	2 *b*	82 *b*	6 *b*	12 *b*
3	Roundup ProMax Esplanade Perspective	25 4 8	FL OZ/A FL OZ/A OZ/A	96 *ab*	3 *ab*	1 *bc*	96 *a*	3 *b*	1 *b*	91 *ab*	2 *b*	8 *b*
4	Roundup ProMax Esplanade Perspective	25 6 8	FL OZ/A FL OZ/A OZ/A	91 *b*	8 *a*	1 *abc*	98 *a*	2 *b*	1 *b*	93 *a*	1 *b*	6 *b*
5	Roundup ProMax Esplanade Perspective	25 4 10	FL OZ/A FL OZ/A OZ/A	94 *ab*	6 *ab*	0 *c*	97 *a*	2 *b*	1 *b*	98 *a*	1 *b*	4 *b*
6	Roundup ProMax Esplanade Streamline Plateau	25 5 8 5	FL OZ/A FL OZ/A OZ/A FL OZ/A	95 *ab*	5 *ab*	0 *c*	97 *a*	4 *b*	1 *b*	91 *ab*	1 *b*	8 *b*
7	Roundup ProMax Esplanade Streamline Plateau	25 7 8 5	FL OZ/A FL OZ/A OZ/A FL OZ/A	94 *ab*	6 *ab*	0 *c*	98 *a*	2 *b*	0 *b*	97 *a*	0 *b*	3 *b*
8	Roundup ProMax Esplanade Streamline Plateau	25 5 10 5	FL OZ/A FL OZ/A OZ/A FL OZ/A	97 *a*	3 *ab*	0 *c*	96 *a*	2 *b*	1 *b*	89 *ab*	1 *b*	10 *b*
9	Roundup ProMax Esplanade Streamline Plateau	25 5 8 7	FL OZ/A FL OZ/A OZ/A FL OZ/A	97 *a*	3 *ab*	0 *c*	97 *a*	2 *b*	1 *b*	94 *a*	1 *b*	5 *b*

All herbicide treatments (except trt. #1) contained the adjuvant, Activator 90 at 0.25% v/v.

[1]Means followed by the same letter are not different according to Fisher's LSD at P < 0.05.

Table 3: Results for Guardrail Trial in Paintsville (2016)

Treatment	Product Name	Rate	Rate Unit	% Bare Ground	% Fescue	% Other Grass	% Medic	% Other Broadleaves
				331 DAT				
1	Roundup ProMax	25	FL OZ/A	17 *c*[1]	8	42 *a*	22 *a*	15
2	Roundup ProMax	25	FL OZ/A	53 *b*	5	7 *b*	17 *ab*	18
	Esplanade	3.5	FL OZ/A					
	Oust XP	3	OZ/A					
3	Roundup ProMax	25	FL OZ/A	72 *a*	1	6 *b*	5 *b*	17
	Esplanade	4	FL OZ/A					
	Perspective	8	OZ/A					
4	Roundup ProMax	25	FL OZ/A	67 *ab*	0	7 *b*	6 *b*	21
	Esplanade	6	FL OZ/A					
	Perspective	8	OZ/A					
5	Roundup ProMax	25	FL OZ/A	70 *ab*	0	10 *b*	12 *ab*	8
	Esplanade	4	FL OZ/A					
	Perspective	10	OZ/A					
6	Roundup ProMax	25	FL OZ/A	63 *ab*	2	8 *b*	15 *ab*	12
	Esplanade	5	FL OZ/A					
	Streamline	8	OZ/A					
	Plateau	5	FL OZ/A					
7	Roundup ProMax	25	FL OZ/A	72 *a*	0	7 *b*	7 *b*	15
	Esplanade	7	FL OZ/A					
	Streamline	8	OZ/A					
	Plateau	5	FL OZ/A					
8	Roundup ProMax	25	FL OZ/A	68 *ab*	0	5 *b*	14 *ab*	13
	Esplanade	5	FL OZ/A					
	Streamline	10	OZ/A					
	Plateau	5	FL OZ/A					
9	Roundup ProMax	25	FL OZ/A	70 *ab*	0	8 *b*	9 *b*	13
	Esplanade	5	FL OZ/A					
	Streamline	8	OZ/A					
	Plateau	7	FL OZ/A					

All herbicide treatments (except trt. #1) contained the adjuvant, Activator 90 at 0.25% v/v.

[1]Means followed by the same letter are not different according to Fisher's LSD at $P < 0.05$.

2015 PGR Trials on Turf

Introduction

Seasonal management of cool season turf can include application of plant growth regulators (PGRs) to suppress growth and reduce the number of time consuming and costly mowings. PGRs may also be a good option on steep slopes where it is difficult to cut the grass safely. However, these products can injure the turf causing discoloration, which is undesirable but in many cases is temporary. Our group has tested PGRs for seedhead suppression and growth reduction in forage type tall fescue (see 2012 Research Report). We established trials in 2015 on turf to test PGR options, including the new product Anuew, for growth suppression .

There are a number of PGR products available for turf and the early classification of these had two groups. Type I PGRs slow cellular division and include some herbicides. Our previous trials only included Type 1 PGRs. Type II PGRs were gibberellic acid (GA) inhibitors and slow cell elongation. The current classification has 6 groups, Classes A – F. This trial included a number of Type 1 PGRs which are now Class C (mitotic inhibitors) (cell division) (foliar absorbed) and Class D (herbicidal mode) PGRs. Mefluidide (in the product Envoy) is in Class C while imazethapyr + imazapyr (Stronghold), imazapic (Plateau), and metsulfuron methyl (Escort) are in Class D. The new product, Anuew (prohexadione calcium), is in Class A (late GA synthesis blocker) (foliar absorbed).

Materials and Methods

The trials were established at the Turfgrass Research Center at Spindletop Research Farm in Lexington KY with 9 treatments and 3 replications arranged in a randomized complete block design on each of two turf types. They were part of a trial conducted by Kenneth Cropper (see reference) from 2013 to 2014. The turf type tall fescue plot was under high maintenance management during that time and the mixed species endemic polystand (endemic) plot was under low maintenance management.

