

2018 Wisconsin Weed Science Research Report



Cropping Systems Weed Science

UNIVERSITY OF WISCONSIN-MADISON

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The purpose of this report is to share annual research results with crop production clientele of Wisconsin. Information herein does not constitute a recommendation or endorsement of any particular product or practice. Information herein also does not replace any information presented on pesticide labels. More complete product use guidelines are given through the University of Wisconsin Extension publication:

A3646, Pest Management in Wisconsin Field Crops
Available at: <https://learningstore.uwex.edu/>

Despite careful proof reading, there may be some typing or compilation errors in the report. Should you find any information presented to be unreasonably questionable, please contact:

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Table of Contents

Corn Weed Control Trials	Trial #	Page #
Evaluation of Harness Max Applied PRE Compared to Competitors	CN01	1-3
Evaluation of Harness Max Applied Early POST Compared to Competitors	CN02	4-9
Sequential Corn Herbicide Evaluation	CN03	10-14
Evaluation of Anthem Maxx Tank Mix Partners in 1 and 2-Pass Programs	CN04	15-20
Evaluation of Diflexx Duo Applied Early POST Compared to Competitors	CN06	21-25
Corn Herbicide Evaluation: 1 and 2-Pass Programs	CN07	26-31
Corvus Length of Residual with Atrazine vs Competitors	CN09	32-34
Liberty System Comparison with New Rates in Corn	CN10	35-38
Corn Herbicide System Comparison without Atrazine	CN11	39-41
ImpactZ and Impact Efficacy and Crop Safety in 1 and 2-Pass Programs	CN12	42-44
Corteva Herbicide Programs in Enlist Corn	CN13	45-49
Systems Approach to Weed Management in Corn	CN14	50-53
Soybean Weed Control Trials	Trial #	Page #
Authority Brands Programs Efficacy in Soybean	SB06	54-60
Evaluation of Anthem Maxx Applied PRE Compared to Competitors	SB07	61-64
Evaluation of Fierce Herbicide in Liberty Link Soybean	SB08	65-69
Balance Bean Efficacy in Balance GT Soybean	SB09	70-74
Corteva Soybean Herbicide Programs	SB12	75-80
Systems Approach to Weed Control in Xtend Soybean	SB13	81-83
Tavium Plus Vaporgrip Technology Efficacy in Xtend Soybean	SB14	84-90
Engenia PRO System vs Competitors in Xtend Soybean	SB16	91-94
Utility of PRE/EPOST Application of Dicamba in Xtend Soybean	SB17	95-98
Evaluation of Single MOA Soybean Herbicides Applied PRE	SB19	99-101
UW Waterhemp Challenge: Comparison of Soil Residual Herbicides	WC02	102-106
Additional Information		Page #
Precipitation and temperature Summary		107
List of figures and tables		108-109
Index of weeds evaluated		110
Index of adjuvants		110
Index of herbicides evaluated		111-112
Index of trial sponsors		113

Project Goal: Compare Harness Max to industry standard herbicide premix competitors at multiple rates specified on product labels.

Site Description:

Location: Janesville, WI	Crop: Corn
Field #: 1	Variety: DKC 54-38 RIB
Soil type: Plano silt loam	Planting Date: 5/8
% OM: 3.5	Emergence Date: 5/20
pH: 6.4	Population: 34,000 seeds/acre
Fertilization: 200 lbs N/acre	Depth: 2 in
Previous crop: Soybean	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 30 ft
Weed species: giant ragweed (AMBTR), common lambsquarters (CHEAL), giant foxtail (SETFA), barnyardgrass (ECHCG)	

Herbicide Application Information:

Date:	5/8
Treatment:	PRE (A)
Air Temp (°F):	74
2" Soil Temp (°F):	65
Soil moisture [surface]:	Moist
RH %:	37
Cloud cover %	20
Wind speed (mph)/direction	4-6/SE
Rainfall (in) 1 wk after APP:	2.45
GPA:	15
PSI:	16
Nozzle:	XR11002
Nozzle spacing (in):	15
Boom Height (in):	20

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Harness Xtra	3.9 lb/gal	5, 15	2.6 qt/a	PRE	A
2	Resicore	3.29 lb/gal	4, 15, 27	3 qt/a	PRE	A
3	Acuron	3.44 lb/gal	5, 15, 27	3 qt/a	PRE	A
4	Harness Max	3.85 lb/gal	15, 27	75 fl oz/a	PRE	A
5	Harness Max AAtrex	3.85 lb/gal 4 lb/gal	15, 27 5	75 fl oz/a 32 fl oz/a	PRE PRE	A A
6	Harness Xtra	3.9 lb/gal	5, 15	2.2 qt/a	PRE	A
7	Resicore	3.29 lb/gal	4, 15, 27	2.375 qt/a	PRE	A
8	Acuron	3.44 lb/gal	5, 15, 27	2.75 qt/a	PRE	A
9	Harness Max	3.85 lb/gal	15, 27	64 fl oz/a	PRE	A
10	Harness Max AAtrex	3.85 lb/gal 4 lb/gal	15, 27 5	64 fl oz/a 32 fl oz/a	PRE PRE	A A
11	Harness Xtra	3.9 lb/gal	5, 15	1.8 qt/a	PRE	A
12	Resicore	3.29 lb/gal	4, 15, 27	2.25 qt/a	PRE	A
13	Acuron	3.44 lb/gal	5, 15, 27	2.5 qt/a	PRE	A
14	Harness Max	3.85 lb/gal	15, 27	55 fl oz/a	PRE	A
15	Harness Max AAtrex	3.85 lb/gal 4 lb/gal	15, 27 5	55 fl oz/a 32 fl oz/a	PRE PRE	A A

Trial Summary:

This trial compared weed control of five standard corn herbicide premixes at three different rate structures. Rates were structured within a range based on product labels. There was no visible corn injury at any of the rating dates (data not shown). Control of common lambsquarters and all grass species was greater than 95% at 58 days after the PRE application (data not shown). The average control of giant ragweed ranged from 40 to 92% at 58 days after treatment (Figure 1). In general, all treatments at the high rate containing a group 27 herbicide (HPPD inhibitor) had better and more consistent giant ragweed control than Harness Xtra (acetochlor + atrazine) at all rating timings.

