2007 – 2009 Evaluations of New Broadleaf Weed Control Herbicide Formulations for ODOT Roadside Vegetation Management Programs

FINAL REPORT - FHWA-OK-09-07
ODOT SPR ITEM NUMBER 2157

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16. ABSTRACT

A three year research project was conducted between the Oklahoma Department of Transportation (ODOT) and the Oklahoma State University to investigate herbicides and herbicide tank mixes that could supplement existing ODOT weed control programs in the safety zone.

Two studies were conducted using generic herbicides MSM E-Pro (metsulfuron methyl) and Diuron 80 WDG (diuron). Both provided similar control of broadleaf weeds as compared to the current equivalent industry standard formulations. Two studies were conducted to evaluate efficacy of Milestone VM (aminopyralid) and Milestone VM blended formulations. We do not believe the new blended Milestone VM formulations provide advantages in terms of efficacy, safety, or price over the current postemergence standard treatments used by ODOT. Five studies were conducted to evaluate BAS 80003 (saflufenacil), a new herbicide active ingredient manufactured by BASF. Saflufenacil was found to provide benefits to ODOT broadleaf weed control programs. This product produces quick broadleaf weed control activity in the first 2-3 days on susceptible species and may provide for a higher degree of safety around sensitive crops due to its low volatility. Nine studies were conducted to evaluate DPX-MAT28 (aminocyclopyrachlor) a new herbicide active ingredient manufactured by Dupont. This product has potential to provide significant benefits to ODOT broadleaf and grassy weed control programs. DPX-MAT28 produced good control of many annual broadleaf weeds. Most important, DPX-MAT28 has shown significant activity for both preemergence kochia (Kochia scoparia) control and postemergence Palmer amaranth (Amaranthus palmeri) control. Both of these weed species currently pose serious problems for ODOT. Specific weed control results from this product are very dependent on both timing and rate of application. Additional work with aminocyclopyrachlor will need to continue in the future to finalize product rate, application timings, and weed control spectrum. Provided that Federal as well as Oklahoma State labeling of several products occurs in combination with a competitive bid process, several new, cost effective and efficacious products will be available to ODOT for weed control purposes in the future.

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EXECUTIVE SUMMARY OF THE FINAL REPORT CONCERNING 2006 – 2009 EVALUATIONS OF NEW BROADLEAF WEED CONTROL HERBICIDE FORMULATIONS FOR ODOT ROADSIDE VEGETATION MANAGEMENT PROGRAMS

In October 2006, Joint Research Project 2157: *Refinement Of Roadside Vegetation Management Practices In Oklahoma* was initiated as a cooperative effort between the Oklahoma Department of Transportation (ODOT) and the Oklahoma State University (OSU). The objectives of this specific report appeared in Task # 1: *Evaluations of New Weed Control Herbicide Formulations For Potential Integration Into Existing ODOT Roadside Vegetation Management Programs.* The overall objective of this research was:

To evaluate new broadleaf weed control herbicide formulations for potential integration into existing ODOT roadside vegetation management programs.

During 2007-2009, a total of 18 herbicide screening experiments were conducted in ODOT Divisions 4 and 6 to determine herbicide treatments and rates effective in the selective control of certain weeds. All trials contained three replications of treatment. Experiment data were statistically analyzed using an Analysis of Variance Procedure. Treatment means were compared using the least significant difference test. Weed species included in trials were Palmer amaranth, kochia, prickly lettuce, Carolina geranium, cheat, common ragweed, crabgrass, downy brome, annual ryegrass, field bindweed, and marestail, There were a total of 4 research thrust areas during this project.

Based upon our three years of research trials covered in this report, the RVM Research Team at OSU has developed the following 4 statements/recommendations to ODOT.

1. Two studies were conducted using generic herbicides MSM E-Pro® and Diuron 80 WDG®. Both herbicides provided similar control of broadleaf weeds as compared to the current equivalent industry standard. Subsequently, ODOT has placed these two products on the Approved Herbicide and Adjuvant List (AHAL) for possible future contracting and purchases.

2. Two studies were conducted to evaluate Milestone VM® and blended formulations for efficacy. While Milestone VM® does provide low levels of preemergence kochia control it should

not be used as a primary kochia control herbicide where kochia is the main target. New blended formulations of Milestone VM®, and triclopyr amine, provide good broadleaf weed control when applied postemergence in early summer, however we do not believe they provide advantages (efficacy, safety, or price) over the current postemergence standard treatments.

3. Five studies were conducted during 2007-2009 to evaluate the experimental product formulation BAS 80003 (active ingredient saflufenacil), a new herbicide active ingredient manufactured by BASF. Saflufenacil can provide benefits to ODOT broadleaf weed control programs and will be recommended for use as a summer postemergence broadleaf weed control option when the manufacturer receives full federal and state registrations. Additional research may be needed on this product in the future if substantial formulation changes are undertaken by BASF from the formulation BAS 80003. This product produces quick broadleaf weed control results evident in 2-3 days. BAS 80003 may provide for a higher degree of safety around sensitive crops due to its low volatility. This product should produce good control of many current annual broadleaf weeds, however, it has some weed selectivity issues meaning it will not be recommended for use if kochia, Illinois bundleflower or field bindweed are major target species. This product is not currently labeled for use on roadsides but full registration is expected in the near future. The treatment costs are currently not available for this product since it has not been commercialized in the utility turf area of roadside right of way.

4. Nine studies were conducted during 2008-2009 to evaluate aminocyclopyrachlor (DPX-MAT28), a new herbicide active ingredient manufactured by Dupont. Research and development of this new product are still ongoing but it appears at this time this product has potential to provide significant benefits to ODOT broadleaf and grassy weed control programs. This product should produce good control of many current annual broadleaf weeds. Most important, this product has shown significant activity for both preemergence kochia control and postemergence Palmer amaranth control. Both of these weed species currently pose many problems for ODOT. The product has also shown the ability to control summer annual grasses from postemergence applications. Specific weed control results from this product appear to be very dependent on both timing and rate of application. Much of this information has already been developed, however, during the 2010 research year the final pieces of data should be collected to formulate recommendations for ODOT use. This product is not currently labeled for use on roadsides but full registration is expected in the near future. The treatment costs are currently not available for this product.

1.0 INTRODUCTION

1.1 PROBLEM

The Oklahoma Department of Transportation (ODOT) is responsible for maintaining the vegetation along state highways at an acceptable level to provide for a safe and positive traveling experience. While most ODOT clear zones are currently under effective mowing and herbicide programs they remain subject to the natural process of plant community succession, resulting in ever increasing ecosystem diversity. To the lay person this means that an increasing number of different species of plants will invade the roadside over time. Some of these plants, being tall in nature or otherwise not meeting ODOT's needs for a low growing soil stabilizing vegetation, will be determined to be weeds or plants growing out of place. Over many years an effective roadside vegetation management program will produce stands of desirable vegetation but there will also be some undesirable weedy species present. These changes in roadside vegetation species may be due to changes in mowing frequencies [1], herbicide resistance [2], lack of use of herbicide controls, and climate [3,4]. These influences, along with budget constraints, continue to make ODOT herbicide weed control programs very challenging.

1.2 BACKGROUND

While the sluggish economy has slowed the development of agrichemicals for traditional crops, our major herbicide manufacturers continue to provide new herbicide chemistry for the industrial roadside vegetation management market. Roadside weed control programs across the country at Federal, State, County, and Local levels continue to benefit from the development of these new herbicide products. The development of new herbicide products is crucial as we continue to address new weed problems while continuing to lose older herbicide active ingredients due to US Environmental Protection Agency (EPA) reregistration [5] or manufacturer marketing decisions. This report covers our research during 2007-2009 on a total of eight new herbicide active ingredients from four manufacturers. This level of development activity for new herbicide chemistry is not occurring in other agricultural crops at this time. Each of these new active ingredients were evaluated for their ability to provide beneficial broadleaf weed control while promoting the release of beneficial grasses on the roadside. Through the accumulation of weed control efficacy and perennial grass safety data in these studies it can be determined if any of these products can provide better, less expensive, or environmentally safer weed control alternatives to today's standard treatments.

1.3 OBJECTIVES

The objectives of this research are to determine if any of the new products evaluated show promise in allowing ODOT to manage vegetation problems more effectively, efficiently, or in a safer manner. This research also addresses the need to provide for a screening of older herbicide chemistries that have lost patent protection and become available as generic formulations ("same-as-formulations" to the original patented product). This research continues to focus on current specific problem areas that ODOT weed control programs experience statewide.

1.4 SCOPE

The contents of this report are divided into three main areas: 1) a *Summary of Findings & Recommendations from our research* (Section 2.1 – 2.8), 2) *Materials & Methods* (Section 3.0) and 3) a detailed presentation of the *Results & Discussion* of each of the 18 weed control or product evaluation trials. These studies are grouped into 4 areas of similar work (Section 4.1 – 4.4). The *Summary* section is recommended for those wishing to merely have an overview of what was discovered in this research and what recommendations have been developed from our research. The more detailed *Materials & Methods* as well as *Results & Discussion* sections are recommended for those wishing to know more details about each research study that was conducted.

All of the research presented in this report has been conducted using both industry and University weed control standard research techniques. All research studies were conducted on Oklahoma highway system roadsides and under the normal range of roadside conditions such that results could be expected to be similar to those that would be experienced by ODOT herbicide applicators. As with all herbicide research conducted under field conditions, there are many variables that can influence the effects of the treatments. The most extreme examples of these include varying soil types and the effects of drought. All data collected from treated plots was compared to nearby untreated plots. Data was collected in an unbiased fashion with respect to product and manufacturer as well.

Each of our studies involved either commercially available and/or experimental phase products and treatments that could have a positive impact on ODOT roadside vegetation management programs. Beyond the findings of our research, the availability of herbicide products to ODOT will depend upon both US Environmental Protection Agency (EPA) and Oklahoma Department of Agriculture, Food and Forestry (ODAFF) labeling of the products, specific non-crop right of way site intent (part of labeling), the product being placed on the ODOT Approved Herbicide & Adjuvant List (AHAL) and competitive bidding of contracts by private industry. Most of these factors lay outside the control or influence of our vegetation management research program.

2.0 SUMMARY OF CONCLUSIONS REGARDING WEED CONTROL STUDIES AND SUBSEQUENT RECOMMENDATIONS

2.1 EVALUATION OF GENERIC METSULFURON AND DIURON PRODUCTS

Two studies were conducted using generic herbicides MSM E-Pro® and Diuron 80 WDG®. Both provided similar control of broadleaf weeds as compared to the current equivalent industry standard. Subsequently, ODOT has placed each of these products on the Approved Herbicide and Adjuvant List (AHAL) for possible future contracting and purchases.

2.2 DEVELOPMENT OF MILESTONE VM FOR BROADLEAF WEED CONTROL

Two studies were conducted to evaluate Milestone VM® and blended formulations for efficacy. While Milestone VM® does provide low levels of preemergence kochia control it should not be use as a primary kochia control herbicide where kochia is the main target. New blended formulations of Milestone VM®, and triclopyr amine, provide good broadleaf weed control when applied postemergence in early summer, however we do not believe they provide advantages (efficacy, safety, or price) over the current postemergence standard treatments.

2.3 DEVELOPMENT OF SAFLUFENACIL FOR SUMMER BROADLEAF WEED CONTROL

Five studies have been conducted during 2007-2009 to evaluate saflufenacil (BAS 80003), a new herbicide active ingredient manufactured by BASF. Saflufenacil can provide benefits to ODOT broadleaf weed control programs and will be recommended for use as a summer postemergence broadleaf weed control option when the manufacturer receives full federal and state registrations. This product produces quick broadleaf weed control results (2-3 days) and may provide for higher degree of safety around sensitive crops due to its low volatility. This product should produce good control of many current annual broadleaf weeds, however, it has some weed selectivity issues meaning it will not be recommended for use if kochia, Illinois bundleflower or field bindweed are major target species. This product is not currently labeled for use on roadsides but full registration is expected in the near future. The treatment costs are currently not available for this product.

2.4 DEVELOPMENT OF AMINOCYCLOPYRACHLOR FOR SUMMER BROADLEAF AND GRASSY WEED CONTROL

Nine studies have been conducted during 2008-2009 to evaluate aminocyclopyrachlor (DPX-MAT28), a new herbicide active ingredient manufactured by Dupont. Research and development of this new product are still ongoing but it appears at this time this product has potential to provide significant benefits to ODOT broadleaf and grassy weed control programs. This product should produce good control of many current annual broadleaf weeds. Most important, this product has shown significant activity for both preemergence kochia control and postemergence Palmer amaranth control. Both of these weed species currently pose many problems for ODOT. The product has also shown the ability to control summer annual grasses from postemergence applications. Specific weed control results from this product appear to be very dependent on both timing and rate of application. Much of this information has already been developed, however during the 2010 research year the final pieces of data should be collected to formulate recommendations for ODOT use. This product is not currently labeled for use on roadsides but full registration is expected in the near future. The treatment costs are currently not available for this product.

3.0 MATERIALS & METHODS

In order to develop a Final Report of improved readability we have chosen to present a generalized materials and methods section that is applicable to all herbicide trials that we conducted. Minute details of each trial have already been report in the Year End 2007 and 2008 Research Reports so we spare the reader those many details in this report. The generalized methods used in all of our studies follow.

All studies were conducted on common bermudagrass (*Cynodon dactylon*) roadside rights-of-way. The objectives of each study are reported in their respective Results & Discussion section. Additionally, the target weeds studied are reported in those same sections. Research Study name codes are assigned to each of our trials and those codes are listed in each respective section. Studies were named for record keeping purposes using the following code: A-B-C-D, where A= the ODOT Division number, B= H for herbicide or G for plant growth regulator, C=the cumulative number of that study, representing the total number of studies that were conducted in that ODOT division since our record keeping began in 1963, and D= the two digit code for the year of the study. For instance a study coded as 4-H-32-06 would be a study conducted in Division 4 involving herbicides that was the 32nd cumulative study conducted in that division by our program (since 1963) and that study was put out in 2006.

All trials were conducted using Randomized Complete Block field experiment designs and they contained 3 replications of treatment and at least one untreated check in each replication. Herbicide treated plots ranged in size from 5 x 10 feet up to 8 x 15 in dimension. We utilized either 80 degree or 110 degree flat fan spray nozzles mounted to a boom on an R&D brand $C0_2$ pressurized bicycle sprayer or custom built CO_2 pressurized 4-wheeler sprayer. Either 20 or 30 gallons of sprayer carrier rate was used in each trial.

Data were collected for percent weed control and damage (phytotoxicity) to bermudagrass usually at 14, 30, 60 and 90 days-after-application (DAA). The amount of time that had passed since application will be at the top of the weed control or turf damage data column. The time will be labeled as the number of days since herbicide application. The specific weed to which the data applies is listed at the top of each column. Likewise, if injury or phytotoxicity to bermudagrass is being studied, that label will also appear above its respective data column.

All data was subject to an Analysis of Variance procedure. When the herbicide treatment effect was statistical significant at the 90% certainty level (probability = 0.10) a least significant difference (LSD) test was used to compare the individual performance averages (called means) of each herbicide treatment. The reader can use the LSD value to compare the various means or simply refer to the statistical letter of the alphabet that follows each treatment mean. Means followed by the same letter are not statistically different from each other at the 90% certainty level even if they are numerically different. The 90% certainty levels means that the test is 90% certain that

the difference witnessed is not likely due to simply pure chance but rather it is likely a real effect due to true differences in the performance of the herbicide treatments.

4.0 HERBICIDE WEED CONTROL TRIAL RESULTS AND DISCUSSION

4.1 DEVELOPMENT OF GENERIC METSULFURON AND DIURON PRODUCTS

Trial Objectives: The objectives of these studies were to evaluate the effectiveness of the generic herbicides MSM E-Pro® (metsulfuron methyl) from Alligare (study 4-H-80-07) and Diuron 80 WDG® (diuron) from Loveland (study 4-H-73-07) for controlling common broadleaf weeds and common bermudagrass tolerance.

Methods (4-H-80-07): The manufacturer Etigra sought inclusion of its metsulfuron methyl herbicide MSM E-Pro® on the 2008 ODOT Approved Herbicide and Adjuvant List. This study compared the broadleaf weed control produced by the MSM E-Pro® product to the original EPA approved Escort XP® herbicide. Treatments were applied on May 16, 2007 to actively growing field bindweed, marestail, and prairie cupgrass. Visual weed control data was collected for each weed species at 14, 27, and 58 days-after-applications (DAA). Bermudagrass injury data was also collected at each of the evaluation dates.

Results & Discussion (4-H-80-07): Field bindweed control at 14, 27 and 58 DAA was very similar for both MSM E-Pro® and Escort XP® when applied alone (Table 1), although an acceptable level of field bindweed control was not achieved for either treatment (>90%). This is not completely unexpected as field bindweed is a difficult-to-control deep-rooted perennial broadleaf and given the amount of rainfall this spring bindweed growth was aggressive. The addition of Roundup Pro Conc.® to each of these treatments produced and maintained an acceptable level of field bindweed control through 58 DAA. However, the addition of the Roundup Pro Conc.® also produced an unacceptable amount of bermudagrass injury at 14 and 27 DAA. All bermudagrass injury had diminished by 58 DAA. Only marestail control observations were taken as populations were low, and it appeared that the MSM E-Pro® treatments produced similar control to that achieved from Escort XP® treatments. Prairie cupgrass is a native annual grass that was unaffected by either MSM E-Pro® or Escort XP applied alone. The addition of Roundup Pro Conc.® to both products produced excellent control of prairie cupgrass through 58 DAA evaluations.

It appears from the data collected in this study that the MSM E-Pro® product will provide ODOT herbicide programs with a similar level of weed control as Escort XP®. As MSM E-Pro® product successfully passed compatibility testing in fall 2007 MSM E-Pro® was recommended for inclusion on the 2008 ODOT Approved Herbicide and Adjuvant List.

Table 1. Postemergence Broadleaf Weed Control Study 4-H-80-07 in Garfield County in 2007.