Plots were 5 ft by 20 ft with running unsprayed checks (2 ft) between each of the plots. Application was at 20 gallons per acre on July 10, 2015 and included a non-ionic surfactant at 0.25% v/v. Table 1 lists the herbicide treatments with their active ingredients and application rates. In all treatments a synthetic auxin (2,4-D) was included to increase the weed control spectrum but also as a “safener” to reduce damage to the grasses. The Embark, Plateau, and Stronghold treatments are industry standards for seedhead suppression and growth reduction. The plots were irrigated on a set schedule for the duration of the trial. Due to miscommunication with the Research Center staff, the plots were mowed three days after application. They were left unmowed for the remainder of the trial.

Turf color was assessed by comparison to the running check strips 14 (7/24/2015) days after application (DAT). The color rating ranges from 0 (dead) to 9 (full green). The color of the check strips was set at 8. Canopy heights were measured at 14, 39 (8/18/2015) and 60 (9/8/2015) DAT. Broadleaf weed (% control) ratings were taken on the endemic (low maintenance) turf plots 14 and 39 DAT with % broadleaf cover rating taken 60 DAT. Fresh and dry clipping weights were measured by collecting the mower output from a mower swath for all plots 60 DAT. Data were analyzed using ARM software and treatment means were compared using Fisher's Protected LSD at p = 0.05. Data columns in Tables 2 and 3 with *ns* have treatment means compared using Fisher's LSD where the overall P was greater than 0.05.

Results and Discussion

The Anuew treatments had the same turf color as the control in the tall fescue turf plots 14 DAT (Table 2). Embark and Escort affected turf color less than the Stronghold and Plateau treatments. All treatments had shorter turf than the control 14 DAT while by 60 DAT only Plateau was shorter than the control. There were no differences in clipping weights between the treatments by 60 DAT.

In the endemic plots, the Escort and the two lower rates of Anuew had the same turf color as the control 14 DAT (Table 3). Embark had the lowest color rating. All treatments had shorter turf than the control with Embark being shorter than the others 14 DAT. At 39 DAT, most treatments were still shorter than the control except for Escort. By 60 DAT, only the Embark and two of the Anuew treatments were still shorter than the control. Broadleaf control ranged from 62 to 78% in the herbicide treatments 39 DAT while broadleaf % cover ranged from 0 to 17 % among the plots 60 DAT. Clipping weights were variable and none of the treatments were different than the control 60 DAT.

There are a number of PGR options for use on cool season turf which temporarily reduce height and turf color rating. The different rates of Anuew did not affect turf color but still temporarily reduced turf height.

Cropper, Kenneth L., "INVESTIGATIONS INTO THE HOME LAWN CARBON BALANCE AND IMPROVING THE EFFICACY OF T-PHYLLOPLANINS FOR COMBATING TURFGRASS DISEASES" (2015).*Theses and Dissertations--Plant and Soil Sciences*. 63.
http://uknowledge.uky.edu/pss_etds/63

Table 1. Treatments and Active Ingredients for PGR Trials on Turf

Treatment	Product Names	Rate (per Acre)	Rate Unit	Active Ingredient(s)	ai Rate (per acre)
1	Embark	24	fl oz/a	mefluidide	6 oz ae
	Formula 40	2	qt/a	2,4-D amine	1.84 lb ae
2	Stronghold	12	fl oz/a	mefluidide + imazethapyr + imazapyr	2.20 oz ae + 0.53 oz ae + 0.01 oz ae
	Hi-Dep IVM	2	qt/a	2,4-D amine	1.90 lb ae
3	Plateau	4	fl oz/a	imazapic	1.00 oz ae
	Formula 40	2	qt/a	2,4-D amine	1.84 lb ae
4	Escort	0.4	oz/a	metsulfuron methyl	0.24 oz
	Formula 40	2	qt/a	2,4-D amine	1.84 lb ae
5	Aneuw	1	lb/a	prohexadione calcium	4.4 oz
	Formula 40	2	qt/a	2,4-D amine	1.84 lb ae
6	Aneuw	1.5	lb/a	prohexadione calcium	6.6 oz
	Formula 40	2	qt/a	2,4-D amine	1.84 lb ae
7	Aneuw	2	lb/a	prohexadione calcium	8.8 oz
	Formula 40	2	qt/a	2,4-D amine	1.84 lb ae
8	Untreated Check				

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

Table 2. Results for PGR Trial on Tall Fescue Turf

Treatment	Product	Rate (per Acre)	Turf Color (0-9)	Height (in)	Height (in)	Height (in)	Fresh Clipping Weight (g)	Dry Clipping Weight (g)
			14 DAT		39 DAT	60 DAT		
1	Embark Formula 40	24 fl oz 2 qt	6.7 b	3.8 bc	6.0 b	5.7 ab	647	247
2	Stronghold Hi-Dep IVM	12 fl oz 2 qt	4.7 c	2.8 d	6.2 b	5.8 ab	950	340
3	Plateau Formula 40	4 fl oz 2 qt	4.3 c	3.2 cd	5.8 b	5.2 b	793	315
4	Escort Formula 40	0.4 oz 2 qt	6.3 b	3.0 d	6.0 b	5.8 ab	987	378
5	Aneuw Formula 40	1 lb 2 qt	8.0 a	4.3 b	6.5 ab	6.0 a	727	290
6	Aneuw Formula 40	1.5 lb 2 qt	8.0 a	4.2 b	6.3 ab	6.0 a	793	310
7	Aneuw Formula 40	2 lb 2 qt	8.0 a	4.3 b	6.3 ab	6.2 a	667	261
8	Untreated Check		8.0 a	6.0 a	7.0 a	6.2 a	873	369
					ns	*ns*	*ns*	*ns*

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

[1]*Means followed by the same letter are not different according to Fisher's LSD at P < 0.05. Data columns with ns have treatment means compared using Fisher's LSD where the overall P was greater than 0.05*