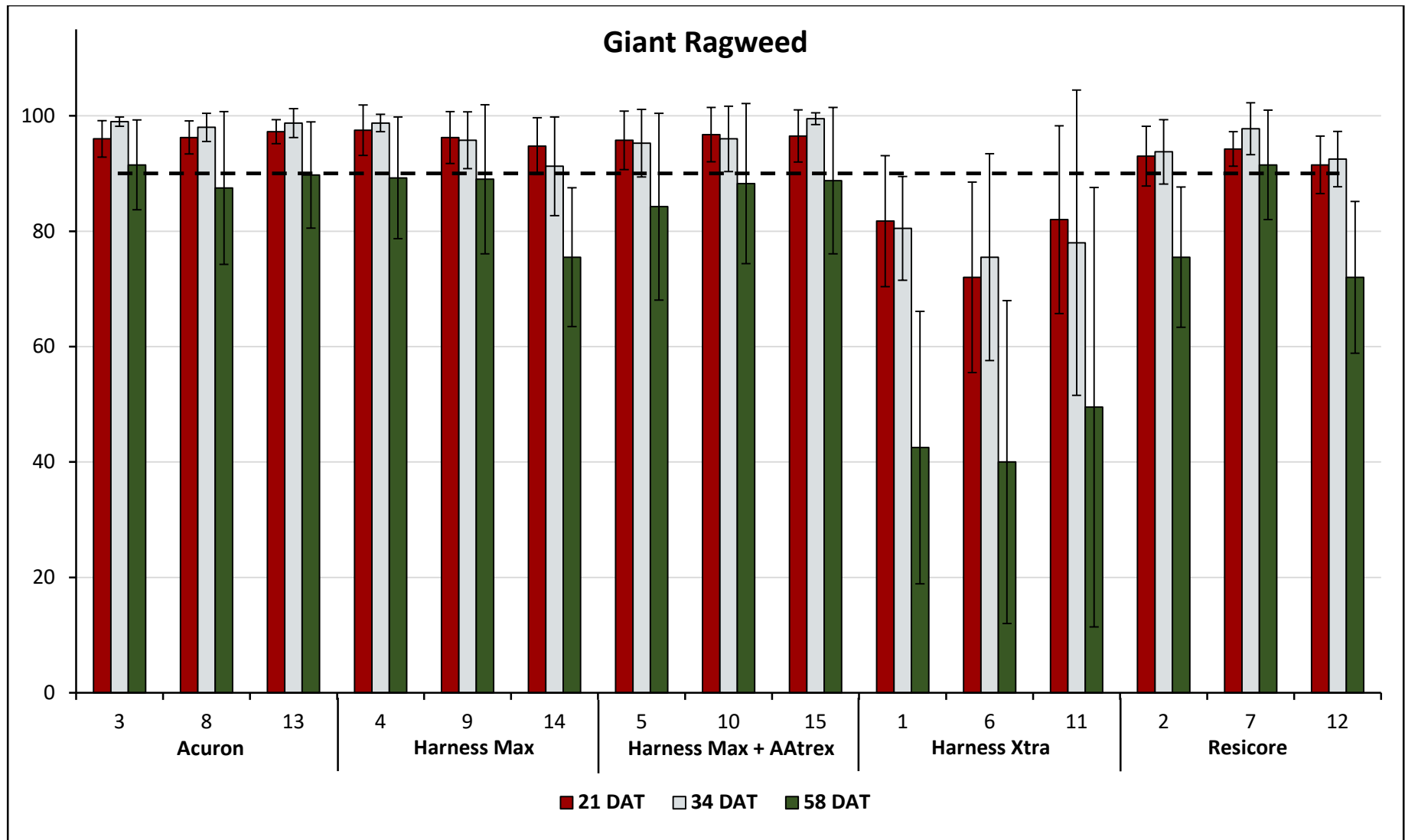


Figure 1: Giant ragweed efficacy ratings for trial #18-ROK-CN01. Bars indicate the average % control \pm the standard deviation of four replications following PRE herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

Project Goal: Compare the length of residual weed control and crop safety of Harness Max applied early postemergence to competitor treatments.

Site Description:

Location: Janesville, WI	Crop: Corn
Field #: 2	Variety: DKC 54-38 RIB
Soil type: Plano silt loam	Planting Date: 5/8
% OM: 3.5	Emergence Date: 5/20
pH: 6.7	Population: 34,000 seeds/acre
Fertilization: 200 lbs N/acre	Depth: 2 in
Previous crop: Soybean	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 30 ft
Weed species: giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), barnyardgrass (ECHCG)	

Herbicide Application Information:

	Date: 5/8	6/1	6/9
Treatment:	PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):	74	71	75
2" Soil Temp (°F):	65	80	76
Soil moisture [surface]:	Moist	Normal	Wet
RH %:	36.6	73	80
Cloud cover %	20	20	15
Wind speed (mph)/direction	4-6/SE	5-10/NE	0-3/NE
Rainfall (in) 1 wk after APP:	2.45	0.37	1.96
GPA:	15	15	15
PSI:	16	20	20
Nozzle:	XR 11002	TTI 110015	TTI 110015
Nozzle spacing (in):	15	15	15
Boom Height (in):	20	24	26

Crop and weed information at application:

	Date: 5/8	6/1	6/9	
Crop	Height (in):	-	8	11
	Stage:	-	V3	V5
AMBTR	Height (in):	-	3.5	8
	Density:	-	4-40/m ²	3-30/m ²
ABUTH	Height (in):	-	2.5	-
	Density:	-	6/m ²	-
AMARE	Height (in):	-	3	-
	Density:	-	18/m ²	-
CHEAL	Height (in):	-	2	-
	Density:	-	37/m ²	-
Grass	Height (in):	-	2	-
	Density:	-	40/m ²	-

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Roundup PowerMax	4.5 lbae/gal	9	27 fl oz/a	EPOST	B
	Diflexx	4 lbae/gal	4	16 fl oz/a	EPOST	B
	AMS			2.5% v/v	EPOST	B
3	Harness Max	3.85 lb/gal	15, 27	40 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	27 fl oz/a	EPOST	B
	AMS			2.5% v/v	EPOST	B
4	Halex GT	4.39 lb/gal	9, 15, 27	1.8 qt/a	EPOST	B
	NIS			.25% v/v	EPOST	B
	AMS			2.5% v/	EPOST	B
5	Resicore	3.29 lb/gal	4, 15, 27	1.25 qt/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	27 fl oz/a	EPOST	B
	AMS				EPOST	B
6	Harness Xtra	6 lb/gal	5, 15	2 qt/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	27 fl oz/a	EPOST	B
	Diflexx	4 lbae/gal	4	16 fl oz/a	EPOST	B
	AMS			2.5% v/v	EPOST	B
7	Harness Max	3.85 lb/gal	15, 27	64 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	EPOST	B
	AMS			2.5% v/v	EPOST	B
8	Harness Max	3.85 lb/gal	15, 27	64 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	EPOST	B
	NIS			.25% v/v	EPOST	B
	AMS			2.5% v/v	EPOST	B
9	Halex GT	4.39 lb/gal	9, 15, 27	2 qt/a	EPOST	B
	NIS			.25% v/v	EPOST	B
	AMS			2.5% v/	EPOST	B
10	Resicore	3.29 lb/gal	4, 15, 27	2.25 qt/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	EPOST	B
	AMS				EPOST	B
11	Harness Max	3.85 lb/gal	15, 27	64 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	1 qt/a	EPOST	B
	AMS			2.5% v/v	EPOST	B
12	Harness Max	3.85 lb/gal	15, 27	64 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	1 qt/a	EPOST	B
	NIS			.25% v/v	EPOST	B
	AMS			2.5% v/v	EPOST	B
13	Halex GT	4.39 lb/gal	9, 15, 27	2 qt/a	EPOST	B
	AAtrex	4 lb/gal	5	1 qt/a	EPOST	B
	NIS			.25% v/v	EPOST	B
	AMS			2.5% v/	EPOST	B

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
14	Resicore	3.29 lb/gal	4, 15, 27	2.25 qt/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	1 qt/a	EPOST	B
	AMS				EPOST	B
15	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	EPOST	B
	Destiny HC (COC)			.5% v/v	EPOST	B
	AMS			2.5% v/v	EPOST	B
16	Harness Xtra	6 lb/gal	5, 15	1.5 qt/a	PRE	A
	Halex GT	4.39 lb/gal	9, 15, 27	1.8 qt/a	POST	C
	Status	56% w/w	4, 19	3 oz/a	POST	C
	NIS			.25% v/v	POST	C
	AMS			2.5% v/v	POST	C

Adjuvants: AMS = Amsol; NIS = Induce

Trial Summary:

This trial evaluated the weed control and crop safety of common corn herbicides applied early postemergence. Corn injury was observed at 7 and 14 days after the EPOST application (Figure 4). Injury symptoms depended on the herbicide treatment and consisted of leaf necrosis, leaf chlorosis, and corn leaning. Leaning was rated as the percentage of plants leaning greater than 45 degrees from perpendicular to the ground. There was no visible injury at the later rating dates. Control of common lambsquarters, redroot pigweed, and velvetleaf exceeded 90, 93, and 92%, respectively, at 59 days after the EPOST application (data not shown). The average control of giant ragweed ranged from 86 to 98% at 14 days and 89 to 100% at 59 days after the EPOST application (Figure 2). Grass control ranged from 77 to 93% at 59 days after treatment for the EPOST applications (Figure 3). The PRE + POST treatment (16) had 100% grass control at the 59 DAT rating. Corn yield did not differ among the herbicide treatments (data not shown). Yield across all herbicide treatments was 246 bu/acre, while the untreated check was 38 bu/acre, an 85% reduction.