Weed Code				field bindweed		field bindweed		Field bindweed		Prairie cupgrass		prairie cupgrass		prairie cupgrass		common bermuda-grass		common bermuda-grass	
Rating Data Type				control		control		Control		Control		control		control		injury		injury	
Rating Unit				%		%		%		%		%		%		%		%	
Rating Date				5/30/2007		6/12/2007		7/13/2007		5/30/2007		6/12/2007		7/13/2007		5/30/2007		6/12/2007	
Trt-Eval Interval				14 DAA		27 DAA		58 DAA		14 DAA		27 DAA		58 DAA		14 DAA		27 DAA	
Trt No.	Treatment Name	Product Rate	Product Rate Unit																
1	Untreated check			7		17		0		0		0		0		2		0	
2	MSM E-Pro®	1.0	oz wt/a	35	b	63	a	72	a	7	b	0	b	0	b	5	b	0	b
	Red River NIS	0.25	% v/v																
3	Escort XP®	1.0	oz wt/a	38	b	76	a	72	a	0	c	0	b	0	b	3	b	2	b
	Red River NIS	0.25	% v/v																
4	MSM E-Pro®	1.0	oz wt/a	60	a	93	a	90	a	100	a	95	a	90	a	43	a	47	a
	Roundup Pro Conc.®	19	fl oz/a																
5	Escort XP®	1.0	oz wt/a	55	a	93	a	93	a	100	a	95	a	90	a	52	a	52	a
	Roundup Pro Conc.®	19	fl oz/a																
LSD (P=.10)				12.7		NS		NS		4.6		0.4		4.0		8.8		7.9	
Standard Deviation				7.7		15.5		15.3		2.9		0.3		2.5		5.5		5.0	
CV				16.45		19.04		18.68		5.59		0.68		5.56		21.4		20.0	
Replicate F				8.889		1.555		0.331		1.000		1.000		1.000		1.909		1.000	
Replicate Prob(F)				0.0226		0.2984		0.7303		0.4219		0.4096		0.4219		0.2282		0.4219	
Treatment F				7.535		2.609		1.743		1124.000		121411.012		1296.000		62.636		94.000	
Treatment Prob(F)				0.0265		0.1639		0.2574		0.0001		0.0001		0.0001		0.0001		0.0001	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-73-07): The Diuron 80 WDG® Loveland formulation included rates of use on its federal label recommended by OSU for roadside weed control. This eliminated the need for additional state labeling as was necessary with past diuron products. Diuron is an herbicide that was previously recommended for ODOT use under the trade name of Karmex®. The evaluation of this product was at the request of ODOT Field Divisions 2 & 6.

Applications were made on March 7, 2007 to plots and were activated approximately 4 days later with a 0.5 inch rain event. Diuron, provides both preemergence and postemergence control, but to begin controlling weeds preemergence it must have rainfall to move the herbicide into the top layer of soil and activate the product. At the time of application several winter annual weeds were actively growing which included; cereal rye, downy brome, and corn gromwell. The specific research site was selected in early March because of the abundance of kochia and pigweed plant remnants that remained from the previous year with the intention that a uniform crop of kochia and pigweed would emerge this spring/summer. This would allow for the herbicide treatments to be evaluated for preemergence control of the later emerging kochia and pigweed, as well as any other summer weeds. The first six months of 2007 had been extremely wet. In May and June this research site had approximately 9 and 14 inches of rainfall, respectively. While rainfall is important to promote weed germination and growth, flooding conditions can cause problems. Part of the experimental area was located in the bottom of the roadside ditch and was under water for much of May and June. This compromised the data from this study in two ways. First, the herbicide diuron is considered to be moderately soluble in water so it is likely that much of the diuron moved down and out of the soil profile making it unavailable for long-term weed control. Secondly most plants do not produce active growth and development when growing under conditions where soil water is greater than field capacity. These conditions reduce oxygen levels in soils and can prevent both weed seed germination and reduced weed growth. Considering both the solubility of diuron and soil water capacities, the beneficial weed control from the treatments in this study only lasted for about 2 months instead of the 3 to 4 months that was expected. Nevertheless, weed control evaluations were taken as scheduled and recommendations on the use of this product can be made based on the data from this study.

Results & Discussion (4-H-73-07): At 33 & 64 days-after-application (DAA) all treatments which included Campaign® + AMS provided excellent control of cereal rye and downy brome (Table 2). The lower rate of Diuron 80 WDG® alone provided only suppression of these winter annual grassy weeds. The higher rate of Diuron 80 WDG® did provide good to excellent control of winter annual grassy weeds, however, it would be more cost efficient to lower the Diuron rate and include the Campaign®+ AMS component to winter annual grassy weed control. All treatments provided excellent control of corn gromwell (winter annual broadleaf) at both 33 & 64 DAA evaluations. Weed control evaluations were attempted for the summer annual weeds crabgrass, pigweed, and kochia, however as explained earlier, results were erratic. Presumably this was due to soil moisture conditions within the study area during May and June. While it is unfortunate that some data was not available it is the opinion of the OSU

RVM Team that the product under evaluation, Diuron 80 WDG®, performed up to expectations considering the conditions during which it was evaluated. We recommended that Diuron 80 WDG® from Loveland Industries be added to the 2008 ODOT Approved Herbicide and Adjuvant List effective January 2008.

Table. 2. Preemergence Kochia Control Study 4-H-73-07 in Kingfisher County in 2007.

Weed Code				cereal rye	cereal rye	Downy brome	downy brome	corn gromwell	corn gromwell	common bermudagrass	common bermudagrass
Rating Data Type				control	control	control	control	control	control	greenup	greenup
Rating Unit				%	%	%	%	%	%	%	%
Rating Date				4/9/2007	5/10/2007	4/9/2007	5/10/2007	4/9/2007	5/10/2007	4/9/2007	5/10/2007
Trt-Eval Interval				33 DA-A	64 DA-A	33 DA-A	64 DA-A	33 DA-A	64 DA-A	33 DA-A	64 DA-A
Trt No.	Treatment Name	Product Rate	Product Rate Unit								
1	Untreated Check			0	0	0	0	0	0	48	100
2	Diuron 80 WDG®	3	lb/a	40 c	52 b	40 c	55 b	94 a	100 a	35 a	100 a
	surf king surfactant	0.25	% v/v								
3	Diuron 80 WDG®	5	lb/a	78 b	89 a	80 b	91 a	98 a	100 a	30 a	100 a
	surf king surfactant	0.25	% v/v								
4	Diuron 80 WDG®	3	lb/a	99 a	99 a	99 a	99 a	91 a	98 a	43 a	100 a
	Campaign®	32	fl oz/a								
	ammonium sulfate	17	lb/100 gal								
5	Diuron 80 WDG®	5	lb/a	99 a	99 a	99 a	99 a	98 a	100 a	38 a	100 a
	Campaign®	32	fl oz/a								
	ammonium sulfate	17	lb/100 gal								
6	Milestone VM®	4	fl oz/a	99 a	91 a	99 a	92 a	98 a	100 a	50 a	100 a
	Campaign®	32	fl oz/a								
	ammonium sulfate	17	lb/100 gal								
LSD (P=.10)				17.1	16	17.2	14.9	NS	NS	NS	0
Standard Deviation				11.3	10.5	11.3	9.8	5.6	1.3	12.4	0
CV				13.55	12.28	13.61	11.28	5.8	1.35	31.66	0
Replicate F				2.579	1.38	2.602	1.866	0.925	0.771	20.573	0
Replicate Prob(F)				0.1367	0.3057	0.1348	0.2162	0.4466	0.4942	0.0007	1
Treatment F				15.624	10.446	15.292	10.482	0.851	0.862	1.161	0
Treatment Prob(F)				0.0008	0.0029	0.0008	0.0029	0.5416	0.5256	0.3958	1

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, gal = gallon, LSD = least significant difference value, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

4.2 DEVELOPMENT OF MILESTONE VM FOR BROADLEAF WEED CONTROL

Trial Objectives: The objectives of these studies were to continue the evaluation of new Milestone VM® (4-H-74-07 & 4-H-79-07) in controlling common broadleaf weeds and common bermudagrass tolerance.

Methods (4-H-74-07): Comments made in January 2007, at the Southern Weed Science Society Annual Meeting in Nashville, by Pat Burch/Dow AgroSciences, suggested that Milestone VM® would provide control of kochia and pigweed if applications were made and activated prior to seedling emergence. This meant making applications earlier than those previously evaluated at OSU. An area was selected on March 5, 2007 with initial applications being made on March 8, 2007. The study received a 0.2 inch rain event on March 11 which was important in activating the residual treatments. It is important to note that even at this early date of application, approximately 1-3 percent of kochia had emerged by the March 8 application day. This is important because one of the parameters of this work was to apply and activate the treatments prior to kochia and pigweed emergence. March was unseasonably warm in Oklahoma which likely triggered the earlier-than-expected kochia germination. Postemergence applications in this study were made on selected plots on May 17 to actively growing kochia and other weeds. Visual weed control evaluations were made on 15, 25, 55, 83, 112, and 140 days-after-application (DAA). Weed control data was taken on several broadleaf weed species, however, other than kochia, weed densities were not high enough to allow statistical comparisons. A very dense stand of kochia comprised approximately 90% of the broadleaf weeds in this trial and allowed a good evaluation of kochia control. Growing conditions for both weeds and common bermudagrass were ideal throughout the duration of this study.

Results & Discussion (4-H-74-07): At 15 DAA kochia control from all treatments of Milestone VM® alone ranged from 20-52% (Table 3). Similar Milestone VM® treatments that included Accord XRT® showed increased levels of early kochia control that ranged from 52-73% (Table 3a). Oust XP® alone was showing very little effect on emerging kochia. At 25 DAA kochia control for all treatments had increased, excluding Oust XP®. Kochia control for Milestone VM® alone treatments ranged from 43-52% while similar treatments including Accord XRT® provided good control ranging from 82-92%. By 55 DAA kochia control for Milestone VM® alone treatments increased slightly with control ranging from 62-73%. At this time similar Milestone VM® treatments that included Accord XRT® were producing less kochia control than previous evaluations making it apparent the initial benefits of postemergence kochia control with the Accord XRT® had diminished. Kochia control dropped at 83 DAA for all early treatments of Milestone VM® whether applied alone or with Accord XRT®. At this point in the kochia growing season it appears that the Milestone VM® alone treatments were producing approximately 40% suppression of the existing kochia population. The addition of Accord XRT® to Milestone VM® increased kochia suppression to approximately 55%. Also at this time postemergence treatments of Milestone VM® alone or the second split applications of Milestone VM® alone or tank-mixed with Accord XRT® provided only moderate levels of

kochia control. By the final 140 DAA evaluations, which followed a very wet June, it was apparent that the various Milestone VM® treatments in this study had produced consistent suppression of kochia populations in an area with severe kochia problems. Even with kochia suppression from some treatments as low as 20-30% there was enough kochia suppression for common bermudagrass to fill in many of the bare areas once occupied by kochia. The bermudagrass thickening in these areas was able to compete and limit the additional spread of kochia that was under suppression from Milestone VM®. It is also possible that if the early treatments in this study were applied two weeks earlier that kochia control or suppression would have been greater. Several species of broadleaf weeds within this study were present in low densities making data collection difficult. These species included marestail, giant ragweed, sunflower, and coreopsis. Even at low densities observations showed they were susceptible to Milestone VM®. Common bermudagrass injury was evaluated throughout this study (Table 3b). No treatments produced any spring green-up delay or phytotoxicity to common bermudagrass with the exception of the early application of Oust XP®. It is well known that dormant applications of Oust XP® will cause significant spring green-up delays of common bermudagrass. While Oust XP® can produce good weed control results from dormant applications the severe green-up delay problem would prohibit its use in Oklahoma.

While initially targeted, pigweed emergence was sparse within this specific study area. Several of the amaranth species are becoming problems along state highways. While amaranth control data was not available from this study it was noted that nearby ODOT broadcast applications of Milestone VM® at 4 oz per acre applied in March with Campaign® + AMS treatments resulted in very little preemergence control or suppression of amaranth species.

Table 3a. Preemergence and Postemergence Kochia Control Study 4-H-74-07 in Woods County in 2007.

Weed Code					Kochia		kochia		kochia		kochia		kochia		kochia	
Rating Data Type					Control		control		control		control		control		control	
Rating Unit					%		%		%		%		%		%	
Rating Date					3/23/2007		4/2/2007		5/2/2007		5/30/2007		6/28/2007		7/26/2007	
Trt-Eval Interval					15 DAA		25 DAA		55 DAA		83 DAA		112 DAA		140 DAA	
Trt No.	Treatment Name	Product Rate	Product Rate Unit	Appl Code												
1	Milestone VM®	4	fl oz/a	A	35	cd	43	d	62	b	47	ab	43	abc	43	a
	Activator 90®	0.25	% v/v	A												
2	Milestone VM®	7	fl oz/a	A	40	c	68	bc	73	ab	43	abc	25	cd	28	a
	Activator 90®	0.25	% v/v	A												
3	Milestone VM®	4	fl oz/a	A	52	bc	82	ab	63	b	43	abc	53	abc	52	a
	Accord XRT®	6	fl oz/a	A												
	Activator 90®	0.25	% v/v	A												
4	Milestone VM®	7	fl oz/a	A	73	a	92	a	83	a	70	a	70	a	53	a
	Accord XRT®	6	fl oz/a	A												
	Activator 90®	0.25	% v/v	A												
5	Milestone VM®	4	fl oz/a	A	20	de	52	cd	62	b	30	bc	32	bcd	33	a
	Milestone VM®	3	fl oz/a	B												
	Activator 90®	0.25	% v/v	A												
6	Milestone VM®	4	fl oz/a	A	62	ab	88	ab	68	ab	67	a	63	ab	67	a
	Accord XRT®	6	fl oz/a	A												
	Milestone VM®	3	fl oz/a	B												
	Oust XP®	1	oz wt/a	B												
	Activator 90®	0.25	% v/v	A												
7	Oust XP®	0.5	oz wt/a	A	7	e	0	e	0	c	0	d	0	d	0	a
	Activator 90®	0.25	% v/v	A												
8	Milestone VM®	4	fl oz/a	B							25	bcd	53	abc	50	a
	Activator 90®	0.25	% v/v	B												
9	Milestone VM®	7	fl oz/a	B							15	cd	43	abc	38	a
	Activator 90®	0.25	% v/v	B												
10	Untreated Check				0		0		0		0		0		0	
LSD (P=.10)					18.7		21.6		20.0		29.4		31.7		NS	
Standard Deviation					12.9		14.9		13.7		20.7		22.3		29.7	
CV					31.23		24.48		23.41		54.68		52.27		73.2	
Replicate F					0.698		1.019		1.608		2.858		6.524		3.442	
Replicate Prob(F)					0.5168		0.3902		0.2405		0.0869		0.0085		0.0571	
Treatment F					9.799		14.237		11.621		3.676		2.766		1.241	
Treatment Prob(F)					0.0005		0.0001		0.0002		0.0128		0.0397		0.3380	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, gal = gallon, LSD = least significant difference value, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Table 3b. Preemergence and Postemergence Kochia Control Study 4-H-74-07 in Woods County in 2007.

Crop Code					common bermudagrass		common bermudagrass		common bermudagrass		common bermudagrass		common bermudagrass	
Rating Data Type					Greenup		greenup		greenup		greenup		injury	
Rating Unit					%		%		%		%		%	
Rating Date					3/23/2007		4/2/2007		5/2/2007		5/30/2007		6/28/2007	
Trt-Eval Interval					15 DAA		25 DAA		55 DAA		83 DAA		112 DAA	
Trt No.	Treatment Name	Product Rate	Product Rate Unit	Appl Code										
1	Milestone VM®	4	fl oz/a	A	25	abc	60	b	100	a	100	a	0	a
	Activator 90® ®	0.25	% v/v	A										
2	Milestone VM®	7	fl oz/a	A	29	ab	75	a	100	a	100	a	0	a
	Activator 90®	0.25	% v/v	A										
3	Milestone VM®	4	fl oz/a	A	12	de	58	b	100	a	100	a	0	a
	Accord XRT®	6	fl oz/a	A										
	Activator 90®	0.25	% v/v	A										
4	Milestone VM®	7	fl oz/a	A	23	bc	68	ab	100	a	100	a	0	a
	Accord XRT®	6	fl oz/a	A										
	Activator 90®	0.25	% v/v	A										
5	Milestone VM®	4	fl oz/a	A	17	cd	57	b	100	a	100	a	0	a
	Milestone VM®	3	fl oz/a	B										
	Activator 90®	0.25	% v/v	A										
6	Milestone VM®	4	fl oz/a	A	35	a	67	ab	100	a	100	a	0	a
	Accord XRT®	6	fl oz/a	A										
	Milestone VM®	3	fl oz/a	B										
	Oust XP®	1	oz wt/a	B										
	Activator 90®	0.25	% v/v	A										
7	Oust XP®	0.5	oz wt/a	A	4	e	4	c	48	b	100	a	0	a
	Activator 90®	0.25	% v/v	A										
8	Milestone VM®	4	fl oz/a	B									0	a
	Activator 90®	0.25	% v/v	B										
9	Milestone VM®	7	fl oz/a	B									0	a
	Activator 90®	0.25	% v/v	B										
10	Untreated Check				24		68		100		100		0	
LSD (P=.10)					11.5		14.6		4.2		NS		NS	
Standard Deviation					7.9		9.9		2.9		0.0		0.0	
CV					38.29		17.88		3.12		0.0		0.0	
Replicate F					13.509		1.741		1.000		0.000		0.000	
Replicate Prob(F)					0.0008		0.2203		0.3966		1.0000		1.0000	
Treatment F					5.281		16.964		137.286		0.000		0.000	
Treatment Prob(F)					0.0070		0.0001		0.0001		1.0000		1.0000	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, gal = gallon, LSD = least significant difference value, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-79-07): All treated plots in this study were 8 feet wide (this includes the 2.5 foot paired untreated check). At the 29 days-after-application (DAA) evaluation it was noticed that all paired checks and untreated plots were showing uniform signs of mild epinasty. An investigation revealed that a 48 acre pasture approximately 0.38 mile across and upwind from the trial had received an aerial application of Cimarron Maxx® herbicide (metsulfuron methyl + dicamba). We believe the pasture application volatilized and was moved down and over the research site. We believe the data collected on 16 DAA was uncompromised and the 29 DAA data, while showing mild drift injury to untreated plants, is representative of the weed control achieved by the various individual treatments in this study. It is our opinion that weed control ratings at 59 and 90 DAA were compromised as untreated weeds in paired checks and untreated check plots continued to decline from the drift injury showing increased epinasty, severe chlorosis, and necrosis. At 59 and 90 DAA it was very difficult to separate weed control resulting from the study treatments and that resulting from the drift injury. This being said the following discussion of results will include weed control produced by the study treatments (16 & 29 DAA data) and as a result of the study treatments and drift injury (59 & 90 DAA data).

Treatments were applied on May 14 in this trial to field bindweed (2-8" tall), pigweed (2-8" tall), and sunflower (6-16" tall). Climate conditions were ideal throughout the duration of this study providing active grass and broadleaf weed growth as well as herbicide uptake and translocation.