Table 3. Results for PGR Trial on Endemic Turf

Treatment	Product	Rate (per Acre)	Turf Color (0-9)	Height (in)	Broadleave Control (%)	Height (in)	Broadleave Control (%)	Height (in)	Broadleave Cover (%)	Fresh Clipping Weight (g)	Dry Clipping Weight (g)
			14 DAT			39 DAT		60 DAT			
1	Embark Formula 40	24 fl oz 2 qt	5.0 e	4.2 c	47 ab	7.3 bc	70 ab	6.3 b	12 ab	703 ab	269 ab
2	Stronghold Hi-Dep IVM	12 fl oz 2 qt	6.7 d	5.5 b	37 abc	6.3 c	72 ab	7.3 ab	6 bc	803 ab	314 ab
3	Plateau Formula 40	4 fl oz 2 qt	6.8 cd	5.3 b	33 abc	6.7 c	78 a	6.7 ab	8 abc	747 ab	307 ab
4	Escort Formula 40	0.4 oz 2 qt	8.0 a	5.3 b	40 ab	8.0 ab	78 a	7.8 ab	0 c	1070 a	411 a
5	Aneuw Formula 40	1 lb 2 qt	8.0 a	5.7 b	10 bc	6.8 c	63 ab	6.2 b	17 a	567 b	219 b
6	Aneuw Formula 40	1.5 lb 2 qt	7.8 ab	5.7 b	43 ab	7.2 bc	68 ab	7.7 ab	5 bc	1033 a	374 ab
7	Aneuw Formula 40	2 lb 2 qt	7.3 bc	5.3 b	60 a	6.5 c	62 b	6.3 b	12 ab	600 b	241 b
8	Untreated Check		8.0 a	7.3 a	0 c	8.5 a	0 c	8.5 a	8 abc	913 ab	373 ab
					ns			*ns*		*ns*	*ns*

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

[1]*Means followed by the same letter are not different according to Fisher's LSD at P < 0.05. Data columns with ns have treatment means compared using Fisher's LSD where the overall P was greater than 0.05*

2013-2015 Controlling Lespedeza on Reclaimed Mining Land Trial

Sericea lespedeza (*Lespedeza cuneata*) has been used in mine reclamation for many years in the past. It is no longer recommended as it can be aggressive in growth and dominate an area interfering with establishment of other species and regeneration of trees and shrubs. One of the objectives of land managers is to reduce the competitiveness of lespedeza to allow the establishment of a more diverse range of species including native forbs and grasses. A key objective on military bases with lespedeza is to provide a safe site for infantry training as well as habitat for quail / pheasant for hunting. Good habitat for quail is also good for maneuvers. The base land managers use fire to manage the landscape and increase the proportion of desirable prairie species while reducing the amount of lespedeza. The use of herbicides can be effective and cost effective as well. We established this trial to test the use and timing of some herbicides to control lespedeza to facilitate establishment of native grasses and forbs. Another objective was to collect data on the tolerance of these forbs to these herbicides.

Materials and Methods

The trial was established at the Wendell H. Ford Regional Training Center, Greenville Kentucky on an area with a mix of lespedeza and Indian grass with a 6 x 2 factorial set of treatments and 4 replications arranged in a randomized complete block design. The six herbicide treatments also had either dormant seeding done or not. Plots were 10 ft by 30 ft with running unsprayed checks (10 ft) between each of the plots. All applications were at 20 gallons per acre and included a non-ionic surfactant (Activator 90) at 0.25% v/v.

Table 1 lists the herbicide treatments with their active ingredients, application rates, and application dates. The application rates were set for an anticipated cost of approximately $15-16 per acre and may not have been optimal for control of lespedeza. Opensight was applied at 3.3 oz per acre (Trt. 1, 2, 7, and 8) and the label recommended 2.5 to 3 oz applied at the beginning of flower initiation through full bloom. Milestone was applied at 3 fl oz per acre in combination with PastureGard and Garlon 4 while the label recommends 5 to 7 fl oz when applied by itself to control annual lespedeza. PastureGard was applied at 12 fl oz per acre in combination with Milestone while the label recommends 12 to 24 fl oz when applied by itself. The 12 fl oz rate is recommended when the lespedeza plants are 12 to 15 inches tall in the late spring to early summer prior to bloom. The 24 fl oz rate is recommended for dense stands and later stages of growth. Garlon 4 Ultra was applied at 1 pt per acre in combination with Milestone and the label recommends 1.5 pt when applied by itself.

The first applications of Opensight, PastureGard + Milestone, and Garlon + Milestone were in the early fall on September 26, 2013 (treatments 1 to 6), with the lespedeza at 36 inches height, marestail at 50 inches, common ragweed at 45 inches, annual marsh elder at 42 inches and Indian grass at 70 inches. The second application of Opensight was on October 21, 2013 (treatments 7 and 8). There was no distinct visual difference between the previously sprayed plots and unsprayed strips. Dormant seeded plots were sown March 18, 2014 by mixing the seed mix with vermiculite to increase the volume and then broadcasting it over the plot areas. The rate and composition of the seed mix is listed in Table 2. We waited until the snow had melted to ensure more even distribution of seed as we did not want the seed washing away with the melting snow. However, the seed may not have had good contact with the soil and a dry period in the spring may have reduced the establishment of any seedlings. The trial area was not burned while the surrounding area was part of the scheduled prescribed burn in the early spring. The last set of applications of Opensight, PastureGard + Milestone, and Garlon + Milestone were in the spring on June 8, 2014 (treatments 9 to 12) with the lespedeza at 24-36 inches height and the common ragweed at 12 inches.

Lespedeza control (%) was assessed at the time of the last application on June 6, 2014 for treatments 1-6 (253 Days after Treatment) (DAT) and 228 DAT for treatments 7-8. Lespedeza control (%) was assessed on October 23, 2014 as well as % cover of lespedeza, grasses, other broadleaves, and bare ground (Table 3). Percent cover of lespedeza, grasses, other broadleaves, and bare ground was assessed on October 7, 2015 (Table 4). Data were analyzed using ARM software and treatment means were compared using Fisher's Protected LSD at p = 0.05. Data columns in Tables 3 and 4 with *ns* have treatment means compared using Fisher's LSD where the overall P was greater than 0.05.