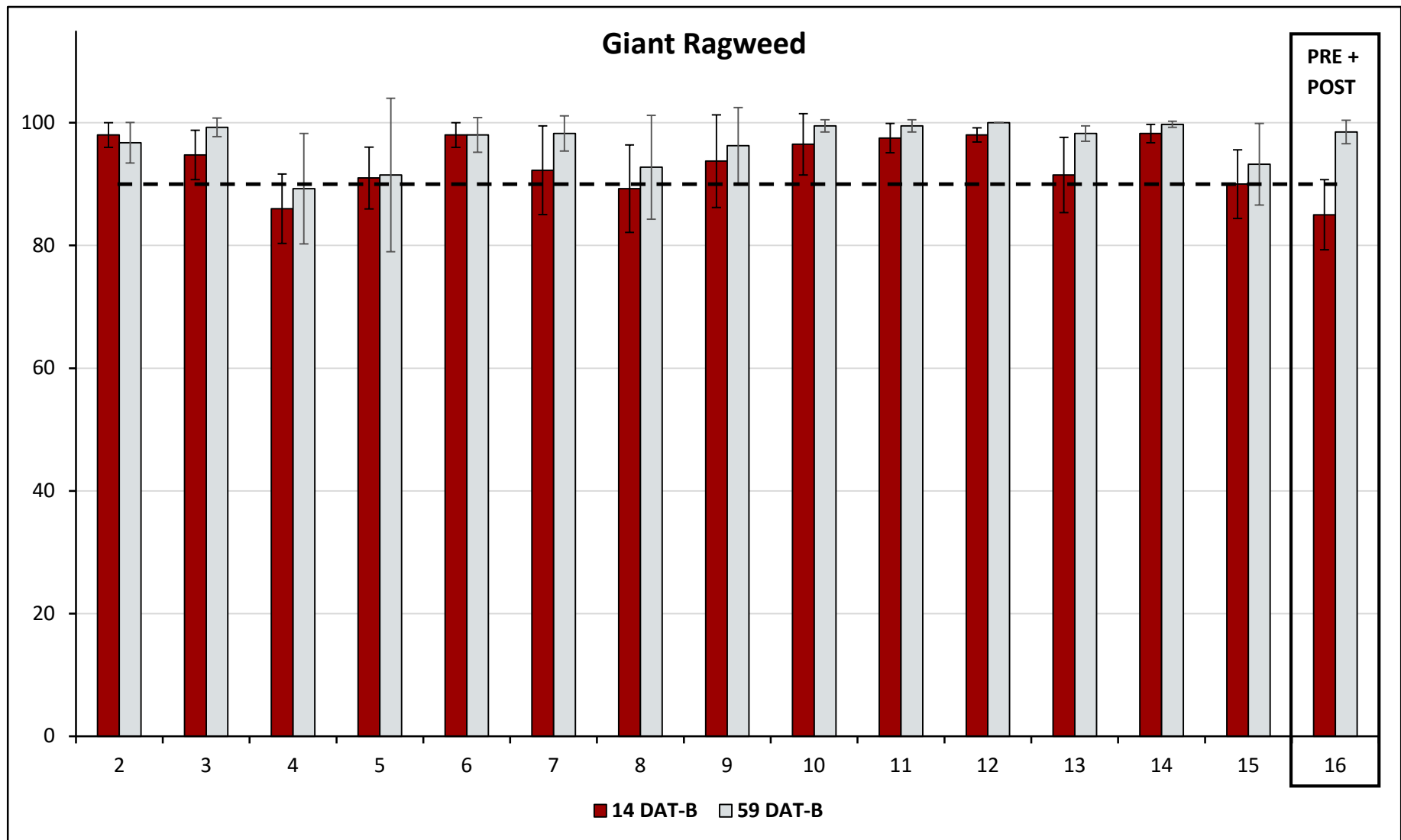


Figure 2. Giant ragweed efficacy ratings for trial #18-ROK-CN02. Bars indicate the average % control \pm the standard deviation of four replications following EPOST and PRE + POST herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

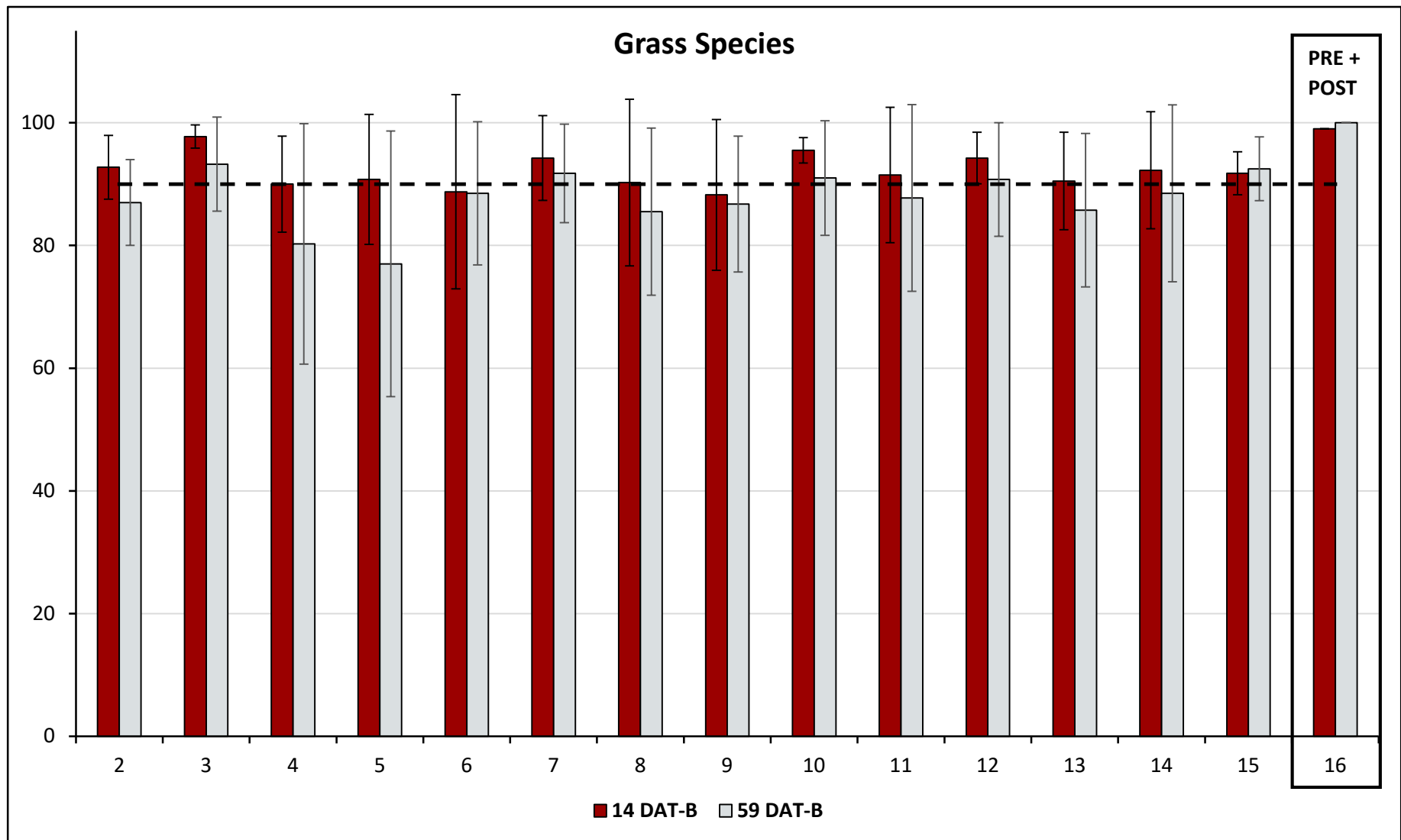


Figure 3. Grass species ratings for trial #18-ROK-CN02. Bars indicate the average % control ± the standard deviation of four replications following EPOST and PRE + POST herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