Results & Discussion (4-H-79-07): At 14 DAA all treatments were providing good control of field bindweed that ranged from 82-90%, excluding the Milestone VM® treatment (Table 4a.). By 29 DAA all treatments were producing excellent field bindweed control that ranged from 90-95% except for Milestone VM® which was producing moderate control at this time. Good to excellent field bindweed control was produced and maintained through 59 and 90 DAA evaluations for all treatments excluding the lowest rate of the GF-1883 which did not maintain field bindweed control at the later evaluations. AT 16 DAA pigweed control was moderate to good for all treatments with the highest rate of GF-1883 producing the highest level of control at 78%. By 29 DAA pigweed control had increased for all treatments with the highest rate of GF-1883 and Vanquish® producing excellent control (95%) and all other treatments producing moderate control (50-68%). By 59 and 90 DAA pigweed control had increased for all treatments nearly to the point of complete control. It is our opinion that some of the 59 and 90 DAA pigweed control was due to the drift injury. At 16 DAA only the two higher rates of GF-1883 were producing moderate sunflower control of 65 & 77% (Table 4b.). All other treatments at this time were producing moderate to poor sunflower control (25-53%). By 29 DAA sunflower control had increased with all treatments producing good to excellent control (88-99%). By 59 and 90 DAA evaluations, all treatments had produced complete control of sunflower. It is our opinion that most of the sunflower control at these dates was due to the study treatments. However, the complete sunflower control achieved by some of the treatments was likely due to both the study treatments and drift injury. Common bermudagrass injury was evaluated throughout the duration of the study. At 16 DAA evaluations only a small

amount of noticeable phytotoxicity was present for all treatments (1-5%). This level of injury is acceptable for bermudagrass roadsides and was not evident at later evaluations.

The GF-1993 product produced good to excellent broadleaf weed control in this study. Since the inception of this study the GF-1883 product has received a Federal EPA-approved label as Milestone VM Plus®. It is our suggestion to Dow AgroSciences to consider evaluating lower Milestone VM Plus® product rates in future studies to make this product more economical.

Table 4a. Postemergence Broadleaf Weed Control Study 4-H-79-07 in Kingfisher County in 2007.

Weed Code				field bindweed		field bindweed		field bindweed		field bindweed		pigweed		Pigweed		pigweed		pigweed	
Rating Data Type				control		control		control		control		control		Control		control		control	
Rating Unit				%		%		%		%		%		%		%		%	
Rating Date				5/30/2007		6/12/2007		7/12/2007		8/15/2007		5/30/2007		6/12/2007		7/12/2007		8/15/2007	
Trt-Eval Interval				16 DAA		29 DAA		59 DAA		90 DAA		16 DAA		29 DAA		59 DAA		90 DAA	
Trt No.	Treatment Name	Product Rate	Product Rate Unit																
1	GF-1883	4.0	pt/a	86	a	90	a	57	b	33	b	43	b	68	B	100	a	98	a
	Red River 90 Surfactant®	0.25	% v/v																
2	GF-1883	6.0	pt/a	90	a	95	a	100	a	93	a	52	b	67	B	100	a	100	a
	Red River 90 Surfactant®	0.25	% v/v																
3	GF-1883	8.0	pt/a	93	a	95	a	98	a	96	a	78	a	95	A	100	a	100	a
	Red River 90 Surfactant®	0.25	% v/v																
4	Milestone VM®	5	fl oz/a	30	b	68	a	98	a	96	a	32	b	50	B	95	a	100	a
	Red River 90 Surfactant®	0.25	% v/v																
5	Garlon 3A®	32	fl oz/a	82	a	93	a	57	b	93	a	33	b	67	B	100	a	100	a
	Red River 90 Surfactant®	0.25	% v/v																
6	Vanquish®	16	fl oz/a	84	a	93	a	93	a	88	a	40	b	95	A	100	a	100	a
	Red River 90 Surfactant®	0.25	% v/v																
7	Untreated Check			0		32		0		0		0		18		10		72	
LSD (P=.10)				34.7		NS		20.9		36.9		21.2		25.0		NS		NS	
Standard Deviation				23.4		13.9		14.1		25.0		14.3		16.9		3.5		1.2	
CV				30.27		15.63		16.85		29.95		30.84		22.99		3.57		1.18	
Replicate F				0.295		1.438		3.846		0.803		2.286		1.460		1.000		1.000	
Replicate Prob(F)				0.7508		0.2826		0.0577		0.4749		0.1522		0.2778		0.4019		0.4019	
Treatment F				3.035		1.661		6.754		2.970		4.354		3.345		1.000		1.000	
Treatment Prob(F)				0.0636		0.2312		0.0053		0.0673		0.0230		0.0492		0.4651		0.4651	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, gal = gallon, LSD = least significant difference value, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Table 4b. Postemergence Broadleaf Weed Control Study 4-H-79-07 in Kingfisher County in 2007.

Weed Code				sunflower		Sunflower		sunflower		sunflower		common bermudagrass		common bermudagrass	
Rating Data Type				control		Control		control		control		Injury		injury	
Rating Unit				%		%		%		%		%		%	
Rating Date				5/30/2007		6/12/2007		7/12/2007		8/15/2007		5/30/2007		6/12/2007	
Trt-Eval Interval				16 DAA		29 DAA		59 DAA		90 DAA		16 DAA		29 DAA	
Trt No.	Treatment Name	Product Rate	Product Rate Unit												
1	GF-1883	4.0	pt/a	53	b	90	b	100	a	100	a	3	a	0	a
	Red River 90 Surfactant®	0.25	% v/v												
2	GF-1883	6.0	pt/a	65	ab	92	ab	100	a	100	a	5	a	0	a
	Red River 90 Surfactant®	0.25	% v/v												
3	GF-1883	8.0	pt/a	77	a	88	bc	100	a	100	a	4	a	0	a
	Red River 90 Surfactant®	0.25	% v/v												
4	Milestone VM®	5	fl oz/a	25	c	88	bc	100	a	100	a	4	a	0	a
	Red River 90 Surfactant®	0.25	% v/v												
5	Garlon 3A®	32	fl oz/a	25	c	80	c	100	a	100	a	4	a	0	a
	Red River 90 Surfactant®	0.25	% v/v												
6	Vanquish®	16	fl oz/a	45	bc	99	a	100	a	100	a	1	a	0	a
	Red River 90 Surfactant®	0.25	% v/v												
7	Untreated Check			0		25		37		100		0		0	
LSD (P=.10)				22.4		8.5		NS		NS		NS		NS	
Standard Deviation				15.1		5.7		0.0		0.0		2.2		0.0	
CV				31.2		6.42		0.0		0.0		62.6		0.0	
Replicate F				0.143		2.563		0.000		0.000		0.556		0.000	
Replicate Prob(F)				0.8683		0.1263		1.0000		1.0000		0.5905		1.0000	
Treatment F				5.894		3.415		0.000		0.000		1.215		0.000	
Treatment Prob(F)				0.0086		0.0465		1.0000		1.0000		0.3695		1.0000	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, gal = gallon, LSD = least significant difference value, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

4.3 DEVELOPMENT OF SAFLUFENACIL FOR SUMMER BROADLEAF WEED CONTROL.

Trial Objectives: The objectives of these studies were to evaluate the new herbicide saflufenacil (trials 4-H-75-07, 4-H-76-07, 4-H-83-08, 4-H-87-08, & 4-H-98-09) for control of common broadleaf weeds and determine common bermudagrass tolerance.

Methods (4-H-75-07): On March 7, 2007 applications were made to actively growing cereal rye, downy brome, and corn gromwell.

Results & Discussion (4-H-75-07): BAS 800, alone, did not provide any control of cereal rye or brome throughout the duration of this study (Table 5a). The addition of Roundup as well as the standard treatment of Campaign provided for excellent control of both cereal rye and downy brome through final 90 days-after-application (DAA). Good to excellent corn gromwell control was produced by all treatments including the BAS 800 product at 9 DAA while treatments of Roundup alone or Campaign were just beginning to show signs of efficacy (Table 5b). By 56 DAA all treatments were producing good to excellent control of corn gromwell. Preemergence control at 56 & 90 DAA was also collected for large crabgrass, kochia, pigweed, and prostrate spurge control. None of the treatments or products in this study provided preemergence control for any of these summer annual weeds. Also, no treatment or product in this study produced any injury or green-up delay on the roadside common bermudagrass throughout the duration of this study.

Table 5a. Preemergence and Postemergence Broadleaf Weed Control Study 4-H-75-07 in Kingfisher County in 2007.

Weed Code					cereal rye		cereal rye		cereal rye		cereal rye		downy brome		downy brome		downy brome		downy brome	
Rating Data Type					control		control		control		control		control		control		control		control	
Rating Unit					%		%		%		%		%		%		%		%	
Rating Date					3/16/07		3/23/07		4/2/07		5/2/07		3/16/07		3/23/07		4/2/07		5/2/07	
Trt-Eval Interval					9 DAA		16 DAA		26 DAA		56 DAA		9 DAA		16 DAA		26 DAA		56 DAA	
Trt No.	Treatment Name	Product Rate	Product Rate Unit	Appl Code																
1	Untreated Check				0		0		0		0		0		0		0		0	
2	BAS 800 Meth-oil	1.02 1	oz wt/a % v/v	A A	0	b	0	b	0	b	0	b	0	b	0	b	0	b	0	b
3	BAS 800 Meth-oil	2.04 1	oz wt/a % v/v	A A	2	b	0	b	0	b	0	b	2	b	0	b	0	b	0	b
4	Roundup® Meth-oil	16 1	Fl oz/a % v/v	A A	72	a	95	a	95	a	99	a	72	a	95	a	95	a	99	a
5	BAS 800 Roundup® Meth-oil	1.02 16 1	oz wt/a Fl oz/a % v/v	A A A	75	a	95	a	95	a	98	a	75	a	95	a	95	a	99	a
6	BAS 800 Roundup® Meth-oil	2.04 16 1	oz wt/a Fl oz/a % v/v	A A A	73	a	95	a	95	a	98	a	73	a	95	a	95	a	98	a
7	Campaign® Meth-oil	64 1	Fl oz/a % v/v	A A	73	a	95	a	95	a	99	a	73	a	95	a	95	a	99	a
LSD (P=.10)					4.5		0.0		0.0		1.5		4.5		0.0		0.0		1.5	
Standard Deviation					3.0		0.0		0.0		1.0		3.0		0.0		0.0		1.0	
CV					6.16		0.0		0.0		1.55		6.16		0.0		0.0		1.51	
Replicate F					1.364		0.000		0.000		0.484		1.364		0.000		0.000		0.730	
Replicate Prob(F)					0.2994		1.0000		1.0000		0.6301		0.2994		1.0000		1.0000		0.5058	
Treatment F					459.182		0.000		0.000		7512.130		459.182		0.000		0.000		7863.023	
Treatment Prob(F)					0.0001		1.0000		1.0000		0.0001		0.0001		1.0000		1.0000		0.0001	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, gal = gallon, LSD = least significant difference value, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Table 5b. Preemergence and Postemergence Broadleaf Weed Control Study 4-H-75-07 in Kingfisher County in 2007.

Weed Code					Corn gromwell		corn gromwell		corn gromwell		corn gromwell		pigweed, spp.		common bermuda-grass		Common bermuda-grass		common bermuda-grass	
Rating Data Type					Control		control		Control		control		control		greenup		Greenup		greenup	
Rating Unit					%		%		%		%		%		%		%		%	
Rating Date					3/16/07		3/23/07		4/2/07		5/2/07		6/5/07		3/23/07		4/2/07		5/2/07	
Trt-Eval Interval					9 DAA		16 DAA		26 DAA		56 DAA		90 DAA		16 DAA		26 DAA		56 DAA	
Trt No.	Treatment Name	Product Rate	Product Rate Unit	Appl Code																
1	Untreated Check				0		0		0		0		0		22		52		100	
2	BAS 800 Meth-oil	1.02 1	Oz wt/a % v/v	A A	87	a	73	ab	57	b	85	bc	0	b	17	ab	50	a	100	a
3	BAS 800 Meth-oil	2.04 1	Oz wt/a % v/v	A A	95	a	96	a	100	a	98	a	22	b	22	a	48	a	100	a
4	Roundup® Meth-oil	16 1	Fl oz/a % v/v	A A	23	b	38	c	77	ab	80	c	0	b	12	b	45	a	100	a
5	BAS 800 Roundup® Meth-oil	1.02 16 1	Oz wt/a Fl oz/a % v/v	A A A	93	a	78	a	93	a	93	ab	20	b	13	b	46	a	100	a
6	BAS 800 Roundup® Meth-oil	2.04 16 1	Oz wt/a Fl oz/a % v/v	A A A	95	a	99	a	100	a	98	a	7	b	13	b	43	a	100	a
7	Campaign® Meth-oil	64 1	Fl oz/a % v/v	A A	15	b	40	bc	68	ab	94	ab	60	a	13	b	42	a	100	a
LSD (P=.10)					10.6		34.9		33.6		9.7		34.6		5.2		17.4		0.0	
Standard Deviation					7.0		23.0		22.1		6.6		21.8		3.5		11.8		0.0	
CV					10.25		32.44		26.79		7.17		120.65		23.49		25.85		0.0	
Replicate F					2.215		0.103		1.441		1.418		0.670		0.146		0.078		0.000	
Replicate Prob(F)					0.1716		0.9036		0.2920		0.2870		0.5461		0.8661		0.9252		1.0000	
Treatment F					89.279		3.972		2.004		3.892		3.234		3.560		0.222		0.000	
Treatment Prob(F)					0.0001		0.0415		0.1823		0.0322		0.0927		0.0472		0.9448		1.0000	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, Meth-oil = methylated seed oil additive, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-76-07): Treatments were applied in this study on May 17, 2007 to actively growing weeds and common bermudagrass. At the time of treatment marestail (HPPVU) and Texas croton (CVNTE) were 1-6" tall and kochia (KCHSC) 1-4" tall. Climate conditions were ideal throughout the duration of this study to provide both active weed growth and herbicide uptake and translocation. Visual weed control evaluations were taken at 8, 14, 27, 57, and 90 days-after-application (DAA).

Results & Discussion (4-H-76-07): At 8 DAA all treatments, excluding Plateau alone, were producing a small amount of chlorosis on kochia which ranged from 13-30% (Table 6a). At 14 DAA the level of kochia control had increased for most treatments with an increase in chlorosis levels with little to no necrosis happening at this time. At 27, 57 and 90 DAA evaluations kochia control decreased for all treatments to a point where there was little difference between kochia in the treated plots versus their untreated paired checks. At 8 DAA all treatments, excluding Plateau® alone and Plateau® + Garlon 3A®, were producing good to excellent marestail control that ranged from 80-99% (Table 6a). By 14 DAA marestail control had increased for most treatments with most treatments now producing excellent control (90-98%), excluding Plateau® alone and Plateau® + Garlon 3A®. By 27 DAA all treatments, excluding Plateau® and Plateau® + Garlon 3A®, were producing 96% or higher levels of marestail control. At both 57 and 90 DAA marestail control evaluations most treatments maintained excellent levels of control with only a little emergence of later germinating marestail escaping treatments. The Plateau® + Garlon 3A® eventually did produce 83% control of marestail with this being marginally acceptable due to the time it took to achieve the final result. Texas croton seemed to be particularly susceptible to BAS 800 & 802 treatments (Table 6b). At 8 DAA all treatments, excluding Plateau® and Plateau® + Garlon 3A®, were producing 99% control. Near complete Texas croton control was maintained for all BAS 800 & 802 throughout later evaluations. Plateau® alone eventually produced moderate levels of Texas croton control at 57 DAA. Plateau® + Garlon 3A®, similar to marestail control, did produce complete control of Texas croton but it took this treatment close to 2 months to achieve the final control levels. Common bermudagrass phytotoxicity was evaluated throughout the duration of this study (Table 6c). At 8, 14, and 27 DAA most treatments were showing a small amount of yellowing at bermudagrass leaf blade tips. The phytotoxicity ranged from 2-7% and would be more than acceptable for roadside bermudagrass. No bermudagrass injury was noticed at evaluations past 27 DAA.

The BAS 800 chemistry, being a non-hormone, showed promise as a potential weed control tool in roadside vegetation management programs. In our two years of trial work the product may have a better fit as an early summer application compared to late winter/early spring application. This is primarily due to the lack of residual weed control properties of BAS 800. We would encourage BASF to continue the development of BAS 800 and/or 802 in the roadside area and recommend concentrating on summer postemergence control on pigweed, field bindweed, sericea lespedeza, and other broadleaf weed problems. A question remains as to how effective BAS 800 will be on perennials. The fact that this product is not a hormone type product may allow for easy

and safer use in early summer adjacent or near sensitive crops, grapes, gardens, etc. The lack of kochia activity will be a problem for BAS 800.

Table 6a. Postemergence Broadleaf Weed Control Study 4-H-76-07 in Garfield County in 2007.

Weed Code				kochia		Kochia		kochia		kochia		Kochia		marestail		marestail		marestail	
Rating Data Type				control		Control		control		control		Control		control		control		control	
Rating Unit				%		%		%		%		%		%		%		%	
Rating Date				5/25/07		5/31/07		6/13/07		7/13/07		8/15/07		5/25/07		5/31/07		6/13/07	
Trt-Eval Interval				8 DA-A		14 DA-A		27 DA-A		57 DA-A		90 DA-A		8 DA-A		14 DA-A		27 DA-A	
Trt No.	Treatment Name	Product Rate	Product Rate Unit																
1	Untreated Check			0		0		0		0		0		0		0		0	
2	BAS 800 Induce® NIS	1.02 0.25	oz wt/a % v/v	22	bc	35	bc	13	ab	25	a	0	a	89	abc	97	ab	99	a
3	Plateau® Induce® NIS	3.0 0.25	fl oz/a % v/v	0	e	3	d	3	b	0	b	0	a	5	e	7	d	0	c
4	BAS 802 Induce® NIS	1.394 0.25	oz wt/a % v/v	32	a	32	c	7	ab	0	b	0	a	91	ab	90	b	98	a
5	BAS 802 Induce® NIS	2.09 0.25	oz wt/a % v/v	20	c	42	bc	12	ab	0	b	0	a	88	bc	97	ab	98	a
6	BAS 802 Agridex ®COC	2.09 0.5	oz wt/a % v/v	13	d	30	c	12	ab	0	b	0	a	80	c	94	ab	96	a
7	BAS 802 Induce® NIS	2.79 0.25	oz wt/a % v/v	23	bc	37	bc	10	ab	0	b	0	a	94	ab	98	a	98	a
8	Plateau® BAS 800 Induce® NIS	3.0 1.02 0.25	fl oz/a oz wt/a % v/v	27	ab	48	ab	12	ab	0	b	0	a	94	ab	98	a	96	a
9	Plateau® Garlon 3A® Induce® NIS	3.0 32 0.25	fl oz/a fl oz/a % v/v	27	ab	37	bc	22	a	0	b	0	a	25	d	28	c	63	b
10	Journey® BAS 800 Induce® NIS	8.0 1.02 0.25	fl oz/a oz wt/a % v/v	30	a	58	a	8	ab	13	ab	0	a	99	a	98	a	98	a
LSD (P=.10)				6.1		13.8		15.5		24.8		0.0		10.3		7.5		11.3	
Standard Deviation				4.2		9.7		10.8		17.3		0.0		7.2		5.2		7.9	
CV				19.69		27.02		98.31		406.82		0.0		9.76		6.66		9.56	
Replicate F				2.155		0.899		2.326		0.521		0.000		1.460		0.488		1.992	
Replicate Prob(F)				0.1504		0.4278		0.1319		0.6042		1.0000		0.2635		0.6236		0.1709	
Treatment F				16.034		7.256		0.665		0.799		0.000		67.305		135.362		52.232	
Treatment Prob(F)				0.0001		0.0005		0.7141		0.6130		1.0000		0.0001		0.0001		0.0001	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Table 6b. Postemergence Broadleaf Weed Control Study 4-H-76-07 in Garfield County in 2007.