Results and Discussion

The spring following the fall applications of Opensight had good control (94%) of lespedeza but less control when applied later in the season (83 to 89%) (Table 3). The fall applications of PastureGard + Milestone and Garlon + Milestone were less effective. Application in late summer on smaller plants may have been more effective.

A year after our fall application (392 DAT) the first Opensight treatment (Trt. 1-2) still had good control (73 to 81%) (Table 3) while the late fall application (367 DAT) (Trt. 7-8) had lower control (32 to 43%). The spring applications of PastureGard + Milestone and Garlon + Milestone had good control of lespedeza (94 to 98%) 139 DAT. These treatments, along with the early Opensight treatment, had 3 to 27% lespedeza cover and 78 to 52% grasses as vegetative cover. The grasses were predominantly previously established Indian grass. There was a mix of other broadleaf species but most of the cover was from common ragweed. No plants from the dormant seeding were observed at any of the assessments. Perhaps we would have had better results if had sown the seed mix on the snow so it had good moisture availability early in the season.

By fall in 2015 (741 DAT), lespedeza was dominant in many plots (Table 4). We still had good control with the early Opensight (55 to 65% cover) and spring applications (14 to 31% cover). These treatments had 31 to 84% grasses as cover. There were not many other broadleaf species at this end of season rating. We had a wet July with 4.6 inches more precipitation than the long-term average that may have resulted in good growth of the lespedeza and Indian grass plants.

An early fall application of Opensight was effective for lespedeza control while a very late application was not. Fall applications of PastureGard + Milestone and Garlon + Milestone were not very effective but spring applications were more effective. This is when the plants were smaller and actively growing. Controlling lespedeza resulted in more growth of already established grasses like Indian grass. Herbicides can be effective management tools in promoting desirable prairie species.

Brooke, J.M., and Harper, C.A. 2016. Herbicides are Effective for Reducing Dense Native Warm-season Grass and Controlling a Common Invasive Species, Sericea Lespedeza. Journal of the Southeastern Association of Fish and Wildlife Agencies 3:178–184

Dow Agrosciences, 2012. Invasive Plant Management with Milestone® and Other Herbicides: A Practical And Technical Guide For Natural Area Managers

Table 1. Treatments and Active Ingredients for Lespedeza Control Trial

Trt. No.	Product	Rate per Acre	Active Ingredient(s)	ai Rate (per Ha)	Dormant Seeding	Application Date
1	Opensight	3.3 oz	aminopyralid + metsulfuron	121 g ae + 22 g	No	September 26, 2013
2	Opensight	3.3 oz			Yes	
3	PastureGard HL Milestone	12 fl oz 3 fl oz	triclopyr + fluroxypyr aminopyralid	315 g ae + 105 g ae 53 g ae	No	
4	PastureGard HL Milestone	12 fl oz 3 fl oz			Yes	
5	Garlon 4 Ultra Milestone	1 pt 3 fl oz	triclopyr aminopyralid	560 g ae 53 g ae	No	
6	Garlon 4 Ultra Milestone	1 pt 3 fl oz			Yes	
7	Opensight	3.3 oz	aminopyralid + metsulfuron	121 g ae + 22 g	No	October 21, 2013
8	Opensight	3.3 oz			Yes	
9	PastureGard HL Milestone	12 fl oz 3 fl oz	triclopyr + fluroxypyr aminopyralid	315 g ae + 105 g ae 53 g ae	No	June 6, 2014
10	PastureGard HL Milestone	12 fl oz 3 fl oz			Yes	
11	Garlon 4 Ultra Milestone	1 pt 3 fl oz	triclopyr aminopyralid	560 g ae 53 g ae	No	
12	Garlon 4 Ultra Milestone	1 pt 3 fl oz			Yes	

All treatments included Activator 90 @ 0.25% v/v
Dormant seeded plots were sown March 18, 2014. However no plants from this were observed at any of the assessments.

Table 2. Species composition of IL CP33 Seed Mix

IL CP33 Tall-Grass Pheasant Habitat Mix

Seeding Rate: 3.24 lb/ac (19.8 seeds/ft²)

Notes: Habitat Buffers for Upland Birds

Scientific Name	Common Name	% of Mix	Seeds/ft²	Rate/Acre	Units	Tolerance to Milestone
GRASSES						
Andropogon gerardii	Big Bluestem	15.41	1.8	0.50	PLS lb	
Bouteloua curtipendula	Sideoas Grama	15.41	1.1	0.50	PLS lb	
Schizachyrium scoparium	Little Bluestem	30.83	5.5	1.00	PLS lb	
Sorghastrum nutans	Indiangrass	15.41	2.2	0.50	PLS lb	
FORBS						
Chamaecrista fasciculata	Partridge Pea	3.85	0.1	2.00	PLS oz	
Dalea candidum	White Prairie Clover	3.85	0.9	2.00	PLS oz	
Dalea purpurea	Purple Prairie Clover	3.85	0.7	2.00	PLS oz	T
Desmanthus illinoensis	Illinois Bundle Flower	3.85	0.2	2.00	PLS oz	
Echinacea pallida	Pale Purple Coneflower	1.93	0.1	1.00	PLS oz	
Lespedeza capitata	Round-headed Bush Clover	0.96	0.1	0.50	PLS oz	MS
Penstemon digitalis	Foxglove Beardtongue	0.39	0.6	0.20	PLS oz	
Ratibida pinnata	Yellow Coneflower	1.39	0.7	1.00	PLS oz	S
Rudbeckia hirta	Black-eyed Susan	1.39	2.1	1.00	PLS oz	MT
Veronicastrum virginicum	Culver's Root	0.39	3.7	0.20	PLS oz	

T = Tolerant

MT = Moderately Tolerant

MS = Moderately Susceptible

S = Susceptible

Table 3: Results for Lespedeza Control Trial (2014)