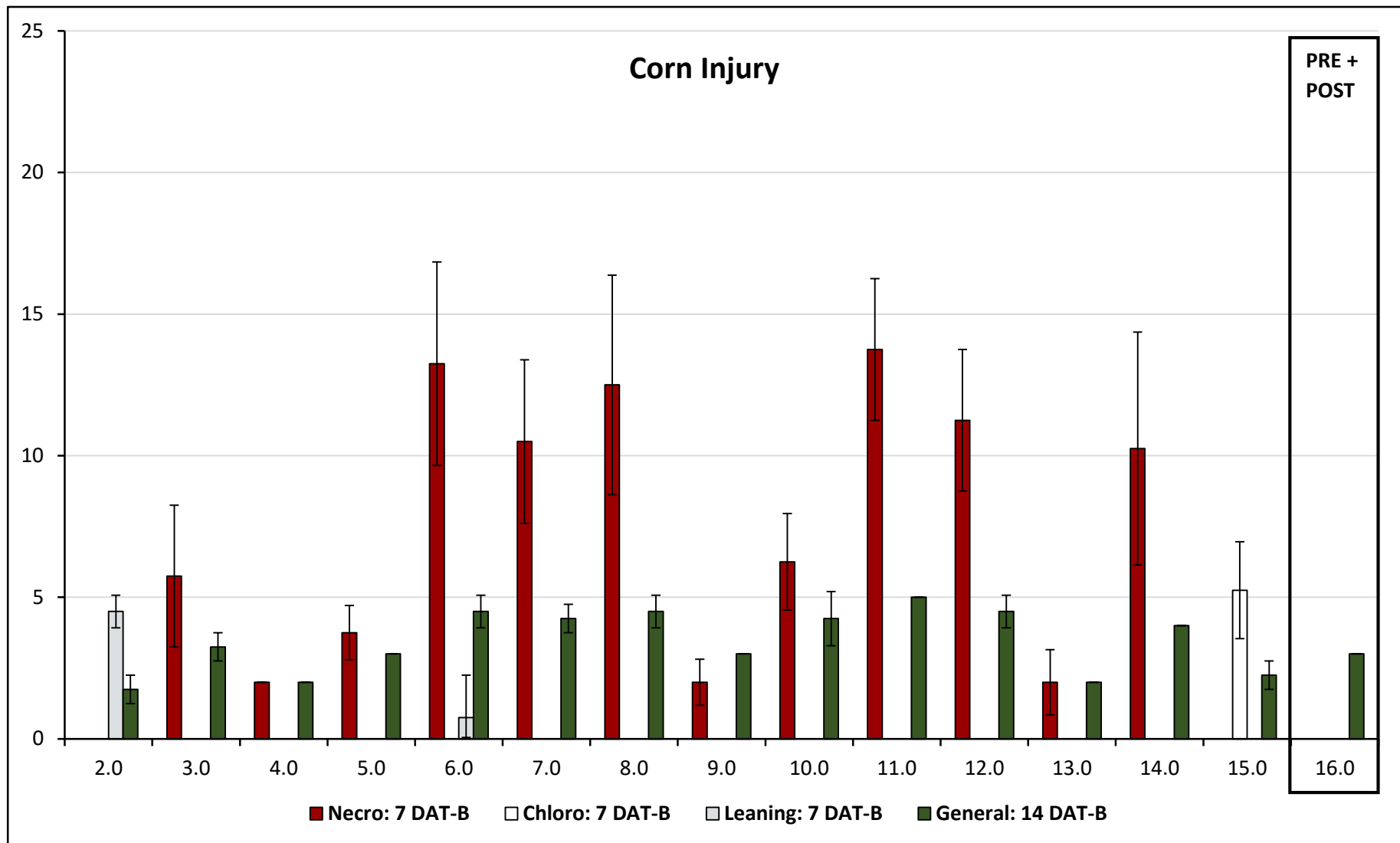


Figure 4. Corn injury ratings for trial #18-ROK-CN02. Bars indicate the average % corn injury ± the standard deviation of four replications at 7 and 14 days after the EPOST application. A general crop injury rating was performed at 14 DAT. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. Abbreviations: necro=necrosis; chloro=chlorosis.

Project Goal: Evaluate various herbicide programs for season long-weed control.

Site Description:

Location: Janesville, WI	Crop: Corn
Field #: 1	Variety: DKC 54-38 RIB
Soil type: Plano silt loam	Planting Date: 5/8
% OM: 3.5	Emergence Date: 5/20
pH: 6.4	Population: 34,000 seeds/acre
Fertilization: 200 lbs N/acre	Depth: 2 in
Previous crop: Soybean	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 30 ft
Weed species: giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), barnyardgrass (ECHCG)	

Herbicide Application Information:

Date:	5/8	6/5
Treatment:	PRE (A)	EPOST (B)
Air Temp (°F):	74	71
2" Soil Temp (°F):	65	73
Soil moisture [surface]:	Moist	Moist
RH %:	36.6	70.3
Cloud cover %	20	5
Wind speed (mph)/direction	4-6/SE	5-7/NE
Rainfall (in) 1 wk after APP:	2.45	1.81
GPA:	15	15
PSI:	16	21
Nozzle:	XR 11002	TTI 110015
Nozzle spacing (in):	15	15
Boom Height (in):	20	24

Crop and weed information at application:

	Date:	5/8	6/5
Crop	Height (in):	-	8
	Stage:	-	V4
AMBTR	Height (in):	-	2-6
	Density:	-	0-3/ft ²
ABUTH	Height (in):	-	2
	Density:	-	0-1/ft ²
CHEAL	Height (in):	-	1
	Density:	-	<1/ft ²
Grass	Height (in):	-	-
	Density:	-	-

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Tripleflex II	4.25 lba/gal	2, 4, 15	1 qt/a	PRE	A
	Harness Max	3.85 lba/gal	15, 27	40 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
2	Harness Xtra 5.6 L	5.6 lb/gal	5, 15	1.75 qt/a	PRE	A
	Harness Max	3.85 lba/gal	15, 27	40 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			2.5 % v/v	POST	B
3	Harness Xtra	6 lb/gal	5, 15	1.5 qt/a	PRE	A
	Harness Max	3.85 lba/gal	15, 27	40 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			2.5 % v/v	POST	B
4	Degree Xtra	4.04 lb/gal	5, 15	2.25 qt/a	PRE	A
	Harness Max	3.85 lba/gal	15, 27	40 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			2.5 % v/v	POST	B
5	Harness Max	3.85 lb/gal	15, 27	64 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	1 qt/a	PRE	A
	Diflexx	4 lb/gal	4	16 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	Intact			0.5 % v/v	POST	B
6	Harness Max	3.85 lba/gal	15, 27	75 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	1 qt/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			2.5 % v/v	POST	B
7	Acuron	3.44 lba/gal	5, 15, 27	48 fl oz/a	PRE	A
	Halex GT	4.389 lba/gal	9, 15, 27	58 fl oz/a	POST	B
	NIS Surfactant			0.25% v/v	POST	B
	AMS			2.5 % v/v	POST	B
8	Bicep II Magnum	5.5 lb/gal	5, 15	56 fl oz/a	PRE	A
	Halex GT	4.389 lb/gal	9, 15, 27	58 fl oz/a	POST	B
	NIS Surfactant			0.25% v/v	POST	B
	AMS			2.5 % v/v	POST	B
9	Lexar EZ	3.704 lba/gal	5, 15, 27	1.5 qt/a	PRE	A
	Halex GT	4.389 lba/gal	9, 15, 27	1.8 qt/a	POST	B
	NIS Surfactant			0.25% v/v	POST	B
	AMS			2.5 % v/v	POST	B
10	Keystone NXT	5.6 lba/gal	5, 15	1.75 qt/a	PRE	A
	Resicore	3.35 lba/gal	4, 15, 27	1.25 qt/a	POST	B
	Durango DMA	4 lbae/gal	9	36 fl oz/a	POST	B
	AMS			2.5 % v/v	POST	B