Weed Code				marestail		marestail		Texas doveweed		Texas doveweed		Texas doveweed		Texas doveweed		common bermudagrass	
Rating Data Type				control		control		control		control		control		control		injury	
Rating Unit				%		%		%		%		%		%		%	
Rating Date				7/13/07		8/15/07		5/25/07		5/31/07		6/13/07		7/13/07		8/15/07		5/25/07	
Trt-Eval Interval				57 DA-A		90 DA-A		8 DA-A		14 DA-A		27 DA-A		57 DA-A		90 DA-A		8 DA-A	
Trt No.	Treatment Name	Product Rate	Product Rate Unit																
1	Untreated Check			0		20		0		0		0		0		3		0	
2	BAS 800 Induce® NIS	1.02 0.25	oz wt/a % v/v	99	a	99	a	99	a	100	a	100	a	100	a	100	a	5	b
3	Plateau® Induce® NIS	3.0 0.25	fl oz/a % v/v	0	e	12	d	5	c	27	c	33	b	77	b	0	b	0	c
4	BAS 802 Induce® NIS	1.394 0.25	oz wt/a % v/v	92	c	93	b	99	a	100	a	100	a	100	a	100	a	5	b
5	BAS 802 Induce® NIS	2.09 0.25	oz wt/a % v/v	94	abc	97	ab	99	a	100	a	100	a	98	a	100	a	5	b
6	BAS 802 Agridex® COC	2.09 0.5	oz wt/a % v/v	93	bc	94	ab	99	a	100	a	100	a	98	a	100	a	5	b
7	BAS 802 Induce® NIS	2.79 0.25	oz wt/a % v/v	97	abc	98	ab	99	a	100	a	100	a	100	a	100	a	5	b
8	Plateau® BAS 800 Induce® NIS	3.0 1.02 0.25	fl oz/a oz wt/a % v/v	95	abc	97	ab	99	a	100	a	100	a	100	a	100	a	5	b
9	Plateau® Garlon 3A® Induce® NIS	3.0 32 0.25	fl oz/a fl oz/a % v/v	74	d	83	c	27	b	57	b	92	a	100	a	100	a	0	c
10	Journey® BAS 800 Induce® NIS	8.0 1.02 0.25	fl oz/a oz wt/a % v/v	98	ab	96	ab	99	a	100	a	100	a	100	a	100	a	7	a
LSD (P=.10)				6.0		6.1		4.5		8.9		12.9		3.6		0.0		0.8	
Standard Deviation				4.2		4.2		3.1		6.1		8.9		2.5		0.0		0.5	
CV				5.05		4.97		3.9		7.03		9.7		2.56		0.0		13.13	
Replicate F				2.275		5.035		2.074		0.618		1.300		0.641		0.000		1.063	
Replicate Prob(F)				0.1371		0.0212		0.1653		0.5542		0.3057		0.5404		1.0000		0.3717	
Treatment F				174.363		130.997		418.461		57.487		18.446		28.611		0.000		58.545	
Treatment Prob(F)				0.0001		0.0001		0.0001		0.0001		0.0001		0.0001		1.0000		0.0001	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Table 6c. Postemergence Broadleaf Weed Control Study 4-H-76-07 in Garfield County in 2007.

Weed Code Rating Data Type Rating Unit Rating Date Trt-Eval Interval				common bermudagrass injury % 5/31/07 14 DA-A		Common bermudagrass Injury % 6/13/07 27 DA-A		common bermudagrass injury % 7/13/07 57 DA-A	
Trt No.	Treatment Name	Product Rate	Product Rate Unit						
1	Untreated Check			0		0		0	
2	BAS 800 Induce® NIS	1.02 0.25	oz wt/a % v/v	2	b	2	ab	0	a
3	Plateau® Induce® NIS	3.0 0.25	fl oz/a % v/v	0	b	2	ab	0	a
4	BAS 802 Induce® NIS	1.394 0.25	oz wt/a % v/v	5	a	2	ab	0	a
5	BAS 802 Induce® NIS	2.09 0.25	oz wt/a % v/v	7	a	8	a	0	a
6	BAS 802 Agridex® COC	2.09 0.5	oz wt/a % v/v	5	a	5	ab	0	a
7	BAS 802 Induce® NIS	2.79 0.25	oz wt/a % v/v	5	a	7	ab	0	a
8	Plateau® BAS 800 Induce® NIS	3.0 1.02 0.25	fl oz/a oz wt/a % v/v	5	a	7	ab	0	a
9	Plateau® Garlon 3A® Induce® NIS	3.0 32 0.25	fl oz/a fl oz/a % v/v	5	a	2	ab	0	a
10	Journey® BAS 800 Induce® NIS	8.0 1.02 0.25	fl oz/a oz wt/a % v/v	5	a	0	b	0	a
LSD (P=.10)				2.2		6.8		0.0	
Standard Deviation				1.5		4.7		0.0	
CV				34.97		127.57		0.0	
Replicate F				0.463		0.639		0.000	
Replicate Prob(F)				0.6386		0.5416		1.0000	
Treatment F				5.733		1.195		0.000	
Treatment Prob(F)				0.0023		0.3640		1.0000	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-83-08): This study was treated on May 20, 2008 at which time bermudagrass was actively growing along with marestail which ranged in height from 3-18 inches (average height was 8 inches).

Results & Discussion (4-H-83-08): At 15 days-after-application (DAA) evaluations all treatments, excluding BAS 80200H, were producing 91-99% control of marestail (Table 7). AT 31 DAA evaluations increased for all treatments except for BAS 80200H. Nearly 100% marestail control was being achieved by all of the BAS treatments that included the methylated seed oil. The BAS 80003H + non-ionic surfactant treatment was also maintaining excellent marestail control at 91%, however some marestail stems were retaining some chlorophyll pigment while other treatments showed complete or nearly complete necrosis. AT the 87 DAA final evaluations all treatments, excluding BAS 80200H and including BAS 80003H + non-ionic surfactant, were producing and maintaining complete or near complete control of marestail. Common bermudagrass injury was also evaluated in this study. At 15 DAA very low levels of bermudagrass phytotoxicity were noticed with the BAS 80003H treatments producing more injury than the other BAS formulations. The phytotoxicity for the BAS 80003H formulation treatments was 6-7% injury and would be more than acceptable for bermudagrass roadsides in Oklahoma. Bermudagrass injury had decreased for all treatments, except BAS 80200H, at 31 DAA evaluations.

Table 7. Postemergence Broadleaf Weed Control Study 4-H-83-08 in Payne County in 2008.

Weed Code					marestail		marestail		marestail		common bermudagrass		common bermudagrass		common bermudagrass	
Rating Data Type					control		control		control		injury		injury		injury	
Rating Unit					%		%		%		%		%		%	
Rating Date					6/4/08		6/20/08		8/15/08		6/4/08		6/20/08		8/15/08	
Trt-Eval Interval					15 DA-A		31 DA-A		87 DA-A		15 DA-A		31 DA-A		87 DA-A	
Trt No.	Treatment Name	Product Rate	Product Rate Unit	Appl Code												
1	Untreated check			A	0		7		20		0		0		0	
2	BAS 80003H	11.4	fl oz/a	A	99	a	100	a	100	a	8	a	5	ab	0	a
	Meth-Oil	1.0	% v/v	A												
3	BAS 80004H	4.0	fl oz/a	A	95	b	98	a	98	a	0	d	0	c	0	a
	Meth-Oil	1.0	% v/v	A												
4	BAS 80001H	2.04	oz wt/a	A	99	a	100	a	100	a	2	cd	0	c	0	a
	Meth-Oil	1.0	% v/v	A												
5	BAS 80003H	22.8	fl oz/a	A	99	a	100	a	100	a	7	ab	3	b	0	a
	Meth-Oil	1.0	% v/v	A												
6	BAS 80004H	8.0	fl oz/a	A	99	a	100	a	100	a	2	cd	0	c	0	a
	Meth-Oil	1.0	% v/v	A												
7	BAS 80001H	4.08	oz wt/a	A	98	ab	98	a	100	a	1	d	0	c	0	a
	Meth-Oil	1.0	% v/v	A												
8	BAS 80003H	34.3	fl oz/a	A	99	a	100	a	100	a	7	ab	3	b	0	a
	Meth-Oil	1.0	% v/v	A												
9	BAS 80003H	45.7	fl oz/a	A	99	a	100	a	100	a	6	ab	3	b	0	a
	Meth-Oil	1.0	% v/v	A												
10	BAS 80200H	2.09	oz wt/a	A	80	d	75	c	73	b	4	bc	7	a	0	a
	NIS	0.25	% v/v	A												
11	BAS 80003H	5.7	fl oz/a	A	91	c	91	b	97	a	1	d	0	c	0	a
	NIS	0.25	% v/v	A												
LSD (P=.10)					3.1		3.0		9.3		3.1		2.0		0.0	
Standard Deviation					2.2		2.1		6.6		2.2		1.4		0.0	
CV					2.25		2.18		6.77		58.9		65.07		0.0	
Replicate F					3.128		1.285		0.952		1.703		5.187		0.000	
Replicate Prob(F)					0.0697		0.3022		0.4047		0.2118		0.0174		1.0000	
Treatment F					23.957		43.734		4.834		5.497		9.437		0.000	
Treatment Prob(F)					0.0001		0.0001		0.0022		0.0013		0.0001		1.0000	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-87-08): This study was treated on May 20 & 22, 2008 (treatments 3,7,12,&13) at which time bermudagrass was actively growing and marestail was 3-18 inches in height (average 8 inches).

Results & Discussion (4-H-87-08): AT 15 days-after-application (DAA) all treatments were producing excellent (>91%) control of marestail (Table 8). The BAS 80003H formulation was producing slightly higher levels of necrosis than the BAS 80004H and very little difference between adjuvants was observed. At 31 DAA evaluations marestail control had increased for all treatments with nearly complete necrosis. At 87 DAA evaluations all treatments in this study were producing and maintaining complete marestail necrosis. Common bermudagrass injury was evaluated during this study. AT 15 DAA slight bermudagrass injury (phytotoxicity) was evident from all treatments of BAS 80003H. The level of injury was very low (1-9%) and would be more than acceptable on bermudagrass roadsides in Oklahoma. AT 31 DAA evaluations bermudagrass injury had decreased for most BAS 80003H treatments and was not present at final 87 DAA evaluations.

Table 8. Postemergence Broadleaf Weed Control Study 4-H-87 in Payne County in 2008.

Weed Code					marestail		marestail		marestail		common bermuda-grass		common bermuda-grass		common bermuda-grass	
Rating Data Type					control		control		control		injury		injury		injury	
Rating Unit					%		%		%		%		%		%	
Rating Date					6/4/08		6/20/08		8/15/08		6/4/08		6/20/08		8/15/08	
Trt-Eval Interval					15 DA-A		31 DA-A		87 DA-A		15 DA-A		31 DA-A		87 DA-A	
Trt No.	Treatment Name	Product Rate	Product Rate Unit	Appl Code												
1	Untreated check			A	0		5		25		0		0		0	
2	BAS 80004H	8.0	fl oz/a	A	98	ab	100	a	100	a	0	d	0	c	0	a
	Induce®	0.25	% v/v	A												
3	BAS 80004H	8.0	fl oz/a	A	96	b	99	a	100	a	0	d	0	c	0	a
	Meth-oil	1.0	% v/v	A												
4	BAS 80004H	8.0	fl oz/a	A	99	a	100	a	100	a	1	d	0	c	0	a
	Dyne-amic®	0.5	% v/v	A												
5	BAS 80004H	8.0	fl oz/a	A	98	ab	100	a	100	a	0	d	0	c	0	a
	Agridex®	1.0	% v/v	A												
6	BAS 80004H	8.0	fl oz/a	A	99	a	100	a	100	a	0	d	0	c	0	a
	Silwet L-77®	0.125	% v/v	A												
7	BAS 80004H	8.0	fl oz/a	A	91	c	96	b	100	a	0	d	0	c	0	a
	Cayuse Plus®	1.0	% v/v	A												
8	BAS 80003H	22.8	fl oz/a	A	99	a	100	a	100	a	3	c	0	c	0	a
	Induce®	0.25	% v/v	A												
9	BAS 80003H	22.8	fl oz/a	A	99	a	100	a	100	a	9	a	5	a	0	a
	Meth-oil	1.0	% v/v	A												
10	BAS 80003H	22.8	fl oz/a	A	99	a	100	a	100	a	7	ab	3	b	0	a
	Dyne-amic®	0.5	% v/v	A												
11	BAS 80003H	22.8	fl oz/a	A	99	a	100	a	100	a	5	bc	5	a	0	a
	Agridex®	1.0	% v/v	A												
12	BAS 80003H	22.8	fl oz/a	A	96	b	100	a	100	a	1	d	1	c	0	a
	Silwet L-77®	0.125	% v/v	A												
13	BAS 80003H	22.8	fl oz/a	A	99	a	100	a	100	a	1	d	0	c	0	a
	Cayuse Plus®	1.0	% v/v	A												
LSD (P=.10)					2.4		1.5		0.0		2.1		1.3		0.0	
Standard Deviation					1.7		1.1		0.0		1.5		1.0		0.0	
CV					1.76		1.1		0.0		65.53		79.71		0.0	
Replicate F					0.463		1.331		0.000		3.564		1.501		0.000	
Replicate Prob(F)					0.6351		0.2846		1.0000		0.0456		0.2448		1.0000	
Treatment F					5.416		3.318		0.000		12.854		13.535		0.000	
Treatment Prob(F)					0.0004		0.0080		1.0000		0.0001		0.0001		1.0000	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Method (4-H-98-09): Treatments were applied on June 17, 2009 at which time slender aster was 2-4 inches tall, annual marshelder was 2-5 inches tall, and Illinois bundleflower was 4-10 inches tall. Illinois bundleflower populations were low and inconsistent in this study. Treatment evaluations were made and should probably be considered as observations than as research data. Common bermudagrass was 100% green and actively growing at the time of treatment. Supplemental watering was applied to the research area during the month of June to promote active weed growth, bermudagrass growth, and herbicide activity. The remainder of the summer adequate rainfall provided for both active growing vegetation and continued herbicide effects.

Results & Discussion (4-H-98-09): BAS 80003H and BAS 80200H provided quick burndown and long-term control of both slender aster (Table 9a) and annual marshelder (Table 9b) when applied alone or with a tank mix partner(s). At 9 days-after-application (DAA) both BAS 80003H at 2.85 fl.oz./A and BAS 80200H at 2 oz.wt./A were producing 91-97% control of slender aster and annual marshelder. This high level of control was maintained through 14, 30, 57, and 89 DAA evaluations with near complete control of slender aster and annual marshelder at 89 DAA. Since both of these products, when applied alone, were able to produce and maintain near complete control of slender aster and annual marshelder one would expect to see tank mixtures with these same rates also produce similar levels of control. All tank mixtures that included either of the BAS products produced excellent control (86-99%) of the target weeds. Treatments in this study that did not include a BAS component, such as Oust XP®, Roundup Pro Concentrate®, or Oust XP® + Roundup Pro Concentrate®, produced and maintained poor to moderate levels of slender aster and annual marshelder control that would not be acceptable if these particular weeds were targeted with these particular treatments. It was very obvious in this study that the Oust XP®/Roundup Pro Concentrate® treatments benefited a great deal from the addition of saflufenacil if broadleaf weed control was an expectation of the treatment.

As mentioned earlier Illinois bundleflower was present at the time of treatment, however, it was in very low populations and inconsistent throughout the study area (Table 9c). This being said the following observations can be made with respect to Illinois bundleflower control. None of the treatments in this study provided for acceptable (80% or greater) control of Illinois bundleflower, however, most treatments produced low levels of suppression (5-40%) up to moderate levels (41-75%). BAS 8003H & BAS 80200H alone treatments produced low levels of Illinois bundleflower suppression. It did appear in this study that the addition of BAS 8003H, to the standard treatment of Roundup Pro Concentrate plus Oust XP, will increase the control of Illinois bundleflower to moderate levels (70-75%) compared to the standard alone. It should be pointed out that Illinois bundleflower is a perennial broadleaf weed and the BAS 80003H product primarily targets annual weeds.

At 9 DAA all treatments in this study were producing common bermudagrass injury (8-20%) [Table 9d]. Common bermudagrass injury was in the form of mild to moderate leaf phytotoxicity and would be acceptable (< 30%) for roadsides. At 14 & 30 DAA bermudagrass injury remained similar to that at 9 DAA with all treatments still producing

acceptable levels of bermudagrass injury. At 57 DAA common bermudagrass injury for all treatments that included BAS 80003H alone, or when combined with Roundup Pro Concentrate® were showing little to no common bermudagrass injury (0-5%). However all other treatments were producing significantly higher levels of common bermudagrass injury. All treatments that included Oust XP®, this includes Oust XP® alone, were producing unacceptable levels of common bermudagrass injury that ranged from 32-45%. At this time the injury was in the form of moderate phytotoxicity and moderate to severe leaf and stolon stunting (whisk broom effect). Also at this time treatments including BAS 80200H were showing significant increases in bermudagrass injury (27-29%) that were very close to unacceptable. At 89 DAA common bermudagrass injury had decreased slightly for those treatments that were producing unacceptable levels of injury at 57 DAA, however, a few of the Oust XP® combination treatments were still maintaining unacceptable levels of stunting (37-41%). This level of bermudagrass stunting would be unacceptable and would likely lead to winter die-off of bermudagrass stolons due to being predisposed from late season herbicide injury. It should be noted that the research area received above average rainfall and mild temperatures for the last half of the study making for ideal common bermudagrass growing and recovery conditions.

Table 9a. Postemergence Broadleaf Weed Control Study 4-H-98-09 in Payne County in 2009.