					Rated June 6, 2014		**Rated October 23, 2014**					
Trt. No.	**Product**	**Rate per Acre**	**Dormant Seeding**	**Application Date**	**Days After Application**	**Lespedeza Control (%)**	**Days After Application**	**Lespedeza Control (%)**	**Lespedeza (% cover)**	**Grasses (% cover)**	**Other Broadleaf (% cover)**	**Bare Ground (%)**
1	Opensight	3.3 oz	No	September 26, 2013	253	94 *a*[1]	392	73 *b*	27 *d*	62 *ab*	12 *abc*	0 *b*
2	Opensight	3.3 oz	Yes		253	94 *a*	392	81 *b*	19 *de*	51 *bc*	20 *ab*	10 *ab*
3	PastureGard HL Milestone	12 fl oz 3 fl oz	No		253	54 *d*	392	38 *c*	60 *bc*	11 *e*	21 *a*	9 *ab*
4	PastureGard HL Milestone	12 fl oz 3 fl oz	Yes		253	58 *d*	392	40 *c*	49 *c*	20 *de*	19 *ab*	14 *ab*
5	Garlon 4 Ultra Milestone	1 pt 3 fl oz	No		253	38 *f*	392	19 *e*	81 *a*	10 *e*	9 *bc*	1 *b*
6	Garlon 4 Ultra Milestone	1 pt 3 fl oz	Yes		253	43 *e*	392	25 *de*	75 *ab*	8 *e*	11 *abc*	4 *b*
7	Opensight	3.3 oz	No	October 21, 2013	228	83 *c*	367	32 *cd*	66 *abc*	26 *de*	3 *c*	5 *b*
8	Opensight	3.3 oz	Yes		228	89 *b*	367	43 *c*	58 *bc*	39 *cd*	4 *c*	0 *b*
9	PastureGard HL Milestone	12 fl oz 3 fl oz	No	June 6, 2014	0	0 *g*	139	94 *a*	6 *e*	58 *abc*	19 *ab*	15 *ab*
10	PastureGard HL Milestone	12 fl oz 3 fl oz	Yes		0	0 *g*	139	96 *a*	5 *e*	52 *bc*	16 *ab*	25 *a*
11	Garlon 4 Ultra Milestone	1 pt 3 fl oz	No		0	0 *g*	139	98 *a*	3 *e*	77 *a*	14 *abc*	6 *b*
12	Garlon 4 Ultra Milestone	1 pt 3 fl oz	Yes		0	0 *g*	139	97 *a*	3 *e*	78 *a*	9 *bc*	11 *ab*
												ns

All treatments included Activator 90 @ 0.25% v/v

Dormant seeded plots were sown March 18, 2014. However no plants from this were observed at any of the assessments.

[1]Means followed by the same letter are not different according to Fisher's LSD at P < 0.05. Data columns with ns have treatment means compared using Fisher's LSD where the overall P was greater than 0.05

Table 4: Results for Lespedeza Control Trial (2015)

Trt. No.	Product	Rate per Acre	Dormant Seeding	Application Date	Days After Application	Lespedeza (% cover)	Grasses (% cover)	Other Broadleaf (% cover)	Bare ground (%)
					Rated October 7, 2015				
1	Opensight	3.3 oz	No	September 26, 2013	741	55 c[1]	43 b	3 ab	0 b
2	Opensight	3.3 oz	Yes		741	65 bc	31 bc	4 ab	0 b
3	PastureGard HL Milestone	12 fl oz 3 fl oz	No		741	96 a	3 d	1 ab	0 b
4	PastureGard HL Milestone	12 fl oz 3 fl oz	Yes		741	84 ab	15 cd	1 ab	0 b
5	Garlon 4 Ultra Milestone	1 pt 3 fl oz	No		741	99 a	1 d	0 b	0 b
6	Garlon 4 Ultra Milestone	1 pt 3 fl oz	Yes		741	96 a	2 d	1 ab	1 a
7	Opensight	3.3 oz	No	October 21, 2013	716	94 a	6 d	1 ab	0 b
8	Opensight	3.3 oz	Yes		716	97 a	2 d	1 ab	0 b
9	PastureGard HL Milestone	12 fl oz 3 fl oz	No	June 6, 2014	488	31 d	65 a	4 ab	0 b
10	PastureGard HL Milestone	12 fl oz 3 fl oz	Yes		488	25 d	70 a	5 a	0 b
11	Garlon 4 Ultra Milestone	1 pt 3 fl oz	No		488	17 d	81 a	3 ab	0 b
12	Garlon 4 Ultra Milestone	1 pt 3 fl oz	Yes		488	14 d	84 a	3 ab	0 b
								ns	ns

All treatments included Activator 90 @ 0.25% v/v

Dormant seeded plots were sown March 18, 2014. However no plants from this were observed at any of the assessments.

[1]*Means followed by the same letter are not different according to Fisher's LSD at P < 0.05. Data columns with ns have treatment means compared using Fisher's LSD where the overall P was greater than 0.05*

Effect of Mowing Timing on Johnsongrass Herbicide Efficacy

Joe Omielan and Michael Barrett
University of Kentucky

UK UNIVERSITY OF KENTUCKY College of Agriculture

University of KY Plant & Soil Sciences IVM

INTRODUCTION

Johnsongrass (*Sorghum halepense*) 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 and most rely on translocation from the leaves to the rhizomes for greatest efficacy. However, mowing is part of roadside management and one question is how long after herbicide application do we need to wait before mowing without reducing herbicide efficacy on johnsongrass control?

OBJECTIVE

The objective of this study was to:

1) Evaluate the effect of mowing timing on the efficacy of johnsongrass control herbicides

MATERIALS & METHODS

This study was initiated August 14, 2014 at an interchange near Bardstown KY. Four herbicide treatments were applied to 10 ft x 60 ft strips at 30 gal/ac (Table 1). Average johnsongrass height was 30 in. Six time of mowing treatments (Table 2) were applied as 10 ft x 40 ft strips across the herbicide treatments (Fig. 1 & 2A) in a split block design, replicated three times. The mowing height was 5 inches. The herbicide treatments were Outrider (sulfosulfuron), Fusilade II (fluazifop), Acclaim Extra (fenoxaprop), and Fusilade + Acclaim. The time of mowing treatments were as follows: no mowing, same day as herbicide application, as well as 1 day, 2 days, 1week, and 2 weeks after application.