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
11	Surestart II	4.25 lba/gal	2, 4, 15	1 qt/a	PRE	A
	Resicore	3.35 lba/gal	4, 15, 27	2.5 qt/a	POST	B
	Durango DMA	4 lbae/gal	9	36 fl oz/a	POST	B
	AMS			2.5 % v/v	POST	B
12	Resicore	3.35 lba/gal	4, 15, 27	2.5 qt/a	PRE	A
	AAtrex	4 lb/gal	5	1 qt/a	PRE	A
	Durango DMA	4 lbae/gal	9	36 fl oz/a	POST	B
	AMS			2.5 % v/v	POST	B
13	Armezon Pro	5.35 lb/gal	15, 27	20 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	1 qt/a	PRE	A
	Status	56% ae w/w	4, 19	5 oz wt/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			2.5 % v/v	POST	B
14	Harness Xtra 5.6 L	5.6 lb/gal	5, 15	1.75 qt/a	PRE	A
	Balance Flexx	2 lb/gal	27	3 fl oz/a	PRE	A
	Diflexx	4 lb/gal	4	16 fl oz/a	POST	B
	Roundup PowerMax	4.5 lb/gal	9	32 fl oz/a	POST	B
	AMS			2.5 % v/v	POST	B
15	Corvus	2.63 lb/gal	2, 27	5.6 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	1 qt/a	PRE	A
	Diflexx	4 lb/gal	4	16 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			2.5 % v/v	POST	B
16	Check					

Adjuvants: AMS = Amsol; NIS = Induce

Trial Summary:

This trial evaluated the weed control and crop safety of sequential herbicide applications (PRE + POST). Corn injury was observed at 3 and 14 days after the EPOST application (Figure 6). Injury symptoms depended on the herbicide treatment and consisted of leaf necrosis and corn leaning. Leaning was rated as the percentage of plants leaning greater than 45 degrees from perpendicular to the ground. There was no visible injury at the later rating dates. Control of common lambsquarters and all grass species exceeded 97% at all rating dates (data not shown). The average control of giant ragweed by the PRE herbicides ranged from 51 to 98% at 28 days after treatment. However, following the POST applications giant ragweed control exceeded 92 and 98% at 14 and 55 days after treatment, respectively (Figure 5). In general, the PRE treatments containing a group 27 herbicide (HPPD inhibitor) performed better than those without. The average giant ragweed control of all PRE treatment without a group 27 was 67% vs 82% control of PRE treatments that contained a group 27. All POST treatments were effective at controlling giant ragweed plants present at the time of application. Corn yield did not differ among the herbicide treatments (data not shown). Yield across all herbicide treatments was 246 bu/acre, while the untreated check was 106 bu/acre, a 57% reduction.

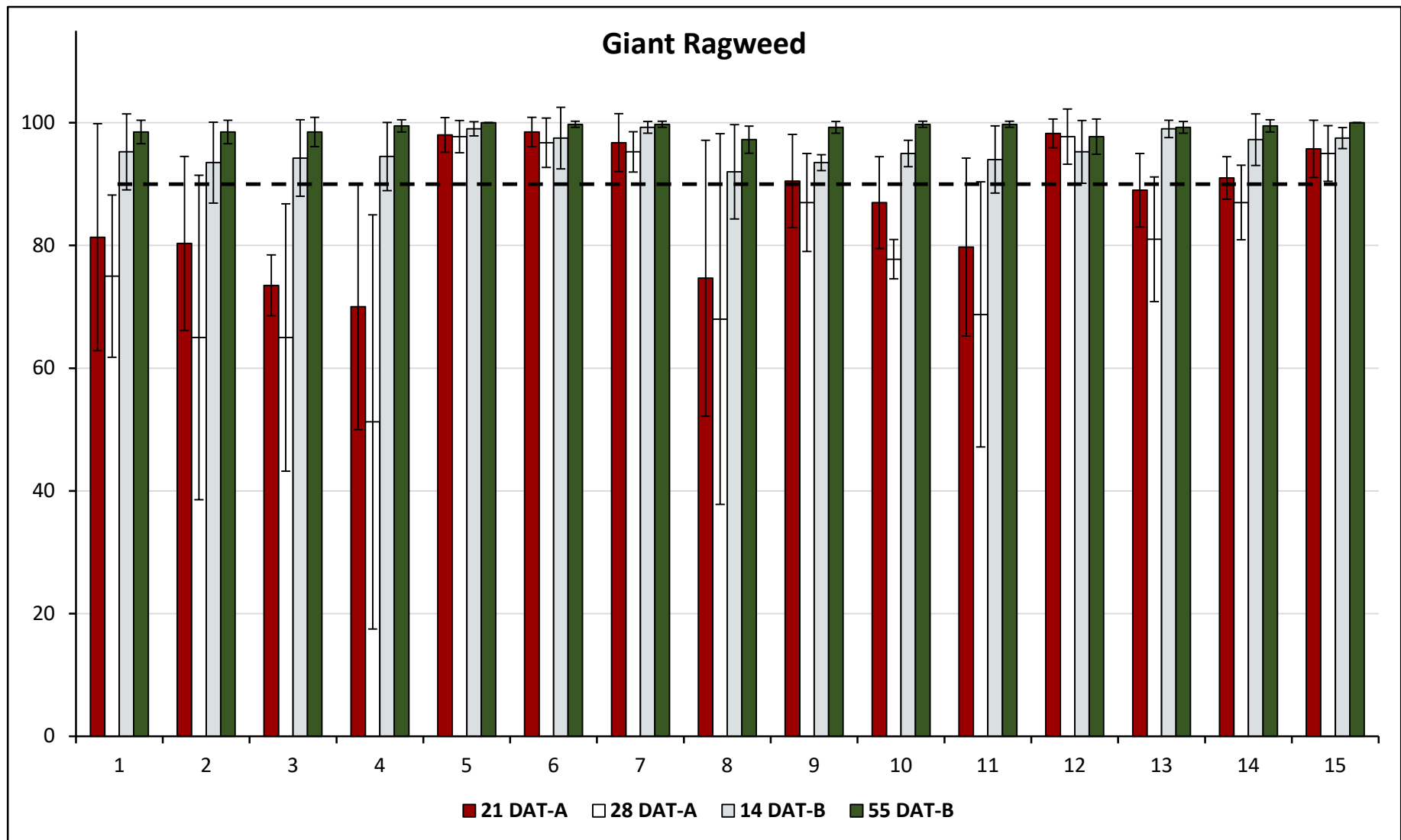


Figure 5. Giant ragweed efficacy ratings for trial #18-ROK-CN03. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