Weed Name					Slender aster		Slender aster		Slender aster		Slender aster		Slender aster	
Rating Date					Jun-26-2009		Jul-1-2009		Jul-17-2009		Aug-13-2009		Sep-14-2009	
Rating Type					Control		control		control		control		Control	
Rating Unit					%		%		%		%		%	
Trt-Eval Interval					9 DA-A		14 DA-A		30 DA-A		57 DA-A		89 DA-A	
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code										
1	Untreated Check			A	0		0		0		0		0	
2	BAS 80003H	2.85	fl oz/a	A	97	a	93	a	99	a	94	a	97	a
	Agridex®	1.0	% v/v	A										
3	BAS 80003H	5.7	fl oz/a	A	91	a	92	a	98	a	95	a	94	a
	Agridex®	1.0	% v/v	A										
4	BAS 80200H	2.09	oz wt/a	A	95	a	95	a	99	a	99	a	98	a
	Agridex®	1.0	% v/v	A										
5	Oust XP®	1.0	oz wt/a	A	40	c	15	c	22	c	32	c	0	d
	Agridex®	1.0	% v/v	A										
6	Roundup Pro Concentrate®	13.0	fl oz/a	A	37	c	40	b	48	b	65	b	68	b
7	Roundup Pro Concentrate®	13.0	fl oz/a	A	3	d	35	b	38	b	83	a	37	c
	Oust XP®	1.0	oz wt/a	A										
8	Roundup Pro Concentrate®	13.0	fl oz/a	A	60	bc	95	a	99	a	98	a	99	a
	BAS 80003H	2.85	fl oz/a	A										
9	Roundup Pro Concentrate®	13.0	fl oz/a	A	95	a	95	a	99	a	98	a	98	a
	BAS 80003H	2.85	fl oz/a	A										
	Agridex	1.0	% v/v	A										
10	BAS 80003H	2.85	fl oz/a	A	93	a	95	a	99	a	96	a	96	a
	Oust XP®	1.0	oz wt/a	A										
	Agridex®	1.0	% v/v	A										
11	Roundup Pro Concentrate®	13.0	fl oz/a	A	79	ab	89	a	98	a	93	a	94	a
	Oust XP®	1.0	oz wt/a	A										
	BAS 80003H	2.85	fl oz/a	A										
12	Roundup Pro Concentrate®	13.0	fl oz/a	A	87	ab	95	a	99	a	99	a	99	a
	Oust XP®	1.0	oz wt/a	A										
	BAS 80003H	2.85	fl oz/a	A										
	Agridex®	1.0	% v/v	A										
13	BAS 80200H	2.09	oz wt/a	A	77	ab	92	a	97	a	95	a	86	a
	Roundup Pro Concentrate®	13.0	fl oz/a	A										
14	BAS 80200H	2.09	oz wt/a	A	93	a	95	a	99	a	96	a	96	a
	Roundup Pro Concentrate®	13.0	fl oz/a	A										
	Agridex®	1.0	% v/v	A										
LSD (P=.10)					30.8		17.0		11.1		18.3		16.5	
Standard Deviation					21.9		12.1		7.9		13.0		11.8	
CV					30.1		15.36		9.44		14.83		14.42	
Replicate F					1.529		3.412		1.229		3.856		2.967	
Replicate Prob(F)					0.2399		0.0512		0.3119		0.0367		0.0723	
Treatment F					5.387		16.529		37.123		6.541		19.772	
Treatment Prob(F)					0.0004		0.0001		0.0001		0.0001		0.0001	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Table 9b. Postemergence Broadleaf Weed Control Study in 4-H-98-09 in Payne County in 2009

Trt No.	Treatment Name	Rate	Rate Unit	Appl Code	Annual Marshelder Jun-26-2009 Control % 9 DAA		Annual marshelder Jul-1-2009 control % 14 DAA		Annual marshelder Jul-17-2009 control % 30 DAA		Annual marshelder Aug-13-2009 control % 57 DAA		Annual marshelder Sep-14-2009 control % 89 DAA	
1	Untreated Check			A	0		0		0		0		0	
2	BAS 80003H	2.85	fl oz/a	A	95	a	95	a	99	a	99	a	98	a
	Agridex®	1.0	% v/v	A										
3	BAS 80003H	5.7	fl oz/a	A	91	a	95	a	99	a	99	a	99	a
	Agridex®	1.0	% v/v	A										
4	BAS 80200H	2.09	oz wt/a	A	91	a	95	a	99	a	99	a	99	a
	Agridex®	1.0	% v/v	A										
5	Oust XP®	1.0	oz wt/a	A	18	cd	20	c	22	c	48	c	57	b
	Agridex®	1.0	% v/v	A										
6	Roundup Pro Concentrate®	13.0	fl oz/a	A	33	bc	42	b	61	b	73	b	62	b
7	Roundup Pro Concentrate®	13.0	fl oz/a	A	3	d	20	c	53	b	88	ab	61	b
	Oust XP®	1.0	oz wt/a	A										
8	Roundup Pro Concentrate®	13.0	fl oz/a	A	54	b	95	a	99	a	99	a	99	a
	BAS 80003H	2.85	fl oz/a	A										
9	Roundup Pro Concentrate®	13.0	fl oz/a	A	91	a	93	a	95	a	95	a	94	a
	BAS 80003H	2.85	fl oz/a	A										
	Agridex®	1.0	% v/v	A										
10	BAS 80003H	2.85	fl oz/a	A	91	a	93	a	95	a	95	a	94	a
	Oust XP	1.0	oz wt/a	A										
	Agridex	1.0	% v/v	A										
11	Roundup Pro Concentrate®	13.0	fl oz/a	A	92	a	93	a	95	a	95	a	94	a
	Oust XP®	1.0	oz wt/a	A										
	BAS 80003H	2.85	fl oz/a	A										
12	Roundup Pro Concentrate®	13.0	fl oz/a	A	95	a	95	a	99	a	99	a	99	a
	Oust XP®	1.0	oz wt/a	A										
	BAS 80003H	2.85	fl oz/a	A										
	Agridex®	1.0	% v/v	A										
13	BAS 80200H	2.09	oz wt/a	A	89	a	95	a	99	a	99	a	99	a
	Roundup Pro Concentrate®	13.0	fl oz/a	A										
14	BAS 80200H	2.09	oz wt/a	A	95	a	95	a	99	a	99	a	99	a
	Roundup Pro Concentrate®	13.0	fl oz/a	A										
	Agridex®	1.0	% v/v	A										
LSD (P=.10)					22.6		19.2		21.6		20.0		24.8	
Standard Deviation					15.9		13.6		15.4		14.2		17.7	
CV					22.03		17.26		17.93		15.57		19.93	
Replicate F					1.954		1.505		2.941		3.964		3.267	
Replicate Prob(F)					0.1723		0.2462		0.0748		0.0346		0.0582	
Treatment F					12.983		14.438		7.702		3.252		2.642	
Treatment Prob(F)					0.0001		0.0001		0.0001		0.0088		0.0248	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Table 9c. Postemergence Broadleaf Weed Control Study 4-H-98-09 in Payne County in 2009.

Pest Name					Illinois bundleflower		Illinois bundleflower		Illinois bundleflower		Illinois bundleflower		Illinois bundleflower	
Rating Date					Jun-26-2009		Jul-1-2009		Jul-17-2009		Aug-13-2009		Sep-14-2009	
Rating Type					Control		control		control		control		control	
Rating Unit					%		%		%		%		%	
Trt-Eval Interval					9 DAA		14 DAA		30 DAA		57 DAA		89 DAA	
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code										
1	Untreated Check			A	0		0		0		0		0	
2	BAS 80003H	2.85	fl oz/a	A	20	ab	55	ab	20	bc	0	e	0	c
	Agridex®	1.0	% v/v	A										
3	BAS 80003H	5.7	fl oz/a	A	45	a	35	a-e	25	bc	18	cde	0	c
	Agridex®	1.0	% v/v	A										
4	BAS 80200H	2.09	oz wt/a	A	35	a	15	cde	13	c	33	b-e	25	bc
	Agridex®	1.0	% v/v	A										
5	Oust XP®	1.0	oz wt/a	A	0	b	0	e	70	a	20	b-e	0	c
	Agridex®	1.0	% v/v	A										
6	Roundup Pro Concentrate®	13.0	fl oz/a	A	5	b	4	e	30	abc	45	bcd	99	a
7	Roundup Pro Concentrate®	13.0	fl oz/a	A	5	b	5	de	13	c	8	de	55	ab
	Oust XP®	1.0	oz wt/a	A										
8	Roundup Pro Concentrate®	13.0	fl oz/a	A	20	ab	15	cde	35	abc	30	b-e	50	abc
	BAS 80003H	2.85	fl oz/a	A										
9	Roundup Pro Concentrate®	13.0	fl oz/a	A	42	a	40	a-d	45	abc	30	b-e	38	bc
	BAS 80003H	2.85	fl oz/a	A										
	Agridex®	1.0	% v/v	A										
10	BAS 80003H	2.85	fl oz/a	A	17	ab	63	a	28	abc	28	b-e	38	bc
	Oust XP®	1.0	oz wt/a	A										
	Agridex®	1.0	% v/v	A										
11	Roundup Pro Concentrate®	13.0	fl oz/a	A	18	ab	43	abc	60	ab	88	a	75	ab
	Oust XP®	1.0	oz wt/a	A										
	BAS 80003H	2.85	fl oz/a	A										
12	Roundup Pro Concentrate®	13.0	fl oz/a	A	27	ab	25	b-e	55	abc	60	ab	70	ab
	Oust XP	1.0	oz wt/a	A										
	BAS 80003H	2.85	fl oz/a	A										
	Agridex®	1.0	% v/v	A										
13	BAS 80200H	2.09	oz wt/a	A	45	a	10	cde	35	abc	20	b-e	0	c
	Roundup Pro Concentrate®	13.0	fl oz/a	A										
14	BAS 80200H	2.09	oz wt/a	A			15	cde	45	abc	50	abc	50	abc
	Roundup Pro Concentrate®	13.0	fl oz/a	A										
	Agridex®	1.0	% v/v	A										
LSD (P=.10)					28.7		35.9		43.4		40.9		51.0	
Standard Deviation					19.7		24.0		29.3		24.9		31.0	
CV					85.4		96.31		80.77		75.58		80.86	
Replicate F					0.234		0.149		0.059		0.245		0.497	
Replicate Prob(F)					0.7951		0.8638		0.9434		0.7913		0.6358	
Treatment F					1.915		2.138		1.106		2.646		3.278	
Treatment Prob(F)					0.1397		0.1300		0.4428		0.1457		0.0995	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Table 9d. Postemergence Broadleaf Weed Control Study 4-H-98-09 in Payne County in 2009.

Crop Name					Common Bermudagrass		Common bermudagrass		Common bermudagrass		Common bermudagrass		Common bermudagrass	
Rating Date					Jun-26-2009		Jul-1-2009		Jul-17-2009		Aug-13-2009		Sep-14-2009	
Rating Type					Injury		Injury		Injury		Injury		Injury	
Rating Unit					%		%		%		%		%	
Trt-Eval Interval					9 DAA		14 DAA		30 DAA		57 DAA		89 DAA	
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code										
1	Untreated Check			A	0		0		0		0		0	
2	BAS 80003H	2.85	fl oz/a	A	15	abc	6	cde	4	e	0	d	0	d
	Agridex®	1.0	% v/v	A										
3	BAS 80003H	5.7	fl oz/a	A	15	abc	5	de	4	e	0	d	0	d
	Agridex®	1.0	% v/v	A										
4	BAS 80200H	2.09	oz wt/a	A	8	cde	9	a-d	10	a-e	27	c	18	c
	Agridex®	1.0	% v/v	A										
5	Oust XP®	1.0	oz wt/a	A	12	a-d	9	a-d	15	a	43	ab	42	a
	Agridex®	1.0	% v/v	A										
6	Roundup Pro Concentrate®	13.0	fl oz/a	A	5	de	2	e	3	e	3	d	2	d
7	Roundup Pro Concentrate®	13.0	fl oz/a	A	2	e	5	de	8	b-e	32	abc	22	bc
	Oust XP®	1.0	oz wt/a	A										
8	Roundup Pro Concentrate®	13.0	fl oz/a	A	9	cde	6	cde	6	cde	5	d	0	d
	BAS 80003H	2.85	fl oz/a	A										
9	Roundup Pro Concentrate®	13.0	fl oz/a	A	20	a	7	bcd	6	de	5	d	0	d
	BAS 80003H	2.85	fl oz/a	A										
	Agridex®	1.0	% v/v	A										
10	BAS 80003H	2.85	fl oz/a	A	14	abc	13	a	12	abc	38	abc	27	abc
	Oust XP®	1.0	oz wt/a	A										
	Agridex®	1.0	% v/v	A										
11	Roundup Pro Concentrate®	13.0	fl oz/a	A	11	bcd	10	abc	13	ab	44	a	37	ab
	Oust XP®	1.0	oz wt/a	A										
	BAS 80003H	2.85	fl oz/a	A										
12	Roundup Pro Concentrate®	13.0	fl oz/a	A	19	a	12	ab	14	a	45	a	40	a
	Oust XP®	1.0	oz wt/a	A										
	BAS 80003H	2.85	fl oz/a	A										
	Agridex®	1.0	% v/v	A										
13	BAS 80200H	2.09	oz wt/a	A	16	abc	9	a-d	6	cde	28	c	20	c
	Roundup Pro Concentrate	13.0	fl oz/a	A										
14	BAS 80200H	2.09	oz wt/a	A	18	ab	12	a	12	a-d	29	bc	27	abc
	Roundup Pro Concentrate®	13.0	fl oz/a	A										
	Agridex®	1.0	% v/v	A										
LSD (P=.10)					8.5		4.5		6.6		14.6		16.6	
Standard Deviation					6.1		3.2		4.7		10.5		11.9	
CV					48.16		39.25		54.49		45.29		66.05	
Replicate F					0.446		2.350		3.529		0.355		1.222	
Replicate Prob(F)					0.6453		0.1169		0.0453		0.7048		0.3122	
Treatment F					2.545		3.116		2.250		8.763		5.555	
Treatment Prob(F)					0.0248		0.0086		0.0439		0.0001		0.0002	

Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

4.4 DEVELOPMENT OF AMINOCYCLOPYRACHLOR FOR SUMMER BROADLEAF WEED CONTROL

Trial Objectives: The objectives of these studies were to evaluate the new herbicide aminocyclopyrachlor (trials 4-H-81-08, 4-H-82-08, 4-H-84-08, 4-H-85-08, 4-H-86-08, 4-H-94-09, 4-H-95-09, 4-H-96-09, & 4-H-97-09) for control of common broadleaf and grassy weeds and determine common bermudagrass tolerance.

Methods (4-H-81-08): This study was treated on March 26, 2008 at which time a few seedling kochia & marestail plants had emerged and common bermudagrass had just broken dormancy (5% greenup). It is worth noting that the study site was under dry conditions for approximately 30 days prior to treatment and 30 days after treatment. Approximately 14 days-after-application (DAA) the study site received adequate rainfall to activate the treatments. With the low level of early kochia germination and the subsequent competition from bermudagrass, the overall low density of kochia in this trial made evaluation of kochia control very difficult. While ratings were taken as per protocol the kochia control data in this trial had several data anomalies that make statistical analysis of little meaning. However, there are some observations on kochia control within this study that are of value (Rep 3 data). Marestail population density was consistent and at levels making evaluation much easier.

While kochia control data was collected at 58, 89, and 118 DAA for all plots, and is represented in the AOV tables, it should be noted that data from Rep I & 2 was questionable making the statistical analysis presented of little value. Kochia control evaluations at 148 DAA were only taken for Rep 3. Since the kochia control data is “so noisy”, only observations will be discussed that are not supported by any statistical analysis.

Results & Discussion (4-H-81-08): Throughout the duration of this study it was evident that DPX-KJM44 & DPX-MAT28 were providing control of kochia (Table 10a). Observations were that the higher rates of each product seemed to produce more consistent levels of control. The addition of Telar® did not seem to increase kochia control for the DPX-KJM44 treatments. Telar® alone, or Milestone VM® at the two low rates did not seem to provide any kochia control. The highest rate of Milestone VM® seemed to provide control of kochia.

All treatments in this study were providing excellent control of marestail (Table 10a) at 29 DAA. All treatments were maintaining good to excellent control of marestail at 58 DAA & 89 DAA, except for the low rate of DPX-KJM44 alone and Telar® alone. These treatments were producing poor marestail control. Marestail evaluations were not made at 118 DAA due to an inadvertent mowing of the study. AT 148 DAA marestail regrowth from the early July mowing was approximately 8-14 inches. At this time treatments of DPX-KJM44 alone at 1.0 & 2.0 oz.a.i./A, DPX-KJM44/Telar® mixes of 0.5, 1.0 & 2.0 oz.a.i./A, DPX-MAT28 at 1.0 oz.a.i./A, and all treatments of Milestone VM® were providing near complete control of marestail. All other treatments were providing moderate to poor marestail control at this time.

At 29 DAA common bermudagrass greenup evaluations were taken with no differences in greenup noticed for any of the treatments in this study (Table 10b). All DPX treatments, as well as other treatments, produced no noticeable affects to bermudagrass greenup or subsequent development throughout the duration of this study.

Table 10a. Preemergence and Postemergence Kochia Control Study 4-H-81-08 in Woods County in 2008.

Weed Code					kochia	kochia	kochia	marestail	marestail	marestail	marestail
Rating Data Type					control	control	control	control	control	control	control
Rating Unit					%	%	%	%	%	%	%
Rating Date					5/23/08	6/23/08	7/22/08	4/24/08	5/23/08	6/23/08	8/21/08
Trt-Eval Interval					58 DAA	89 DAA	118 DAA	29 DAA	58 DAA	89 DAA	148 DAA
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code							
1	DPX-KJM44	0.25	oz ai/a	A	98 a	63 ab	99 a	99 a	40 c	13 d	33 bc
2	DPX-KJM44	0.5	oz ai/a	A	99 a	95 a	99 a	99 a	98 a	92 a	33 bc
3	DPX-KJM44	1.0	oz ai/a	A	98 a	96 a	66 a	99 a	99 a	99 a	99 a
4	DPX-KJM44	2.0	oz ai/a	A	99 a	95 a	96 a	99 a	99 a	99 a	99 a
5	DPX-KJM44 Telar XP®	0.25 0.375	oz ai/a oz ai/a	A	33 cd	63 ab	66 a	99 a	91 ab	95 a	66 ab
6	DPX-KJM44 Telar XP	0.5 0.375	oz ai/a oz ai/a	A	93 ab	95 a	66 a	99 a	99 a	95 a	99 a
7	DPX-KJM44 Telar XP	1.0 0.375	oz ai/a oz ai/a	A	99 a	95 a	98 a	86 b	99 a	99 a	99 a
8	DPX-KJM44 Telar XP®	2.0 0.375	oz ai/a oz ai/a	A	99 a	96 a	99 a	99 a	99 a	99 a	99 a
9	Milestone VM®	0.75	oz ai/a	A	25 d	32 bc	66 a	99 a	99 a	99 a	99 a
10	Milestone VM®	1.75	oz ai/a	A	61 bc	95 a	63 a	99 a	99 a	99 a	99 a
11	Telar XP®	0.375	oz ai/a	A	0 d	0 c	0 b	99 a	30 c	35 c	30 bc
12	DPX-MAT28	0.25	oz ai/a	A	66 a-c	63 ab	66 a	99 a	91 ab	68 b	0 c
13	DPX-MAT28	0.5	oz ai/a	A	98 a	95 a	66 a	99 a	77 b	80 ab	33 bc
14	DPX-MAT28	1.0	oz ai/a	A	99 a	96 a	99 a	99 a	99 a	99 a	99 a
15	Milestone VM®	1.0	oz ai/a	A	0 d	0 c	0 b	99 a	99 a	99 a	99 a
16	Untreated Check			A	0	0	33	0	0	0	0
LSD (P=.10)					34.6	38.5	51.9	8.1	15.4	20.0	39.6
Standard Deviation					24.9	27.7	37.4	5.8	11.1	14.4	28.5
CV					35.09	38.45	53.49	5.92	12.61	16.98	39.36
Replicate F					4.360	1.702	2.183	1.000	0.369	0.494	5.414
Replicate Prob(F)					0.0225	0.2007	0.1315	0.3806	0.6950	0.6152	0.0103
Treatment F					6.990	4.795	2.260	1.000	12.217	10.104	4.777
Treatment Prob(F)					0.0001	0.0002	0.0322	0.4793	0.0001	0.0001	0.0002

All treatments included a methylated seed oil at 1.0 % V/V. Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Table 10b. Preemergence and Postemergence Kochia Control Study 4-H-81 in Woods County in 2008.