Visual assessments of percent johnsongrass control were done 34 (9/17/2014) and 70 (10/23/2014) days after herbicide treatment (DAT). Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at p = 0.05.

RESULTS & DISCUSSION

Differences in johnsongrass regrowth among herbicide treatments with mowing within hours of application were visible 14 DAT (Fig. 2B). These differences were more evident 34 DAT (Table 3A) with Outrider providing greater control than other herbicide treatments with the same day mowing treatment. There may have been more soil uptake with Outrider than other herbicide treatments as well as faster translocation to the rhizomes. Acclaim Extra had less control than the other herbicide treatments at many of the shorter mowing intervals (Table 3A & B) (Fig. 3). An overview of the herbicide treatment strips in rep 1 (Fig. 4) illustrates the control ratings in Table 3A.

Johnsongrass regrowth was visible in some of the treatment combinations 70 DAT and resulted in lower control ratings (Table 3B). The control with Outrider with same day mowing was higher than the other herbicide treatments and in the same group as the top treatments. However, only the no mowing and 2 weeks combinations with Acclaim Extra were in this group.

Table 1. Herbicide treatments, application rates, and active ingredients used in this trial.

Trt. No.	Product(s)	Rate per acre	Active Ingredients
1	Outrider Activator 90	1 oz 0.25% v/v	sulfosulfuron
2	Fusilade II Activator 90	24 fl oz 0.25% v/v	fluazifop
3	Acclaim Extra Activator 90	39 fl oz 0.25% v/v	fenoxaprop
4	Acclaim Extra Fusilade II COC	7 fl oz 14 fl oz 1%	fenoxaprop fluazifop

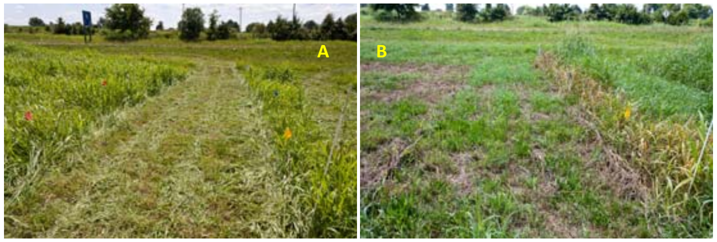


Figure 2. Mowed strip on day of application (**A**) and 2 weeks later (**B**).

Table 2. Timing of mowing treatments used in this trial.

Trt No.	Timing of Mowing Treatments
1	Same day as herbicide application
2	1 Day after
3	2 Days after
4	1 Week after
5	2 Weeks after
6	No mowing

Figure 1. Mowing on day of application (August 14, 2014).

Figure 3. Overview of Rep 1 plots 34 DAT. Red flags mark edge of block while yellow and blue flags mark center of herbicide strips.

Table 3. Herbicide x mowing treatment combinations and % johnsongrass control 34 DAT **(A)** and 70 DAT **(B)**.

(A) Mowing Time	Outrider	Fusilade II	Acclaim Extra	Acclaim + Fusilade
Same Day	83 *cd*	39 *gh*	45 *g*	30 *h*
1 Day After	97 *ab*	90 *abcd*	65 *f*	87 *bcd*
2 Days After	98 *a*	91 *abcd*	68 *f*	91 *abcd*
1 Week After	99 *a*	91 *abcd*	72 *ef*	93 *abc*
2 Weeks After	99 *a*	95 *ab*	83 *cd*	93 *abc*
No Mowing	70 *f*	87 *bcd*	82 *de*	87 *bcd*

(B) Mowing Time	Outrider	Fusilade II	Acclaim Extra	Acclaim + Fusilade
Same Day	88 *ab*	0 *f*	17 *ef*	14 *ef*
1 Day After	99 *a*	94 *a*	37 *de*	96 *a*
2 Days After	100 *a*	97 *a*	48 *cd*	98 *a*
1 Week After	100 *a*	97 *a*	67 *bc*	99 *a*
2 Weeks After	100 *a*	100 *a*	94 *a*	99 *a*
No Mowing	93 *a*	99 *a*	92 *a*	97 *a*

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

Figure 4. Overview of herbicide treatment strips 34 DAT in Rep 1: Trt. 1 (**A**), Trt. 2 (**B**), Trt. 3 (**C**), Trt. 4 (**D**). Yellow and blue flags mark the center of the strips while red flags mark the edge of the rep.

SUMMARY

Mowing timing did affect herbicide efficacy. Initial results suggest that mowing 1 or 2 days after application will not reduce the efficacy of Outrider, Fusilade, or Acclaim + Fusilade. However, one should wait 2 weeks before mowing if Acclaim Extra was applied. Final assessments will be done in 2015.

Kudzu Control Options: Initial Evaluation

Joe Omielan[1], Dustin Gumm[2], and Michael Barrett[1]
[1] University of Kentucky, [2] Kentucky Transportation Cabinet

INTRODUCTION

Kudzu (*Pueraria montana*) is an invasive deciduous twining, trailing, mat-forming, woody leguminous vine that forms dense infestations along forest edges, rights-of-way, old homesteads, and stream banks. It colonizes by vines rooting at nodes and spreads by seed dispersal. The plants have extensive root systems with large tuberous roots which can be 3 to 10 feet deep. Kudzu can dominate a site to the exclusion of other vegetation. Repeated herbicide applications along with other management measures are required to reduce the infestation. Picloram is used for kudzu control in many states but has not been used extensively in KY in recent years. What are some of the other selective herbicide control options and how effective are they?

OBJECTIVE

The objective of this study was to:
1) Evaluate the efficacy of herbicide control options for kudzu control

MATERIALS & METHODS

This study was initiated in June, by mowing a kudzu infested field near Beattyville KY. Plots (9 m x 9 m) with 3 m alleys separating them were arranged in a 10 treatment randomized complete block design with 3 replications. After kudzu regrowth (35 cm canopy), 9 herbicide treatments were applied at 337 L/ha on July 25, 2014 and two repeat treatments were applied on September 25 (Table 1). These same treatments will be applied in 2015 and final assessments taken in 2016. Alleyways were mowed and treated with Milestone VM to prevent vine encroachment (Minogue et al., 2011).