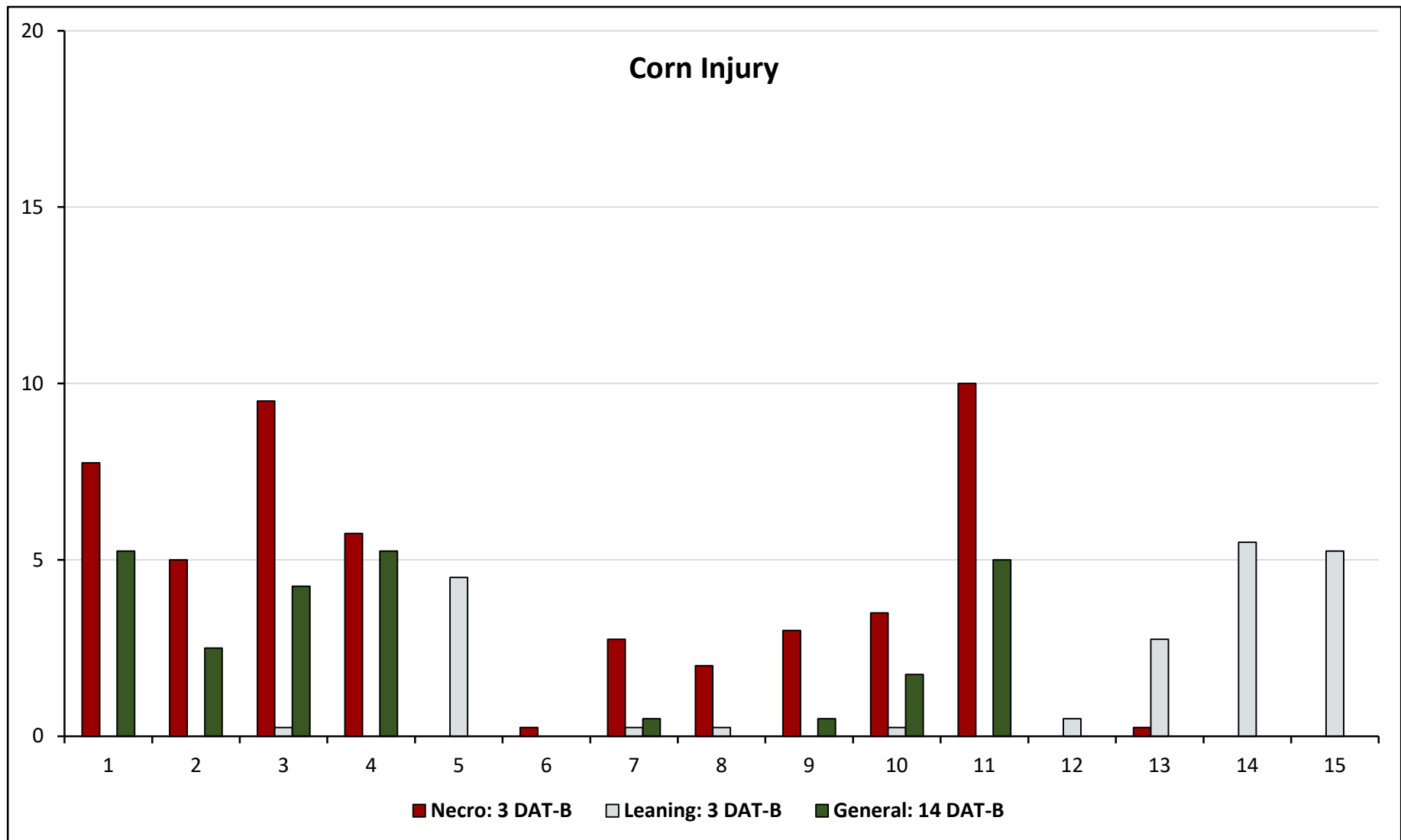


Figure 6. Corn injury ratings for trial #18-ROK-CN03. Bars indicate the average % corn injury \pm the standard deviation of four replications at 3 and 14 days after the POST application. A general crop injury rating was performed at 14 DAT. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. Abbreviations: necro=necrosis.

Project Goal: Compare Anthem Maxx with different tankmix partners in 1- and 2-pass herbicide programs to similar competitor multiple mode of action premixes.

Site Description:

Location: Janesville, WI	Crop: Corn
Field #: 2	Variety: DKC 54-38 RIB
Soil type: Plano silt loam	Planting Date: 5/8
% OM: 3.5	Emergence Date: 5/20
pH: 6.7	Population: 34,000 seeds/acre
Fertilization: 200 lbs N/acre	Depth: 2 in
Previous crop: Soybean	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 30 ft
Weed species: giant ragweed (AMBTR), common lambsquarters (CHEAL), redroot pigweed (AMARE), giant foxtail (SETFA), barnyardgrass (ECHCG)	

Herbicide Application Information:

	Date: 5/8	6/1	6/5
Treatment:	PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):	74	71	71
2" Soil Temp (°F):	65	80	73
Soil moisture [surface]:	Moist	Moist	Moist
RH %:	37	73	70
Cloud cover %	20	5	5
Wind speed (mph)/direction	5/SE	8/NE	6/NE
Rainfall (in) 1 wk after APP:	2.45	0.37	1.81
GPA:	15	15	15
PSI:	16	21	21
Nozzle:	XR11002	TTI 110015	TTI 110015
Nozzle spacing (in):	15	15	15
Boom Height (in):	20	24	24

Crop and weed information at application:

	Date: 5/8	6/1	6/5	
Crop	Height (in):	-	7	8
	Stage:	-	V3-V4	V4
AMBTR	Height (in):	-	4	4
	Density:	-	1-5/ft ²	.5-2/ft ²
AMARE	Height (in):	-	2	-
	Density:	-	2-3/ft ²	-
CHEAL	Height (in):	-	2	1
	Density:	-	10-20/ft ²	0-2/ft ²
Grass	Height (in):	-	3	2
	Density:	-	2-30/ft ²	0-1/ft ²

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Anthem Maxx	4.3 lba/gal	14, 15	4 floz/a	PRE	A
	Solstice	4 lba/gal	14, 27	2.5 fl oz/a	POST	C
	AAtrex	4 lba/gal	5	1 pt/a	POST	C
	Roundup PowerMax	4.5 lbae/gal	9	22 fl oz/a	POST	C
	COC			1 % v/v	POST	C
	AMS			8.5 lb/100 gal	POST	C
3	Anthem Maxx	4.3 lba/gal	14, 15	4 fl oz/a	PRE	A
	Callisto	4 lba/gal	27	6 fl oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	22 fl oz/a	POST	C
	AMS			8.5 lb/100 gal	POST	C
4	Anthem Maxx	4.3 lba/gal	14, 15	4 fl oz/a	PRE	A
	Balance Flexx	4 lba/gal	27	3 fl oz/a	PRE	A
	Roundup PowerMax	4.5 lba/gal	9	22 fl oz/a	POST	C
	AMS			8.5 lb/100 gal	POST	C
5	Anthem Maxx	4.3 lba/gal	14, 15	4 fl oz/a	PRE	A
	Status	56 % ae w/w	4, 19	3 oz/a	POST	C
	AAtrex	4 lba/gal	5	1 pt/a	POST	C
	Roundup PowerMax	4.5 lba/gal	9	22 fl oz/a	POST	C
	COC			1 % v/v	POST	C
	AMS			8.5 lb/100 gal	POST	C
6	Anthem Maxx	4.3 lba/gal	14, 15	4 fl oz/a	PRE	A
	Callisto	4 lba/gal	27	6 fl oz/a	PRE	A
7	Anthem Maxx	4.3 lba/gal	14, 15	4 fl oz/a	PRE	A
	Balance Flexx	2 lba/gal	27	3 fl oz/a	PRE	A
8	Corvus	2.63 lba/gal	2, 27	5.6 fl oz/a	PRE	A
9	Acuron	3.44 lba/gal	5, 15, 27	2.5 qt/a	PRE	A
10	Resicore	3.29 lba/gal	4, 15, 27	2.5 qt/a	PRE	A
11	Verdict	5.57 lba/gal	14, 15	16 fl oz/a	PRE	A
12	Anthem Maxx	4.3 lba/gal	14, 15	3 fl oz/a	EPOST	B
	Callisto	4 lba/gal	27	3 fl oz/a	EPOST	B
	AAtrex	4 lba/gal	5	2 pt/a	EPOST	B
	Roundup PowerMax	4.5 lba/gal	9	22 fl oz/a	EPOST	B
	NIS			0.25 % v/v	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
13	Halex GT	4.39 lba/gal	9, 15, 27	3.6 pt/a	EPOST	B
	AAtrex	4 lba/gal	5	2 pt/a	EPOST	B
	NIS			0.25 % v/v	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
14	Acuron Flexi	3.26 lba/gal	15, 27	2 qt/a	EPOST	B
	AAtrex	4 lba/gal	5	2 qt/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	22 fl oz/a	EPOST	B
	COC			1 % v/v	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
15	Anthem Maxx	4.3 lba/gal	14, 15	2.5 fl oz/a	EPOST	B
	Callisto	4 lba/gal	27	3 fl oz/a	EPOST	B
	AAtrex	4 lba/gal	5	2 pt/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	22 fl oz/a	EPOST	B
	NIS			0.25 % v/v	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B