Weed Code					common bermudagrass	
Rating Data Type					Injury	
Rating Unit					%	
Rating Date					4/24/08	
Trt-Eval Interval					29 DA-A	
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code		
1	DPX-KJM44	0.25	oz ai/a	A	50	a
2	DPX-KJM44	0.5	oz ai/a	A	45	ab
3	DPX-KJM44	1.0	oz ai/a	A	43	ab
4	DPX-KJM44	2.0	oz ai/a	A	47	a
5	DPX-KJM44 Telar XP®	0.25 0.375	oz ai/a oz ai/a	A	42	ab
6	DPX-KJM44 Telar XP®	0.5 0.375	oz ai/a oz ai/a	A	42	ab
7	DPX-KJM44 Telar XP®	1.0 0.375	oz ai/a oz ai/a	A	42	ab
8	DPX-KJM44 Telar XP	2.0 0.375	oz ai/a oz ai/a	A	45	ab
9	Milestone VM®	0.75	oz ai/a	A	42	ab
10	Milestone VM®	1.75	oz ai/a	A	45	ab
11	Telar XP®	0.375	oz ai/a	A	37	b
12	DPX-MAT28	0.25	oz ai/a	A	43	ab
13	DPX-MAT28	0.5	oz ai/a	A	43	ab
14	DPX-MAT28	1.0	oz ai/a	A	47	a
15	Milestone VM®	1.0	oz ai/a	A	42	ab
16	Untreated Check			A	40	
LSD (P=.10)					8.5	
Standard Deviation					6.1	
CV					14.03	
Replicate F					6.531	
Replicate Prob(F)					0.0047	
Treatment F					0.761	
Treatment Prob(F)					0.6991	

All treatments included a methylated seed oil at 1.0 % V/V. Foot notes: Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-82-08): This study was treated on March 25, 2008 at which time cutleaf evening primrose was in the 4 inch rosette stage, cheat/downy brome were 1-4 inches tall, and no Palmer amaranth had emerged. Common bermudagrass was at 5-10% greenup on the day of treatment. Moisture and growing conditions were adequate at this site throughout the trial for ample weed growth. This study was actually located during the previous year and selected due to the moderate to high level of Palmer amaranth pressure. During late July and August of 2007 this site received numerous heavy rain events causing erosion of the top layer of the sandy soil and movement to the bottom of the roadside ditch. After Palmer amaranth germination during early May 2008 it became evident that most of the 2007 Palmer amaranth seed ended up in the ditch bottom and not in the first 15 feet of the shoulder where the study plots were located. This resulted in very low Palmer amaranth populations in the plots in Rep 1 and low to moderate populations in Reps 2, and 3. The low populations made palmer amaranth evaluations very difficult. This study site also received an off-target drift contamination of hormone herbicide from an adjacent pasture on approximately 10 July that affected the 120 days-after-application evaluation and prevented 149 DAA evaluations.

Results & Discussion (4-H-82-08): Many of the treatments in this study provided for good to excellent control of the cool-season perennial cutleaf-evening primrose (Table 11a). At 30 DAA all DPX-KJM44/Telar XP® mixes, Telar XP® alone, and all Milestone VM® rates were producing good to excellent control of primrose. By 59 DAA these same treatments along with DPX-KJM44 at 2.0 oz.a.i./A were producing and maintaining excellent control (90 or greater) of primrose. Lower rates of DPX-KJM44 and DPX-MAT28 produced poor control of primrose. Cheat/downy brome control evaluations were taken at 30 and 59 DAA at which times all treatments were providing poor postemergence control of these winter annual grasses (Table 11a). At 59 & 90 DAA all treatments, except Telar XP® alone, were providing excellent control of the summer annual marestail (Table 11a). Marestail control past the 90 DAA evaluations remained excellent in the treated portions of research plots, however, all marestail in paired checks and untreated plots was severely damaged by the 10 July herbicide drift from the adjacent pasture.

No Palmer amaranth had emerged at this research site at 30 DAA evaluations and by 59 DAA palmer amaranth could be found in the two-three leaf seedling stage at an average height of 3/4 inch. Palmer amaranth control evaluations did not start until the 90 DAA evaluations at which time DPX-KJM44 at 0.5, 1.0, and 2.0 oz.a.i./A and all of the DPX-MAT28 treatments were producing moderate levels of Palmer amaranth control (61-64%). It was noted at this time the Palmer amaranth plants that were present were showing significant chlorosis. All other treatments were producing poor Palmer amaranth control at this time. By 119 DAA (approximately 2 weeks after drift damage occurrence) all treatments were producing near complete control of Palmer amaranth. There is no doubt that the herbicide drift injury affected the Palmer amaranth control in this study as low rate treatments of Milestone VM® (known to be ineffective on Palmer amaranth), paired checks, and untreated checks were showing severe damage to palmer amaranth plants.

At 30 DAA common bermudagrass greenup evaluations were taken with no differences in greenup noticed for any of the treatments in this study (Table 11b). All DPX treatments, as well as other treatments, produced no noticeable affects to bermudagrass greenup or subsequent development throughout the duration of this study.

Table 11a. Preemergence Palmer Amaranth Control Study 4-H-82-08 in Grant County in 2008.

Weed Code					cutleaf primrose		cutleaf primrose		downy brome		downy brome		marestail		marestail		Palmer amaranth		Palmer amaranth	
Rating Data Type					control		control		control		control		control		control		control		control	
Rating Unit					%		%		%		%		%		%		%		%	
Rating Date					4/24/08		5/23/08		4/24/08		5/23/08		5/23/08		6/23/08		6/23/08		7/22/08	
Trt-Eval Interval					30 DAA		59 DAA		30 DAA		59 DAA		59 DAA		90 DAA		90 DAA		119 DAA	
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code																
1	DPX-KJM44	0.25	oz ai/a	A	7	fgh	0	c	0	c	0	c	100	a	100	a	0	b	99	a
2	DPX-KJM44	0.5	oz ai/a	A	20	fg	0	c	0	c	0	c	100	a	100	a	63	a	99	a
3	DPX-KJM44	1.0	oz ai/a	A	40	e	0	c	25	ab	0	c	100	a	100	a	63	a	99	a
4	DPX-KJM44	2.0	oz ai/a	A	62	d	90	a	28	ab	0	c	100	a	100	a	62	a	99	a
5	DPX-KJM44 + Telar XP®	0.25 + 0.375	oz ai/a + oz ai/a	A	73	cd	98	a	5	bc	0	c	93	a	100	a	0	b	99	a
6	DPX-KJM44 + Telar XP®	0.5 + 0.375	oz ai/a + oz ai/a	A	92	ab	98	a	13	bc	0	c	100	a	100	a	30	ab	99	a
7	DPX-KJM44 + Telar XP®	1.0 + 0.375	oz ai/a + oz ai/a	A	95	a	98	a	22	abc	27	ab	100	a	100	a	0	b	96	a
8	DPX-KJM44 + Telar XP®	2.0 + 0.375	oz ai/a + oz ai/a	A	95	a	99	a	43	a	30	a	100	a	67	b	25	ab	99	a
9	Milestone VM®	0.75	oz ai/a	A	78	bc	90	a	7	bc	0	c	100	a	100	a	0	b	99	a
10	Milestone VM®	1.75	oz ai/a	A	89	ab	99	a	27	ab	10	bc	100	a	100	a	32	ab	99	a
11	Telar XP®	0.375	oz ai/a	A	88	abc	99	a	0	c	0	c	67	b	40	c	0	b	96	a
12	DPX-MAT28	0.25	oz ai/a	A	0	h	0	c	0	c	0	c	100	a	100	a	63	a	99	a
13	DPX-MAT28	0.5	oz ai/a	A	5	gh	0	c	5	bc	0	c	100	a	100	a	63	a	99	a
14	DPX-MAT28	1.0	oz ai/a	A	22	f	23	b	27	ab	10	bc	100	a	100	a	63	a	99	a
15	Milestone VM®	1.0	oz ai/a	A	83	abc	99	a	20	abc	0	c	100	a	100	a	32	ab	96	a
16	Untreated Check			A	0		0		0		0		0		33		0		99	
LSD (P=.10)					15.3		15.6		23.7		16.7		20.8		20.7		58.5		3.2	
Standard Deviation					11.0		11.2		17.1		12.0		15.0		14.9		42.1		2.3	
CV					19.45		18.9		115.54		234.89		15.4		15.87		127.12		2.36	
Replicate F					0.581		1.504		2.752		0.802		1.424		1.161		2.083		1.000	
Replicate Prob(F)					0.5657		0.2410		0.0811		0.4586		0.2577		0.3277		0.1434		0.3806	
Treatment F					33.502		53.377		1.907		2.110		1.000		3.996		1.324		0.857	
Treatment Prob(F)					0.0001		0.0001		0.0711		0.0450		0.4793		0.0009		0.2550		0.6080	

Foot notes: All treatments included a methylated seed oil at 1.0 % V/V. Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Table 11b. Preemergence Palmer Amaranth Control Study 4-H-82-08 Grant County in 2008.

Weed Code					common bermudagrass	
Rating Data Type					injury	
Rating Unit					%	
Rating Date					4/24/08	
Trt-Eval Interval					30 DAA	
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code		
1	DPX-KJM44	0.25	oz ai/a	A	55	a-d
2	DPX-KJM44	0.5	oz ai/a	A	47	bcd
3	DPX-KJM44	1.0	oz ai/a	A	65	a
4	DPX-KJM44	2.0	oz ai/a	A	43	cd
5	DPX-KJM44	0.25	oz ai/a	A	62	a
	Telar XP®	0.375	oz ai/a			
6	DPX-KJM44	0.5	oz ai/a	A	62	a
	Telar XP®	0.375	oz ai/a			
7	DPX-KJM44	1.0	oz ai/a	A	57	abc
	Telar XP®	0.375	oz ai/a			
8	DPX-KJM44	2.0	oz ai/a	A	55	a-d
	Telar XP®	0.375	oz ai/a			
9	Milestone VM®	0.75	oz ai/a	A	58	ab
10	Milestone VM®	1.75	oz ai/a	A	42	d
11	Telar XP®	0.375	oz ai/a	A	68	a
12	DPX-MAT28	0.25	oz ai/a	A	62	a
13	DPX-MAT28	0.5	oz ai/a	A	58	ab
14	DPX-MAT28	1.0	oz ai/a	A	60	ab
15	Milestone VM®	1.0	oz ai/a	A	67	a
16	Untreated Check			A	63	
LSD (P=.10)					14.8	
Standard Deviation					10.7	
CV					18.63	
Replicate F					8.286	
Replicate Prob(F)					0.0015	
Treatment F					1.689	
Treatment Prob(F)					0.1156	

Foot notes: All treatments included a methylated seed oil at 1.0 % V/V. Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-84-08): This study was treated on May 14, 2008 at which time musk thistle rosettes were actively growing and ranged in size from 4-14 inches in diameter.

Results & Discussion (4-H-84-08): At initial 11 days-after-application (DAA) evaluations there were significant differences in musk thistle control from many of the treatments (Table 12). At the initial evaluation the DPX-KJM44 treatments were showing a significant rate response early with the low rate producing green but severe stunted rosettes while the high rate was producing rosettes with severe chlorosis and moderate necrosis. The high rate of DPX-KJM44 was producing very similar results as the standard Milestone treatments. The addition of Telar XP® to the DPX-KJM44 did not seem to greatly affect musk thistle control. The MAT28 product was also showing a rate response with the low rate producing severely stunted and beginning chlorosis of rosettes while the high rate was producing rosettes with severe chlorosis and moderate necrosis. Telar XP® alone was producing severe rosette stunting with very little if any chlorosis. By 30 DAA musk thistle control had increased for all treatments. At 30 DAA the standard Milestone treatments were producing 88-98% control of musk thistle. Rosettes that were not completely necrotic were severely chlorotic at this point. The DPX-KJM44 treatments were still showing a rate response with the lower rate producing severely stunted chlorotic rosettes and the high rate producing near complete necrosis of all rosettes. The DPX-KJM44 1.0 oz./A rate also looked very good with 80% control (plants that were not necrotic were very chlorotic). The addition of Telar XP® to the DPX-KJM44 treatments did not increase control of musk thistle rosettes, if anything it seemed to reduce the activity of the DPX-KJM44 product. The MAT28 treatments were also continuing to show a rate response. The high rate was producing good control of rosettes while the lower rates were producing a lot of chlorosis with increasing necrosis. At 60 DAA evaluations all treatments showed increasing levels of musk thistle control. Many treatments that were producing musk thistle control in the range of 60-80% at 30 DAA were now producing 90-100% control at 60 DAA. It became apparent that many of the rosettes that were chlorotic to severely chlorotic developed in necrotic rosettes. By 60 DAA all treatments in this study were producing 100% musk thistle seedhead suppression (except for the Telar XP® alone treatment). At the final 60 DAA evaluations the DPX-KJM44 product was producing nearly 100% necrosis with rates down to 0.5 oz.a.i./A. The lowest rate had a few remaining rosettes in treated plots that were extremely chlorotic and necrotic but never flowered. The DPX-KJM44 plus Telar XP® treatments produced good to excellent control of musk thistle at 60 DAA, but throughout this study the control was slightly less than the comparative DPX-KJM44 alone treatment. All of the MAT28 treatments were producing excellent musk thistle control by 60 DAA. The two highest rates were producing complete necrosis while the lowest rate still had a few very chlorotic and necrotic rosettes remaining. By the standards set in the Oklahoma Noxious Weed Law every treatment in this study, excluding Telar XP® alone, prevented musk thistle seed production and would be considered successful.

Table 12. Postemergence musk thistle control study 4-H-84-08 in Kay County in 2008.

Weed Code Rating Data Type Rating Unit Rating Date Trt-Eval Interval					musk thistle control % 4/25/08 11 DAA		musk thistle control % 5/14/08 30 DAA		musk thistle Control % 6/13/08 60 DAA	
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code						
1	DPX-KJM44	0.25	oz ai/a	A	27	ef	32	g	78	cd
2	DPX-KJM44	0.5	oz ai/a	A	48	cd	60	de	98	ab
3	DPX-KJM44	1.0	oz ai/a	A	55	bc	80	b	100	a
4	DPX-KJM44	2.0	oz ai/a	A	63	ab	96	a	100	a
5	DPX-KJM44 Telar XP®	0.25 0.375	oz ai/a oz ai/a	A	35	e	47	f	73	d
6	DPX-KJM44 Telar XP®	0.5 0.375	oz ai/a oz ai/a	A	48	cd	52	ef	90	abc
7	DPX-KJM44 Telar XP®	1.0 0.375	oz ai/a oz ai/a	A	55	bc	68	cd	97	ab
8	DPX-KJM44 Telar XP®	2.0 0.375	oz ai/a oz ai/a	A	65	ab	82	b	100	a
9	Milestone VM®	0.75	oz ai/a	A	60	abc	94	a	100	a
10	Milestone VM®	1.75	oz ai/a	A	68	a	98	a	100	a
11	Telar XP®	0.375	oz ai/a	A	18	f	47	f	58	e
12	DPX-MAT28	0.25	oz ai/a	A	37	de	50	f	87	bc
13	DPX-MAT28	0.5	oz ai/a	A	50	c	70	c	100	a
14	DPX-MAT28	1.0	oz ai/a	A	58	abc	83	b	100	a
15	Milestone VM®	1.0	oz ai/a	A	67	ab	88	ab	100	a
16	Untreated Check			A	0		0		0	
LSD (P=.10)					12.3		9.9		12.1	
Standard Deviation					8.9		7.1		8.7	
CV					17.65		10.21		9.46	
Replicate F					3.104		2.641		3.461	
Replicate Prob(F)					0.0606		0.0890		0.0454	
Treatment F					8.661		26.028		6.408	
Treatment Prob(F)					0.0001		0.0001		0.0001	

Foot notes: All treatments included a methylated seed oil at 1.0 % V/V. Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-85-08): This study was treated on 29 May at which time kochia was 1-10 inches tall and actively growing along with common bermudagrass. Growing conditions for kochia, large crabgrass, and common bermudagrass were ideal as the research area received good rainfall and mild temperatures.

Results & Discussion (4-H-85-08): AT 32 days-after-application (DAA) DPX-KJM44 at 0.5, 1.0 & 2.0 oz.a.i./A, DPX-KJM44 at 1.0 & 2.0 oz.a.i./A tank-mixed with Telar XP®, and DPX-MAT28 at 1.0 oz.a.i./A were all producing good to excellent (85-99%) control of kochia (Table 13). At this time lower rates of KPX-KJM44 tank-mixed with Telar XP® and lower rates of DPX-MAT28 were providing moderate kochia control (65-73%). All other treatments were providing poor control of kochia at 32 DAA. At 62DAA kochia control increased for all DPX-KJM44 and DPX-MAT28 treatments. All treatments of DPX-KJM44 and DPX-MAT28 at 0.5 and 1.0 oz.a.i./A were producing excellent kochia control (91-100%). There was a small DPX-KJM44 rate response at this time but kochia seemed very susceptible to even the lowest rates evaluated. The lowest rate of DPX-MAT28 was providing moderate kochia control (78%) at 62 DAA. All other treatments were providing poor kochia control at 62 DAA. Kochia control at 91 DAA was very similar to that produced at 62 DAA. All of the treatments that were producing excellent kochia control at 62 DAA were maintaining this high level of control into late summer. This is a very positive result as this research site received several good rainfall events in midsummer which typically would promote kochia germination. The DPX-KJM44 and MAT28 products were producing good postemergence control of existing kochia and preventing later kochia from emerging. The Telar XP® and Milestone VM® treatments in this study produced poor kochia control throughout the duration of the study.