Visual assessments of percent kudzu control and green vegetative cover (0-100%) were done 32 (8/26/2014), and 62 (9/25/2014) DAT (days after initial treatment). Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at p = 0.05.

RESULTS & DISCUSSION

All the treatments had kudzu control greater than 92% 32 DAT (Table 1 and Fig. 1). However by 62 DAT control with Patron 170 had declined to 72%. Green vegetative cover increased from 32 to 62 DAT and ranged from 63 to 100% for most treatments except for Streamline with only 13% green cover 62 DAT (Table 1 and Fig. 2).

SUMMARY

There are a number of herbicide options which are selective and effective in kudzu control. Final assessments will be done in 2016 after repeat applications in 2015.

Literature Cited:
Minojue, P.J., S.F. Enloe, A. Osiecka, and D.K. Lauer. 2011 Comparison of aminocyclopyrachlor to common herbicides for kudzu (*Pueraria montana*) management. Invasive Plant Sci. Management. 4: 419-426.

Table 1. Herbicide treatments, application rates and timing, active ingredients used in this trial plus % kudzu control and % green vegetation cover.

Trt. No.	Product(s)	Rate per Ac	Application	Active Ingredient(s)	ai Rate per Ha	% Kudzu Control 32 DAT	% Kudzu Control 62 DAT	% Green Cover 32 DAT	% Green Cover 62 DAT
1	Transline	21 fl oz	A	clopyralid	551 g ae	92 *b*	96 *b*	83 *ab*	100 *a*
	Activator 90	0.5% v/v							
2	Streamline	11.5 oz	A	aminoclyclopyrachlor + metsulfuron	318 g + 101 g	100 *a*	100 *a*	2 *e*	13 *d*
	COC	1%							
3	Garlon 3A	3 gal	A	triclopyr	10.1 kg ae	100 *a*	100 *a*	10 *de*	80 *b*
	Activator 90	0.5% v/v							
4	Garlon 3A	1.5 gal	A	triclopryr	5 kg ae	98 *a*	100 *a*	38 *c*	97 *a*
	Activator 90	0.5% v/v							
	Garlon 3A	1.5 gal	B	triclopyr	5 kg ae				
	Activator 90	0.5% v/v							
5	Rodeo	8 qt	A	glyphosate	9 kg ae	100 *a*	99 *ab*	25 *cde*	97 *a*
	Activator 90	0.5% v/v							
6	Rodeo	4 qt	A	glyphosate	4.5 kg ae	98 *a*	98 *ab*	30 *cd*	96 *a*
	Activator 90	0.5% v/v							
	Rodeo	4 qt	B	glyphosate	4.5 kg ae				
	Activator 90	0.5% v/v							
7	Opensight	3.3 oz	A	aminopyralid + metsulfuron	121 g ae + 22 g	98 *a*	99 *a*	18 *cde*	63 *c*
	Activator 90	0.5% v/v							
8	BK 800	2 gal	A	2,4-D + 2,4-DP + dicamba	4.2 kg ae + 2.1 kg ae + 1.1 kg ae	99 *a*	98 *ab*	28 *cd*	98 *a*
	Activator 90	0.5% v/v							
9	Patron 170	6.9 pt	A	2,4-D + 2,4-DP	1.7 kg ae + 0.8 kg ae	92 *b*	72 *c*	70 *b*	100 *a*
	Activator 90	0.5% v/v							
10	Unsprayed Control					0 *c*	0 *d*	100 *a*	100 *a*

Application A on 8/26/2014 and B on 9/25/2014.
DAT: Days after initial treatment.
Means followed by the same letter are not different according to Fisher's Protected LSD at $P < 0.05$..

Figure 1. Overall view of trial (**A**), Control (**B**), Transline (**C**), and Streamline (**D**) plots 32 DAT (Aug. 26, 2014).

Figure 2. Overall view of trial (**A**), Control (**B**), Transline (**C**), and Streamline (**D**) plots 62 DAT (Sept. 25, 2014).

2015 Roadside Environment Update
Tuesday March 31, 2015 at Weldon Suite (Good Barn on UK Campus)

Agenda

8:30 – 9:00 a.m.	Coffee, Orange Juice & Donuts
9:00 – 9:50 a.m.	Summary of 2014 Research Trials and Demonstrations (information on cable barrier, kudzu, johnsongrass, Japanese knotweed trials) (Cat. 3, 6, 10) (Dr. Joe Omielan)
9:50 – 10:40 a.m.	Herbicide Resistance Management (tank mixes and other management options) (General) (Dr. Michael Barrett)
10:40 – 11:30 a.m.	Sustainable Roadside Turf Management (information on benefits of clovers and reducing chemical fertilizer and input costs) (Cat 3, 6, 10) (Dr. Gregg Munshaw)
11:30 – 12:20 p.m.	Pollinator Species and How ROW Management Can Benefit Them (information on full range of pollinators from butterflies and moths to bees and wasps to beetles and flies to hummingbirds) (General) (Dr. Lee Townsend)
12:20 – 1:00 p.m.	Lunch (Soup and Sandwich Buffet)
1:00 – 1:50 p.m.	Plant / Weed ID Challenge (seedlings grown in greenhouse) (General) (Dr. Joe Omielan)
1:50 – 2:40 p.m.	Plants Needed by Pollinators and How Can We Incorporate Them Into ROW Management (General) (Joyce Bender)
2:40 – 3:30 p.m.	KYTC Master Agreement Contract Update (Darrell Burks)

Pesticide CEUs approved: General (4 CEU)
Cat. 3, 6, 10 *(2 CEU)*

Attendance: 22 KYTC, 2 UK, 1 KSNPC (Kentucky State Nature Preserves Commission)

Vegetation Management for Highway Rights of Way Workshop
Thursday August 6, 2015 at Robinson Center for Appalachian Resource Sustainability, Quicksand