Adjuvants: NIS=ChemSurf 90; COC=Agri-Dex

Trial Summary:

This trial compared PRE only, EPOST only, and PRE + POST herbicide programs. Leaf necrosis was observed at 4 and 14 days after the EPOST application (Figure 9). None of the PRE only or PRE + POST herbicide treatments showed any injury at any of the rating timings. Control of redroot pigweed exceeded 92% at all rating dates (data not shown). Grass control at the final rating (8/8) was greater than 86% for all treatments (data not shown). The EPOST treatments had slightly lower control ratings on average (90%) when compared to all other treatments (98%). This was likely due to a reduction in herbicide interception due to a denser giant ragweed canopy in the EPOST treatments at the time of application. Common lambsquarters control was below 90% for both the Anthem Maxx alone PRE treatments at the 6/5 rating. After the POST application were made, control was greater than 90% for all treatments (Figure 8). Giant ragweed control varied among the treatments (Figure 7). While some of the PRE herbicide combinations provided good weed control early in the season, all PRE only treatments failed to provide adequate season long giant ragweed control. In contrast, almost all the PRE + POST and EPOST herbicide programs provided >90% control at the final rating (8/8). Corn yield varied considerably throughout the trial, thus we were unable to detect any statistical differences even though there were differences in weed control. Yields of the various herbicide programs were as follows: untreated check = 15 bu/acre, PRE only = 149 bu/acre, EPOST = 193 bu/acre, PRE + POST = 206 bu/acre.

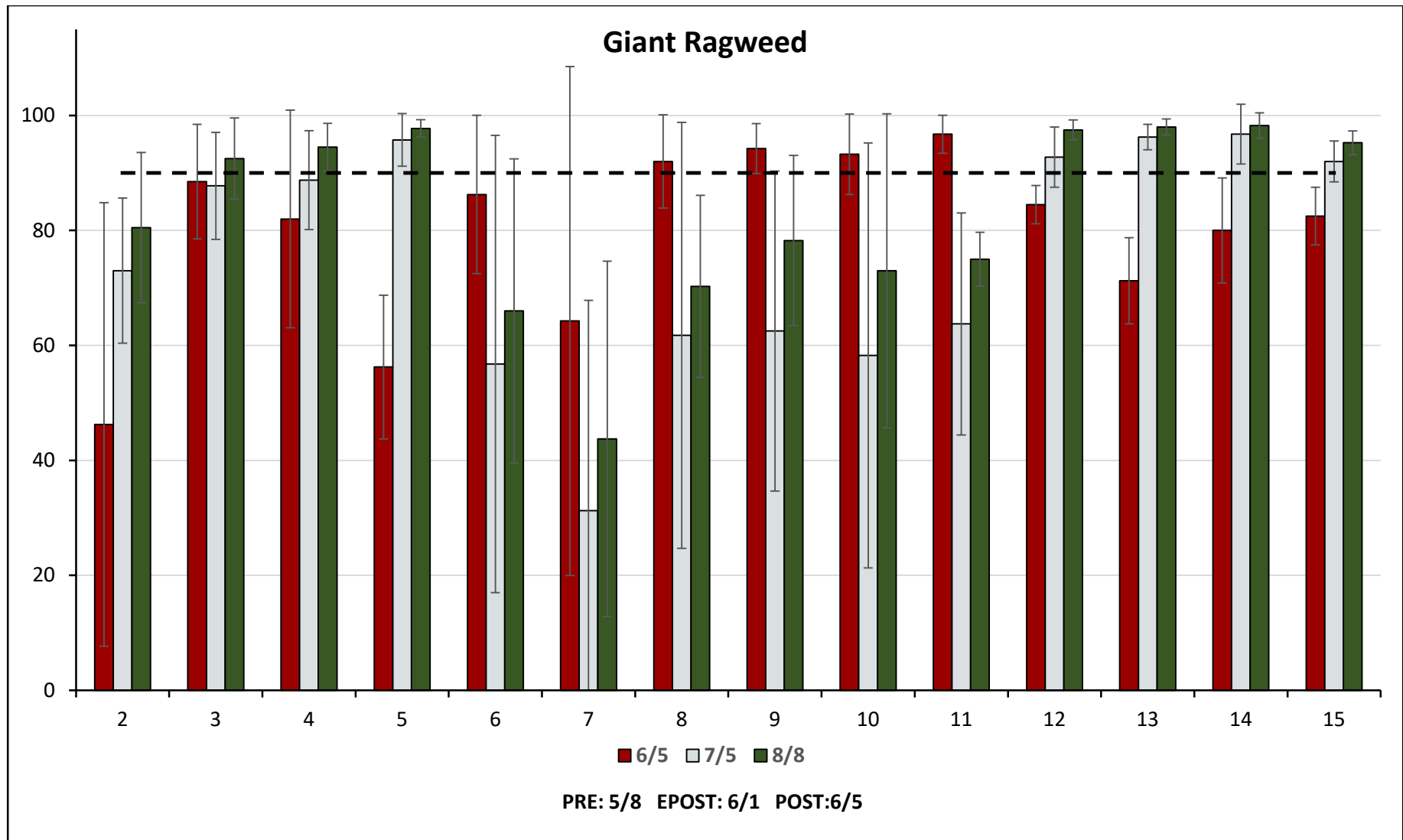


Figure 7. Giant ragweed efficacy ratings for trial #18-ROK-CN04. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. Treatments are grouped according to application timing. The dashed line indicates 90% control.