AT 32 DAA DPX-KJM44 at 2.0 oz.a.i./A alone, or when tank-mixed with Telar XP® was producing good to excellent (85-95%) large crabgrass control (Table 13). At this time DPX-MAT28 at 1.0 oz.a.i./A was producing moderate large crabgrass control (75%). By 62 DAA large crabgrass control had decreased for all treatments with only DPX-KJM44 at 2.0 oz.a.i./A alone, and combined with Telar XP® still producing moderate levels of control (65-73%). AT 91 DAA all treatments were producing poor large crabgrass control.

Common bermudagrass injury was evaluated throughout the duration of this study. At 32 DAA a small amount of common bermudagrass phytotoxicity was noticed with DPX-KJM44 at 2.0 oz.a.i./A alone, or tank-mixed with Telar XP® (3-7%). This amount of bermudagrass toxicity is more than acceptable and was not evident at 62 and 91 DAA.

Table 13. Postemergence Kochia Control Study 4-H-85-08 in Alfalfa County in 2008.

Weed Code					kochia		kochia		kochia		large crabgrass		large crabgrass		large crabgrass		common bermuda-grass		common bermuda-grass	
Rating Data Type					control		control		control		control		control		control		injury		injury	
Rating Unit					%		%		%		%		%		%		%		%	
Rating Date					6/30/08		7/30/08		8/28/08		6/30/08		7/30/08		8/28/08		6/30/08		7/30/08	
Trt-Eval Interval					32 DAA		62 DAA		91 DAA		32 DAA		62 DAA		91 DAA		32 DAA		62 DAA	
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code																
1	DPX-KJM44	0.25	oz ai/a	A	43	e	91	a	98	a	0	f	0	f	0	c	0	b	0	a
2	DPX-KJM44	0.5	oz ai/a	A	92	ab	98	a	100	a	27	de	0	f	5	bc	0	b	0	a
3	DPX-KJM44	1.0	oz ai/a	A	98	a	100	a	100	a	53	bc	27	cde	20	ab	0	b	0	a
4	DPX-KJM44	2.0	oz ai/a	A	99	a	100	a	100	a	93	a	65	ab	30	a	3	ab	0	a
5	DPX-KJM44 Telar XP®	0.25 0.375	oz ai/a oz ai/a	A	73	cd	94	a	95	a	15	ef	0	f	0	c	0	b	0	a
6	DPX-KJM44 Telar XP®	0.5 0.375	oz ai/a oz ai/a	A	77	bcd	99	a	98	a	17	def	5	ef	0	c	0	b	0	a
7	DPX-KJM44 Telar XP®	1.0 0.375	oz ai/a oz ai/a	A	95	a	100	a	100	a	86	a	40	cd	5	bc	7	a	0	a
8	DPX-KJM44 Telar XP®	2.0 0.375	oz ai/a oz ai/a	A	99	a	100	a	100	a	95	a	73	a	33	a	7	a	0	a
9	Milestone VM®	0.75	oz ai/a	A	17	f	12	de	10	c	0	f	0	f	0	c	0	b	0	a
10	Milestone VM®	1.75	oz ai/a	A	13	f	30	c	13	c	0	f	0	f	0	c	0	b	0	a
11	Telar XP®	0.375	oz ai/a	A	17	f	22	cd	0	c	0	f	0	f	0	c	0	b	0	a
12	DPX-MAT28	0.25	oz ai/a	A	33	e	78	b	77	b	0	f	10	ef	10	bc	0	b	0	a
13	DPX-MAT28	0.5	oz ai/a	A	65	d	92	a	85	ab	42	cd	18	def	10	bc	0	b	0	a
14	DPX-MAT28	1.0	oz ai/a	A	84	abc	96	a	98	a	75	ab	45	bc	28	a	0	b	0	a
15	Milestone VM®	1.0	oz ai/a	A	10	f	7	e	0	c	0	f	0	f	0	c	0	b	0	a
16	Untreated Check			A	7		12		0		0		0		0		0		0	
LSD (P=.10)					16.5		10.2		15.2		26.0		21.9		18.1		3.5		0.0	
Standard Deviation					11.9		7.4		11.0		18.7		15.8		13.1		2.6		0.0	
CV					19.46		9.89		15.31		55.91		83.76		138.18		229.6		0.0	
Replicate F					2.745		0.748		0.679		1.234		4.556		2.831		1.366		0.000	
Replicate Prob(F)					0.0815		0.4826		0.5155		0.3064		0.0194		0.0759		0.2716		1.0000	
Treatment F					26.084		72.980		43.393		12.009		7.720		2.675		2.683		0.000	
Treatment Prob(F)					0.0001		0.0001		0.0001		0.0001		0.0001		0.0129		0.0127		1.0000	

Foot notes: All treatments included a methylated seed oil at 1.0 % V/V. Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-86-08): This study was treated on June 19, 2008 at which time Palmer amaranth was 1-9 inches tall, large crabgrass was 1-6 inches tall and actively growing along with common bermudagrass. Growing conditions were good in the early stages in this trial but mid July through late August the study received very little rainfall and experienced a 2-3 week period of high temperatures. During this period weed growth in untreated plots showing moderate to severe necrosis due to the climate extremes. In early September temperature's broke followed by heavy rainfall created a late season flush of growth from both Palmer amaranth and large crabgrass. It should also be noted that Palmer amaranth population densities were inconsistent in this study, this made for less than desirable mean separations through statistical analysis.

Results & Discussion (4-H-86-08): As mentioned the inconsistent Palmer amaranth densities coupled with the weather extremes in this trial made data collection difficult. This being said there was still very useful observations made at each of the 28, 56, and 92 days-after-treatment (DAA) evaluations (Table 14). Observations indicate that DPX-KJM44 at 1.0 and 2.0 oz.a.i./A were providing good to excellent postemergence control of Palmer amaranth (80-95%) throughout the duration of this study. DPX-KJM44 rates lower than 1.0 oz.a.i./A appeared to have more consistent Palmer amaranth escapes in the treated plots. The addition of Telar XP® to DPX-KJM44 treatments did not appear to provide any additional Palmer amaranth control. DPX-MAT28 at 1.0 oz.a.i./A provided for good Palmer amaranth control throughout the duration of the study, however lower rates produced inconsistent levels of control. Treatments of Milestone VM® and Telar XP® did not provide consistent Palmer amaranth, or large crabgrass, throughout the duration of this study.

At 28 DAA DPX-KJM44 at 1.0 and 2.0 oz.a.i./A, alone, and combined with Telar XP® were producing moderate to good (68-90%) control of large crabgrass (Table 14). AT 56 DAA only DPX-KJM44 at 2.0 oz.a.i./A was maintaining good control of large crabgrass (83%) which fell to 65% at final 92 DAA evaluations. Lower rates of DPX-KJM44 were showing a rate response to large crabgrass with decreasing control at lesser rates, however control was not at an acceptable level (>%80). While data was not collected, it is worthy of noting that DPX-KJM44 at 2.0 oz.a.i./A was showing moderate to good levels of field sandbur control through the 92 DAA evaluations.

Common bermudagrass injury was evaluated at 28 DAA at which time no treatments were producing any noticeable phytotoxicity to bermudagrass (Table 14). No bermudagrass injury was noticed at later evaluations as well.

Table 14. Postemergence Palmer Amaranth Control Study 4-H-86-08 in Grant County in 2008.

Weed Code					Palmer amaranth	Palmer amaranth	Palmer amaranth	large crabgrass	large crabgrass	large crabgrass	common bermuda-grass
Rating Data Type					control	control	control	control	control	control	injury
Rating Unit					%	%	%	%	%	%	%
Rating Date					7/17/08	8/14/08	9/19/08	7/17/08	8/14/08	9/19/08	7/17/08
Trt-Eval Interval					28 DAA	56 DAA	92 DAA	28 DAA	56 DAA	92 DAA	28 DAA
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code							
1	DPX-KJM44	0.25	oz ai/a	A	53 b-e	62 ab	63 ab	17 bc	0 d	0 c	0 a
2	DPX-KJM44	0.5	oz ai/a	A	58 a-e	52 ab	55 ab	35 b	17 cd	0 c	0 a
3	DPX-KJM44	1.0	oz ai/a	A	48 cde	57 ab	57 ab	68 a	59 ab	30 b	0 a
4	DPX-KJM44	2.0	oz ai/a	A	77 a-e	62 ab	88 a	90 a	83 a	65 a	0 a
5	DPX-KJM44	0.25	oz ai/a	A	45 e	62 ab	63 ab	13 bc	0 d	0 c	0 a
	Telar XP®	0.375	oz ai/a								
6	DPX-KJM44	0.5	oz ai/a	A	67 a-e	0 b	0 b	23 b	0 d	0 c	0 a
	Telar XP®	0.375	oz ai/a								
7	DPX-KJM44	1.0	oz ai/a	A	79 abc	63 ab	63 ab	82 a	57 ab	30 b	0 a
	Telar XP	0.375	oz ai/a								
8	DPX-KJM44	2.0	oz ai/a	A	81 ab	52 ab	57 ab	77 a	67 a	33 b	0 a
	Telar XP®	0.375	oz ai/a								
9	Milestone VM®	0.75	oz ai/a	A	78 a-d	88 a	63 ab	0 c	0 d	0 c	0 a
10	Milestone VM®	1.75	oz ai/a	A	87 a	32 ab	42 ab	0 c	0 d	0 c	0 a
11	Telar XP®	0.375	oz ai/a	A	46 de	25 ab	12 b	0 c	30 bc	0 c	0 a
12	DPX-MAT28	0.25	oz ai/a	A	70 a-e	63 ab	63 ab	13 bc	0 d	0 c	0 a
13	DPX-MAT28	0.5	oz ai/a	A	47 de	32 ab	32 ab	25 b	10 cd	0 c	0 a
14	DPX-MAT28	1.0	oz ai/a	A	80 abc	87 a	87 a	35 b	23 cd	15 bc	0 a
15	Milestone VM®	1.0	oz ai/a	A	75 a-e	32 ab	32 ab	0 c	0 d	0 c	0 a
16	Untreated Check			A	18	0	0	0	0	0	0
LSD (P=.10)					32.3	64.9	65.0	22.9	29.5	21.1	0.0
Standard Deviation					23.2	46.8	46.8	16.5	21.2	15.2	0.0
CV					35.16	91.48	90.35	51.51	92.0	131.71	0.0
Replicate F					2.970	0.891	0.443	11.695	1.828	2.118	0.000
Replicate Prob(F)					0.0676	0.4214	0.6467	0.0002	0.1794	0.1392	1.0000
Treatment F					1.244	0.759	0.830	11.401	5.692	4.957	0.000
Treatment Prob(F)					0.3005	0.7010	0.6333	0.0001	0.0001	0.0002	1.0000

Foot notes: All treatments included a methylated seed oil at 1.0 % V/V. Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-94-09): The treatments were applied on April 3, 2009 at which time kochia was 1/4-1 inches tall and Buckhorn plantain was present as 2-4 inch rosettes. At treatment time it is estimated that 40-50% of kochia had already emerged (but was very small) but Palmer amaranth had not yet emerged. So the following data and discussion with respect to kochia will include both early postemergence responses as well as preemergence responses. All Palmer amaranth data to be discussed will include only preemergence responses to the various treatments. This trial received adequate rainfall throughout its duration to provide good weed emergence, growth, and development.

Results & Discussion (4-H-94-09): At May 6 evaluations (33 DAA, days-after-application) kochia continued to emerge and was 0.25-5 inches tall in the untreated check. Also at this time Palmer amaranth was just beginning to emerge and was very difficult to evaluate because of its 0.25-1 inch size growing along with the other roadside vegetation. It was also documented at this time that the study site had no common bermudagrass. The canopy of dormant grasses that existed in the trial at the time of treatment was thought to be a mixture of common bermudagrass and large crabgrass, but eventually revealed no common bermudagrass present.

At 33 DAA buckhorn plantain control was very rate dependant (Table 15a). All treatment with low MAT28 rates were producing poor to moderate control of plantain. However, all of the treatments that included the higher rate of MAT28 alone, or combined with other herbicides, produced good to excellent control of plantain. The addition of Telar XP®, Escort XP®, and the higher rate of Matrix® improved plantain control over MAT28 alone. This same trend of buckhorn plantain control was noticed at 62 DAA evaluations with most the higher rate treatments producing very successful control (>90%). Of all the lower rate treatments only the MAT28 treatment combined with Escort XP® produced excellent control of buckhorn plantain (95%).
At 33, 62, and 90 DAA preemergence Palmer amaranth control was poor from all treatments (Table 15a). Control varied dependent on MAT28 rate and combination treatments put was apparent that most Palmer amaranth plants showing little affect from the herbicides applied nearly two months prior to emergence. At 118 DAA Palmer amaranth control from all treatments was still unacceptable however there did appear to be some growth regulation occurring from many of the treatments. Palmer amaranth appeared to be smaller in treated plots and was not developing abundant seedheads as compared to those in the untreated plots. Overall none of the MAT28 treatments or treatment combinations were able to provide successful control of Palmer amaranth.

At 33 DAA treatments of MAT28 alone produced moderate control of kochia (72-76%). The addition Telar XP®, Escort XP® and Matrix® was inconsistent at this time as to its affect on the MAT28 treatment. The standard treatment of Diuron 80 WDG was producing early kochia control of 95%. At 62 DAA kochia control had increased for most treatments. Treatments including MAT28 alone the high rate of MAT28 with Matrix® were producing good to excellent kochia control. All other treatments (Table 15a) were producing moderate kochia control from 55-78%. At this time the standard treatment was maintaining 93% kochia control. By 90 DAA kochia control continued to increase for nearly all treatments. All treatments were producing and maintaining at least 85%

control of kochia. AT 90 DAA most treatments were producing high levels of kochia growth suppression, chlorosis, and significant necrosis while at the same time annual large crabgrass (Table 15a) was producing so much competition the remaining kochia could not compete. Final kochia control evaluations at 118 DAA continued to increase with all treatments producing 92-98% control of kochia. These final levels of kochia control resulted from an early postemergence to preemergence application timing.

At 90 and 118 DAA all treatments were producing good to excellent control of common marestail (Table 15b). Marestail control ranged from 86% (standard treatment) to 99%. All of the MAT28 treatments alone or in combination produced and maintained very successful control of common marestail.

Large crabgrass control was evaluated at 33 and 62 DAA at which time no treatments in this study were producing any noticeable control or suppression. Many of the products in this trial have been noted in past studies to produce some level of annual warm season grass control however possibly due to the early treatment date and high level of spring rainfall may have limited the residual grass control.

Table 15a. Preemergence and Postemergence Palmer Amaranth and Kochia Control Study 4-H-94-09 In Grant County in 2009.

Trt No.	Treatment Name	Rate	Rate Unit	Appl Code	Buckhorn plantain May-6-2009 control % 33 DAA		Buckhorn plantain Jun-4-2009 control % 62 DAA		Palmer amaranth May-6-2009 control % 33 DAA		Palmer amaranth Jun-4-2009 control % 62 DAA		Palmer amaranth Jul-2-2009 control % 90 DAA		Palmer amaranth Jul-30-2009 control % 118 DAA		Large crabgrass May-6-2009 control % 33 DAA		Large crabgrass Jun-4-2009 control % 62 DAA	
1	Untreated Check			A	0		33		10		0		0		0		0		0	
2	DPX-MAT28	0.94	oz ai/a	A	28	d	30	bc	10	a	27	ab	7	b	48	a	0	a	0	a
3	DPX-MAT28	1.88	oz ai/a	A	73	bc	95	a	10	a	18	ab	7	b	49	a	0	a	0	a
4	DPX-MAT28	0.94	oz ai/a	A	62	c	23	bc	7	a	47	a	13	ab	48	a	0	a	0	a
	Telar XP®	0.375	oz ai/a	A																
5	DPX-MAT28	1.88	oz ai/a	A	95	ab	63	ab	13	a	25	ab	27	ab	40	a	0	a	0	a
	Telar XP®	0.75	oz ai/a	A																
6	DPX-MAT28	0.94	oz ai/a	A	67	c	95	a	17	a	7	b	17	ab	47	a	0	a	0	a
	Escort XP®	0.3	oz ai/a	A																
7	DPX-MAT28	1.88	oz ai/a	A	98	a	95	a	13	a	33	ab	40	a	62	a	0	a	0	a
	Escort XP®	0.6	oz ai/a	A																
8	DPX-MAT28	0.75	oz ai/a	A	38	d	32	bc	0	a	20	ab	3	b	50	a	0	a	0	a
	Matrix®	0.5	oz ai/a	A																
9	DPX-MAT28	1.13	oz ai/a	A	37	d	7	c	0	a	20	ab	7	b	58	a	0	a	0	a
	Matrix®	0.75	oz ai/a	A																
10	DPX-MAT28	1.5	oz ai/a	A	83	abc	90	a	0	a	27	ab	17	ab	60	a	0	a	0	a
	Matrix	1.0	oz ai/a	A																
11	Diuron 80 WDG®	2.4	lb ai/a	A	0	e	0	c	27	a	50	a	0	b	0	b	0	a	0	a
LSD (P=.10)					21.9		47.7		28.5		35.8		31.5		38.7		0.0		0.0	
Standard Deviation					15.5		33.7		20.1		25.3		22.3		27.3		0.0		0.0	
CV					26.6		63.51		208.14		92.53		162.95		59.13		0.0		0.0	
Replicate F					4.519		0.274		2.775		11.402		0.208		0.141		0.000		0.000	
Replicate Prob(F)					0.0257		0.7638		0.0890		0.0006		0.8138		0.8693		1.0000		1.0000	
Treatment F					12.572		3.997		0.539		0.805		0.888		1.242		0.000		0.000	
Treatment Prob(F)					0.0001		0.0060		0.8276		0.6172		0.5539		0.3309		1.0000		1.0000	

Foot notes: All treatments included a non-ionic surfactant at 25% V/V. Means followed by same letter do not significantly differ at P=.10.
Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Table 15b. Preemergence and Postemergence Palmer Amaranth and Kochia Control Study 4-H-94-09 in Grant County in 2009.