Agenda

8:30 – 9:00 a.m.	Registration (Auditorium, 176 Robinson Road, Jackson, KY 41339)
9:00 – 9:50 a.m.	Wagon tour of Research Station plots (Wade Turner)
9:50 – 10:30 a.m.	Weed ID (Dr. JD Green) (Group A) & 2,4-D Volatility and Resistance Demo Plots (Group B) (Dr. Mike Barrett)
10:30 – 11:10 a.m.	Weed ID (Group B) & 2,4-D Volatility and Resistance Demo Plots (Group A)
11:10 – 12:00 p.m.	Herbicide Injury Demo (Dr. Joe Omielan and Dr. Mike Barrett)
12:00 – 1:00 p.m.	Lunch
1:00 – 2:00 p.m.	Protecting our pollinators (Dr. Tammy Horn, KY State Apiarist)
2:00 – 3:00 p.m.	Tour of Wood Utilization Center (Bobby Ammerman)

CEU's in this workshop: 2 General and 2 Specific (Categories 3, 6, 10) (applied for)

Wade Turner will lead a wagon tour of the Robinson Center for Appalachian Center for Resource Sustainability and discuss the range of horticultural and agronomic research conducted here. (General)

Dr. JD Green will provide information and practice in identifying crops and weeds while Dr. Mike Barrett will discuss the issues of 2,4-D volatility and herbicide resistance. (Cat. 3, 6, 10)

Dr. Joe Omielan and Dr. Mike Barrett will lead the group in an exercise examining herbicide injury symptoms on different crop species. (Cat. 3, 6, 10)

Dr. Tammy Horn, KY State Apiarist will provide information on the challenges our pollinator species face and what we can do to help. (General)

Bobby Ammerman will lead us on a tour of the Wood Utilization Center and discuss some of the projects here.

For more information contact Joe Omielan at 859-967-6205, e-mail joe.omielan@uky.edu

Attendance: 53 KYTC, 3 UK

2015 KYTC Tree Management Workshop

Tuesday September 22, 2015 at Gorham Hall (Good Barn on UK Campus) (1451 University Drive, Lexington) for Morning and at Dave Leonard Tree Specialists (544 Old Frankfort Pike, Versailles) in Afternoon

Agenda

8:30 – 9:00 a.m.	Registration along with coffee & donuts
9:00 – 10:00	Updates on UK Pollinator Study and Tree Pests (Emerald Ash Borer, Asian Longhorned Beetle, Hemlock Woolly Adelgid, Thousand Cankers Disease) (Dr. Lee Townsend)
10:00 – 11:00	Endangered Species Concerns with Highway Maintenance Operations (Dave Harmon and Andrew Logsdon, KYTC)
11:00 – 11:30	Safety and Hazard Tree Removal from Roadsides (Dave Leonard)
11:30 – 1:00 p.m.	Pick up Box Lunch and drive to Dave Leonard Tree Specialists (544 Old Frankfort Pike, Versailles) (10.5 miles and 20 minutes drive from Good Barn)
1:00 – 4:00	Outdoor Demonstrations and Hands-On Opportunities (*please bring your hard hats and other safety gear plus your chainsaws*)
	- Chainsaw Maintenance, Safety & Ergonomics (Rick Bellew, Bryan Equipment)
	- How to Plan a Tree Removal and Safely Cut It Up (Dave Leonard)

Pesticide CEU's for this workshop (approved): 1 General.

Arborist CEU's and Engineering PDH's also applied for.

For more information contact Joe Omielan at 859-967-6205, e-mail joe.omielan@uky.edu

Topics to be covered in the Workshop

Updates on UK Pollinator Study and Tree Pests (Dr. Lee Townsend)

- An update on the UK Pollinator study being conducted by Dr. Dan Potter and on the current status and what to look for with Emerald Ash Borer, Asian Longhorned Beetle, Hemlock Woolly Adelgid, and Thousand Cankers Disease

Endangered Species Concerns with Highway Maintenance Operations (Dave Harmon, Branch Manager, and Andrew Logsdon, Biologist, KYTC Division of Environmental Analysis)

- Information will be presented about the biology of the Indiana bat and other species of concern and how we should adjust and time maintenance operations to minimize negative impacts

Safety and Hazard Tree Removal from Roadsides (Dave Leonard, ISA Board Certified Master Arborist)

- How to protect yourself and your co-workers when working around trees (hard hats, chaps)

Outdoor Demonstrations and Hands-On Opportunities (*please bring your hard hats and other safety gear plus your chainsaws*)**:**

Chainsaw Maintenance, Safety & Ergonomics (Rick Bellew, Bryan Equipment)

- Rick will discuss the safety features of a saw and proper PPE as well as proper starting and handling
- He will demonstrate an open face cut and notching, a plunge cut, and release of a tree under tension

How to Plan a Tree Removal and Safely Cut It Up (Dave Leonard, ISA Board Certified Master Arborist)

- Dave will go over procedure for setting up for tree removal (safe zone, escape routes, what to watch for as potential problems)

Attendance: 41 KYTC, 3 UK

Kudzu Control Plot Tour

September 29, 2015

Viewing and Discussion from 10 a.m. to noon

You are invited to view a set of Kudzu plots and discuss control options. These were mowed in June 2014 and two sets of annual applications were applied in July 2014 and 2015. We have excellent control in some plots. The treatments include:

Transline
Streamline
Garlon 3A
Rodeo
Opensight
BK 800
Patron 170

We will be meeting at the Beattyville Equipment Garage (780 West Ridge Road, Beattyville, KY 41311) (606-464-2418 / 606-464-2417) at **9:30 a.m.** The plots are not easy to get to (at Hwy 52 and 2469) so we will carpool (in 4 wheel drive vehicles) and provide shuttle service to get people to/from the plots.

For more details contact:

Joe Omielan <joe.omielan@uky.edu>
859-967-6205 (cell)
Dustin Gumm < Dustin.Gumm@ky.gov>
606-666-8841

Attendance: 6 (2 UK) (2 KYTC) (1 Industry) (1 KSNPC Kentucky State Nature Preserves Commission)