Pest Name					Kochia		Kochia		Kochia		Kochia		marestail		marestail		marestail	
Rating Date					May-6-2009		Jun-4-2009		Jul-2-2009		Jul-30-2009		Jun-4-2009		Jul-2-2009		Jul-30-2009	
Rating Type					control		control		control		control		control		control		control	
Rating Unit					%		%		%		%		%		%		%	
Trt-Eval Interval					33 DAA		62 DAA		90 DAA		118 DAA		62 DAA		90 DA-		118 DAA	
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code														
1	Untreated Check			A	0		32		0		0		33		0		0	
2	DPX-MAT28	0.94	oz ai/a	A	72	a	82	ab	91	a	92	c	98	a	90	c	89	bc
3	DPX-MAT28	1.88	oz ai/a	A	76	a	90	ab	95	a	96	abc	99	a	99	a	99	a
4	DPX-MAT28	0.94	oz ai/a	A	33	b	55	b	88	ab	94	abc	95	ab	95	b	95	ab
	Telar XP®	0.375	oz ai/a	A														
5	DPX-MAT28	1.88	oz ai/a	A	85	a	60	ab	92	a	98	a	66	bc	99	a	99	a
	Telar XP®	0.75	oz ai/a	A														
6	DPX-MAT28	0.94	oz ai/a	A	73	a	73	ab	85	ab	94	abc	99	a	98	ab	99	a
	Escort XP®	0.3	oz ai/a	A														
7	DPX-MAT28	1.88	oz ai/a	A	72	a	77	ab	88	ab	97	ab	99	a	99	a	99	a
	Escort XP®	0.6	oz ai/a	A														
8	DPX-MAT28	0.75	oz ai/a	A	85	a	65	ab	83	ab	93	bc	99	a	95	b	96	ab
	Matrix®	0.5	oz ai/a	A														
9	DPX-MAT28	1.13	oz ai/a	A	90	a	78	ab	87	ab	93	bc	99	a	98	ab	99	a
	Matrix®	0.75	oz ai/a	A														
10	DPX-MAT28	1.5	oz ai/a	A	72	a	90	ab	72	b	98	a	99	a	99	a	99	a
	Matrix®	1.0	oz ai/a	A														
11	Diuron 80 WDG®	2.4	lb ai/a	A	95	a	93	a	92	a	98	a	65	c	86	d	83	c
LSD (P=.10)					27.3		36.6		18.5		4.8		29.4		3.5		8.0	
Standard Deviation					19.3		25.8		13.0		3.4		20.8		2.5		5.6	
CV					25.65		33.9		14.96		3.56		22.65		2.62		5.91	
Replicate F					12.000		4.169		1.749		2.275		2.273		1.154		1.870	
Replicate Prob(F)					0.0005		0.0325		0.2022		0.1315		0.1317		0.3378		0.1829	
Treatment F					2.322		0.777		0.754		1.367		1.341		9.507		2.932	
Treatment Prob(F)					0.0612		0.6398		0.6583		0.2728		0.2840		0.0001		0.0249	

Foot notes: All treatments included a non-ionic surfactant at 25% V/V. Means followed by same letter do not significantly differ at P=.10.
Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-95-09): The treatments were applied on April 14, 2009 to musk thistle rosettes that ranged in size from 1-6 inches diameter. All musk thistles in this study received adequate rainfall to produce good growth and development.

Results & Discussion (4-H-95-09): At 28 DAA (days-after-application) all treatments (Table 16) were showing good to excellent control of musk thistle (83-97%) with the exception of the low DPX-MAT28 rate by itself (65%). At this time musk thistle control was noticed as complete growth regulation and severe chlorosis and necrosis in most of the rosettes. At 58 DAA musk thistle control had increased for all treatments and at this time near complete necrosis was being produced by most treatments. Only the low rate of DPX-MAT28 by itself was not producing necrotic thistle plants only severely stunted chlorotic thistles that were not able to flower throughout the duration of this study. Other weed control observations during this study were at 28 DAA only those treatments containing Matrix were producing near complete control of downy brome (Table 16). All other treatments produced little if any downy brome control. Also, at 58 DAA only those treatments containing DPX-MAT28 with Escort were producing excellent control of yellow wood sorrel. All other treatments produced little to no wood sorrel control. Also at 58 DAA all treatments produced near complete control of annual marestail as compared to the untreated check.

Table 16. Postemergence Musk Thistle Control Study 4-H-95-09 in Kay County in 2009.

Trt No.	Treatment Name	Rate	Rate Unit	Appl Code	Musk thistle May-12-2009 control % 28 DAA		Musk thistle Jun-11-2009 control % 58 DAA		Downy brome May-12-2009 control % 28 DAA		Annual marshelder Jun-11-2009 control % 58 DAA		yellow wood sorrel Jun-11-2009 control % 58 DAA	
1	Untreated Check			A	0		0		0		0		0	
2	DPX-MAT28	0.94	oz ai/a	A	64	b	65	b	0	c	99	a	0	c
3	DPX-MAT28	1.88	oz ai/a	A	97	a	99	a	0	c	99	a	0	c
4	DPX-MAT28	0.94	oz ai/a	A	92	a	99	a	0	c	99	a	0	c
	Telar XP®	0.375	oz ai/a	A										
5	DPX-MAT28	1.88	oz ai/a	A	94	a	99	a	0	c	99	a	23	b
	Telar XP®	0.75	oz ai/a	A										
6	DPX-MAT28	0.94	oz ai/a	A	88	a	99	a	33	b	99	a	90	a
	Escort XP®	0.3	oz ai/a	A										
7	DPX-MAT28	1.88	oz ai/a	A	94	a	99	a	0	c	99	a	93	a
	Escort XP®	0.6	oz ai/a	A										
8	DPX-MAT28	0.75	oz ai/a	A	83	a	96	a	99	a	99	a	0	c
	Matrix®	0.5	oz ai/a	A										
9	DPX-MAT28	1.13	oz ai/a	A	90	a	94	a	99	a	99	a	0	c
	Matrix®	0.75	oz ai/a	A										
10	DPX-MAT28	1.5	oz ai/a	A	94	a	99	a	99	a	99	a	7	c
	Matrix®	1.0	oz ai/a	A										
11	Milestone VM®	1.0	oz ai/a	A	97	a	99	a	0	c	99	a	23	b
LSD (P=.10)					17.7		16.4		25.6		0.0		14.8	
Standard Deviation					12.4		11.5		18.1		0.0		10.5	
CV					13.93		12.15		54.77		0.0		44.37	
Replicate F					0.062		1.664		1.000		0.000		0.569	
Replicate Prob(F)					0.9405		0.2206		0.3874		1.0000		0.5761	
Treatment F					1.841		2.581		20.000		0.000		37.284	
Treatment Prob(F)					0.1375		0.0470		0.0001		1.0000		0.0001	

Foot notes: All treatments included a non-ionic surfactant at 25% V/V. Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-96-09): The treatments were applied on June 5, 2009 to kochia that ranged from 1-6 inches in height, large crabgrass 1-3 inches, and common bermudagrass was 100% green and actively growing.

Results & Discussion (4-H-96-09): The data collection in this study was cut short due to an asphalt overlay that partially destroy the research site. Therefore the scheduled 84 DAA data was not able to be collected. All of the kochia, and other vegetation, growing at this site was growing under a wide range of both heat and drought stress conditions. During the two months of this trial the treatments were exposed to moderate, followed by 7-day severe temperature stress period, followed by 10 days of moderate weather, followed by 7 days of severe temperature/drought stress, followed by 17 days of moderate weather. There is perhaps one or more reasons besides the expected NIS versus MSO adjuvant reason as to why these treatments worked more slowly this year than in 2008.

At 27 DAA (days-after-application) all treatments, excluding the low rate of DPX-MAT28 by itself along with the standard treatment of Vanquish®, were producing good to excellent (80-95%) control of kochia (Table 17). By 55 DAA control had decreased for all of the lower rate treatment combinations with most of these treatments now producing moderate kochia control (57-79%). However, DPX-MAT28 at the high rate along with all of the higher rate combination treatments were producing and maintaining good to excellent control of kochia (88-94%). Also, at this time the standard treatment of Vanquish® at 1 pt. prod./A was producing 98% kochia control. Due to weather conditions large crabgrass control was not evaluated at 27 DAA, however, at 55 DAA evaluations were taken. At 55 DAA, DPX-MAT28 at 1.88 oz.ai./A, both treatments including Telar XP®, Escort XP® treatment at 0.6 oz.ai./A, and the two highest rates of Matrix were producing excellent control of large crabgrass (90-96%). Common bermudagrass injury was evaluated at 27 DAA at which time very little bermudagrass injury could be attributed to any herbicide treatment as growing conditions at the study were fairly harsh due to weather. At 55 DAA the study site had received some rainfall and lower temperatures and most common bermudagrass had resumed its normal growth. At this time it was noticeable that all plots treated with the higher rate(s) of DPX-MAT28 were showing 5-10% more injury than lower DPX-MAT28 rates. The level of injury from the higher DPX-MAT28 rates ranges from 11-13% (minor chlorosis, minor stunting) and would be acceptable for common bermudagrass roadsides in Oklahoma.

Table 17. Postemergence Kochia Control Study 4-H-96-09 in Garfield County in 2009.

Weed Name					Kochia		Kochia		Large crabgrass		Common bermudagrass		Common bermudagrass	
Crop Name														
Rating Date					Jul-2-2009		Jul-30-2009		Jul-30-2009		Jul-2-2009		Jul-30-2009	
Rating Type					control		control		control		injury		injury	
Rating Unit					%		%		%		%		%	
Trt-Eval Interval					27 DAA		55 DAA		55 DAA		27 DAA		55 DAA	
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code										
1	Untreated Check			A	23		0		0		10		0	
2	DPX-MAT28	0.94	oz ai/a	A	60	a	57	d	58	c	10	a	0	d
3	DPX-MAT28	1.88	oz ai/a	A	95	a	88	abc	96	a	12	a	12	ab
4	DPX-MAT28	0.94	oz ai/a	A	88	a	80	a-d	90	ab	11	a	9	b
	Telar XP®	0.375	oz ai/a	A										
5	DPX-MAT28	1.88	oz ai/a	A	80	a	90	abc	93	a	11	a	11	ab
	Telar XP®	0.75	oz ai/a	A										
6	DPX-MAT28	0.94	oz ai/a	A	77	a	68	bcd	67	bc	10	a	2	cd
	Escort XP®	0.3	oz ai/a	A										
7	DPX-MAT28	1.88	oz ai/a	A	84	a	90	abc	93	a	10	a	11	ab
	Escort XP®	0.6	oz ai/a	A										
8	DPX-MAT28	0.75	oz ai/a	A	83	a	63	cd	68	bc	10	a	2	cd
	Matrix®	0.5	oz ai/a	A										
9	DPX-MAT28	1.13	oz ai/a	A	84	a	79	a-d	90	ab	12	a	5	c
	Matrix®	0.75	oz ai/a	A										
10	DPX-MAT28	1.5	oz ai/a	A	86	a	94	ab	93	a	12	a	13	a
	Matrix®	1.0	oz ai/a	A										
11	Vanquish®	8	oz ai/a	A	61	a	98	a	0	d	10	a	0	d
LSD (P=.10)					34.7		26.6		24.2		3.2		4.0	
Standard Deviation					24.5		18.8		17.1		2.3		2.8	
CV					30.68		23.34		22.85		21.17		43.46	
Replicate F					0.193		1.415		2.011		2.634		0.465	
Replicate Prob(F)					0.8262		0.2687		0.1628		0.0992		0.6356	
Treatment F					0.616		1.614		9.001		0.349		10.763	
Treatment Prob(F)					0.7685		0.1852		0.0001		0.9452		0.0001	

Foot notes: All treatments included a non-ionic surfactant at 25% V/V. Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

Methods (4-H-97-09): The treatments were applied on June 11, 2009 at which time Palmer amaranth was 1-6 inches tall (average 3.5 Inches) and large crabgrass was 1-3 inches tall. This trial received adequate rainfall throughout its duration to provide good weed emergence, growth, and development. It is also worthy of noting this study site received higher than normal levels of rainfall during the last half of this trial. Bermudagrass phytotoxicity data was not available to be taken during this study.

Results & Discussion (4-H-97-09): At 32 days-after-application (DAA) all treatments were producing moderate to excellent postemergence control of Palmer amaranth with the exception of the standard treatment of Vanquish at 1 pt./A which was producing very poor control (Table 18). Treatments that included DPX-MAT28 at the lower rate, alone, or when combined with other herbicides were producing moderate control of Palmer amaranth ranging from 52-72%. DPX-MAT28 at higher rates, alone, or combined with other herbicides was producing much better Palmer amaranth control ranging from 76-93%. At 32 DAA treatment combinations including DPX-MAT28 at 1.88 oz.a.i./A plus the higher rate of Escort XP® or Matrix® were producing excellent Palmer amaranth control of 92 & 93 % control, respectively. At 61 DAA Palmer amaranth control remained fairly constant to those data taken one month earlier, however, trends were showing the lower rates of DPX-MAT28 were allowing some new Palmer amaranth emergence and or development. At 61 DAA all treatments that included lower rates of DPX-MAT28, alone, or when combined with other herbicides were producing poor to moderate control of Palmer amaranth (48-66%). This level of control at this point after application would not be acceptable. At 61 DAA, all treatments of DPX-MAT28 at higher rates, alone, or when mixed with other herbicides were producing good to excellent control of Palmer amaranth (84-93%). The treatment combination of DPX-MAT28 at 1.88 oz.a.i./A plus Escort XP® at 0.6 oz.a.i./A was maintaining the highest level of Palmer amaranth (93%). At 91 DAA Palmer amaranth control continued to decrease for all of the lower rate treatments in this study. Treatments of DPX-MAT28 at 1.88 oz.a.i./A, alone, or combined with other herbicides were maintaining Palmer amaranth controls levels very similar to earlier evaluations. Treatments of DPX-MAT28 at 1.88 oz.a.i./A, alone, or when mixed with higher rates of Telar XP® or Escort XP® were producing good Palmer amaranth control ranging from 80-89%. From the data from this trial it did not appear that DPX-MAT28 at 0.94 oz.a.i./A, alone, or when combined with other herbicides was able to produce and maintain acceptable levels of Palmer amaranth control. However, treatments that included DPX-MAT28 at 1.88 oz.a.i./A, alone, or when combined with other herbicides were able to produce and maintain acceptable levels of Palmer amaranth control. This data also indicates that as long as higher DPX-MAT28 rates were used there did not appear to be any advantage in any of the treatment combinations over DPX-MAT28 alone.

At 32 DAA all treatments (excluding Vanquish®) were producing moderate to excellent postemergence control of large crabgrass that ranged from 67-92% (Table 18). Treatments including higher rates of DPX-MAT28 were producing higher levels of large crabgrass control than lower rates. At 32 DAA all DPX-MAT28 at 1.88 oz.a.i./A treatments, alone, or combined Telar XP® or Escort XP® were producing excellent control of large crabgrass (92-96%). At 61 DAA large crabgrass control decreased for

all treatments following above average rainfall. However, all treatments of DPX-MAT28, alone, or when mixed with Telar XP® or Escort XP® were still maintaining moderate to good levels of large crabgrass control (50-84%). At 61 DAA all DPX-MAT28 at 1.88 oz.a.i./A treatments, alone, or combined with Telar XP® or Escort XP® were maintaining good control of large crabgrass (77-84%). All DPX-MAT28 combination treatments with Matrix® were producing poor to moderate levels of large crabgrass control. At final 91 DAA evaluations large crabgrass control for all treatments had dropped significantly. Only those treatments including DPX-MAT28 at 1.88 oz.a.i./A were maintaining moderate levels of large crabgrass control (48-64%). The treatment of DPX-MAT28 at 1.88 oz.a.i./A plus Escort XP® at 0.6 oz.a.i./A was maintaining the highest level of large crabgrass control (64%).

Table 18. Postemergence Palmer Amaranth Control Study 4-H-97-09 in 2009.

Weed Name					Palmer amaranth		Palmer amaranth		Palmer amaranth		Large crabgrass		Large crabgrass		Large crabgrass	
Rating Date					Jul-13-2009		Aug-11-2009		Sep-10-2009		Jul-13-2009		Aug-11-2009		Sep-10-2009	
Rating Type					CONTRO		CONTRO		CONTRO		CONTRO		CONTRO		CONTRO	
Rating Unit					%		%		%		%		%		%	
Trt-Eval Interval					32 DAA		61 DAA		91 DAA		32 DAA		61 DAA		91 DAA	
Trt No.	Treatment Name	Rate	Rate Unit	Appl Code												
1	Untreated Check			A	0		0		0		9		0		27	
2	DPX-MAT28	0.94	oz ai/a	A	52	d	48	cd	7	c	84	abc	72	abc	28	abc
3	DPX-MAT28	1.88	oz ai/a	A	77	abc	84	a	88	a	96	a	77	ab	50	ab
4	DPX-MAT28	0.94	oz ai/a	A	68	cd	66	b	43	b	74	bcd	63	bcd	37	abc
	Telar XP®	0.375	oz ai/a	A												
5	DPX-MAT28	1.88	oz ai/a	A	76	bc	84	a	80	a	95	ab	82	ab	48	ab
	Telar XP®	0.75	oz ai/a	A												
6	DPX-MAT28	0.94	oz ai/a	A	65	cd	65	bc	37	b	67	cd	49	de	3	c
	Escort XP®	0.3	oz ai/a	A												
7	DPX-MAT28	1.88	oz ai/a	A	92	ab	93	a	89	a	92	ab	84	a	64	a
	Escort	0.6	oz ai/a	A												
8	DPX-MAT28	0.75	oz ai/a	A	70	c	45	d	46	b	79	a-d	40	e	33	abc
	Matrix®	0.5	oz ai/a	A												
9	DPX-MAT28	1.13	oz ai/a	A	73	c	52	bcd	52	b	63	d	43	e	25	abc
	Matrix®	0.75	oz ai/a	A												
10	DPX-MAT28	1.5	oz ai/a	A	93	a	88	a	76	a	65	cd	57	cde	12	bc
	Matrix®	1.0	oz ai/a	A												
11	Vanquish®	8	oz ai/a	A	13	e	50	bcd	53	b	17	e	0	f	17	bc
LSD (P=.10)					16.9		17.3		21.8		21.2		18.8		43.6	
Standard Deviation					11.9		12.2		15.3		14.9		13.2		30.4	
CV					17.49		18.11		26.89		20.37		23.33		96.19	
Replicate F					0.970		7.560		6.205		6.750		0.336		0.870	
Replicate Prob(F)					0.3990		0.0045		0.0095		0.0070		0.7195		0.4389	
Treatment F					10.979		6.835		8.793		7.396		10.968		1.143	
Treatment Prob(F)					0.0001		0.0004		0.0001		0.0002		0.0001		0.3935	

Foot notes: All treatments included a non-ionic surfactant at 25% V/V. Means followed by same letter do not significantly differ at P=.10. Abbreviations: a = acre, ai = active ingredient, CV = coefficient of variation, DAA = days after application, F = statistical F value, fl = fluid, LSD = least significant difference value, NIS = non-ionic surfactant, oz = ounce, Prob = probability, v = volume, and wt = weight. The untreated check was excluded from statistical analysis.

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