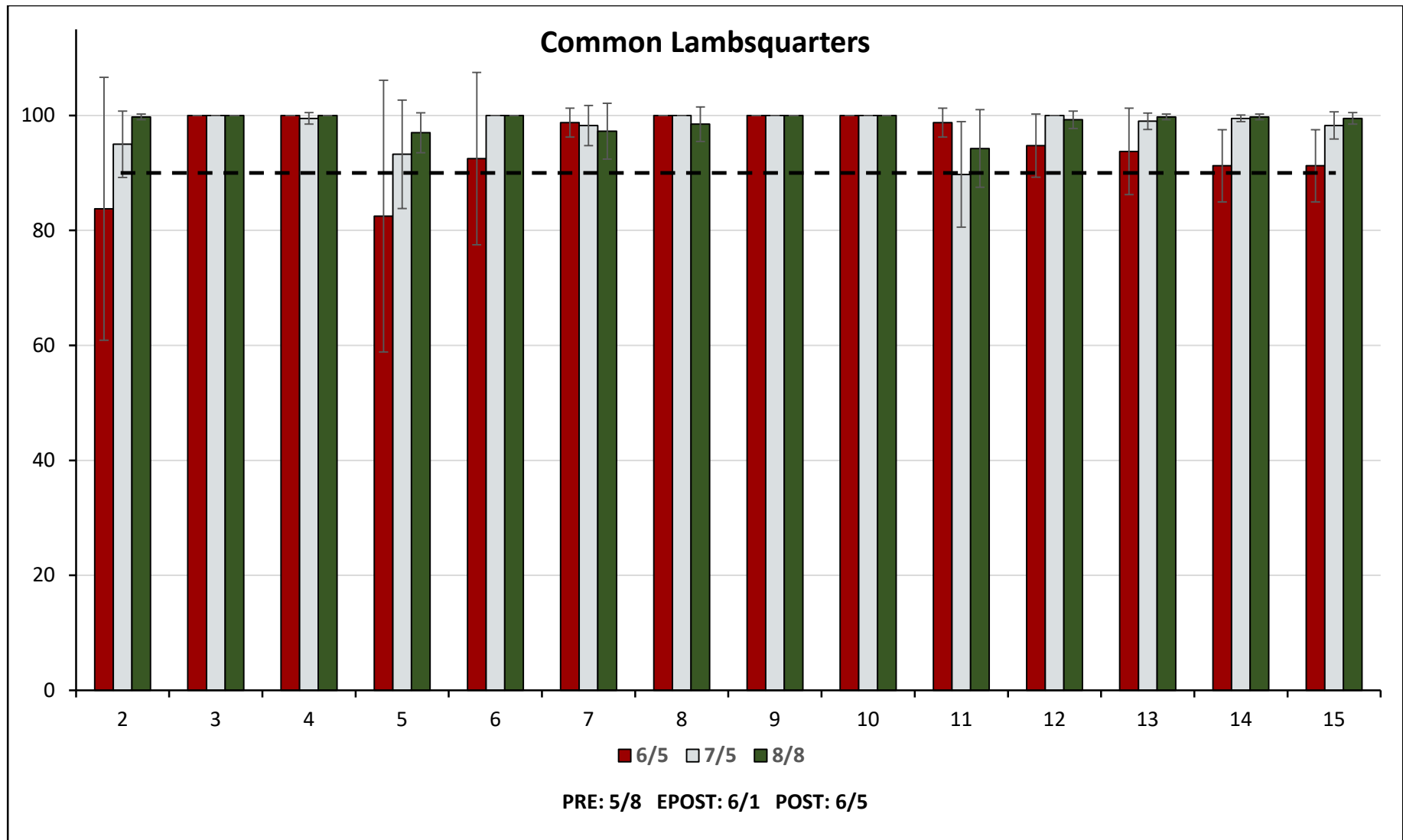


Figure 8. Common lambsquarters efficacy ratings for trial #18-ROK-CN04. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. Treatments are grouped according to application timing. The dashed line indicates 90% control.

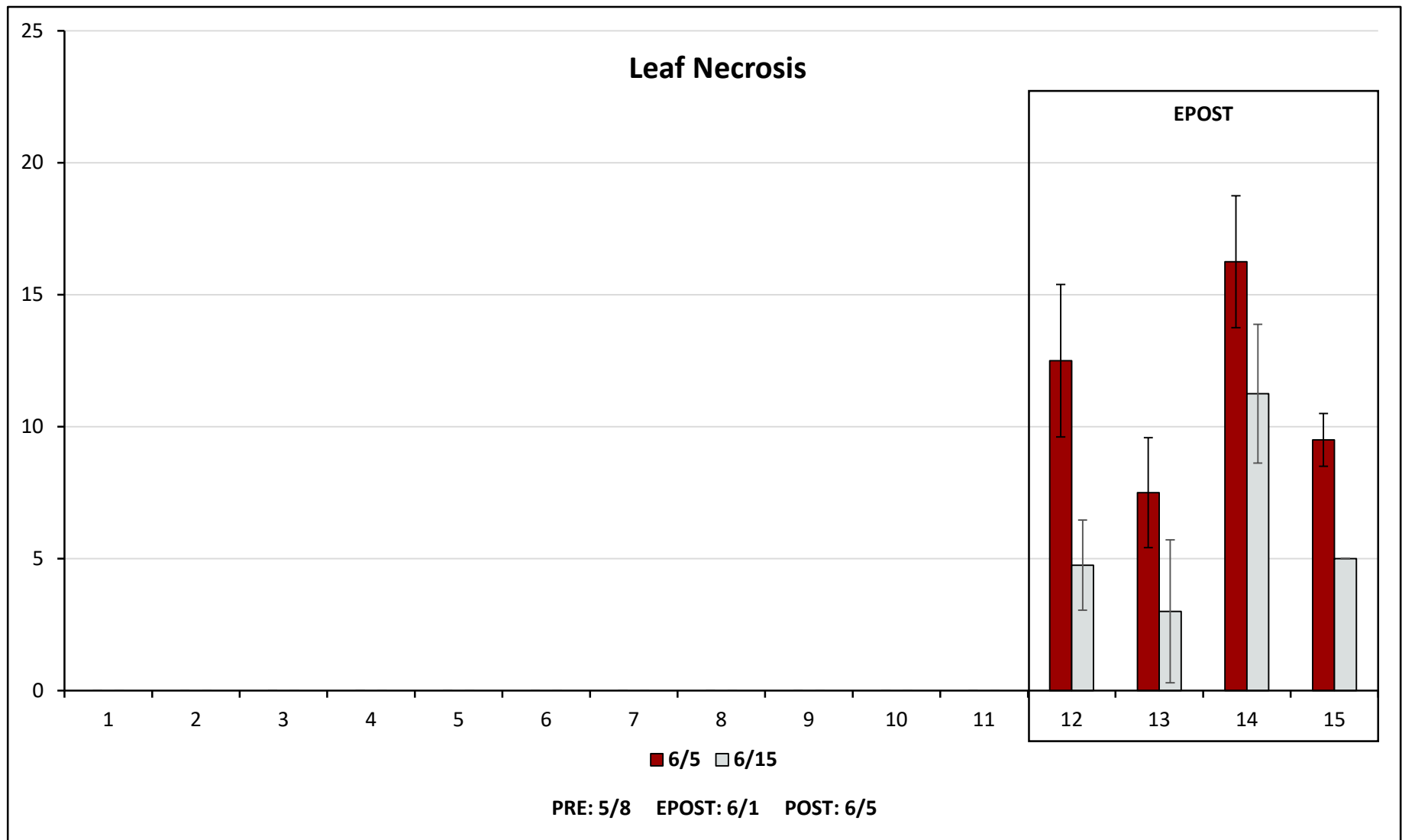


Figure 9. Corn injury ratings for trial #18-ROK-CN04. Bars indicate the average % leaf necrosis \pm the standard deviation of four replications on 6/5 and 6/15, 4 and 14 days after EPOST application, respectively. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number.

Project Goal: Compare the efficacy and crop safety of Diflexx Duo applied POST to similar competitor products in the market.

Site Description:

Location:	Janesville, WI	Crop:	Corn
Field #:	0	Variety:	Pioneer P0339
Soil type:	Plano silt loam	Planting Date:	5/8
% OM:	3.5	Emergence Date:	5/20
pH:	6.4	Population:	34,000 seeds/acre
Fertilization:	200 lb N/acre	Depth:	2 in
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	conventional	Plot Size:	10 x 30 ft
Weed species:	giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), barnyardgrass (ECHCG)		

Herbicide Application Information:

	Date:	5/10	6/1	6/9
Treatment:		PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):		66	71	75
2" Soil Temp (°F):		68	80	76
Soil moisture [surface]:		Wet	Moist	Wet
RH %:		63	73	80
Cloud cover %		90	5	15
Wind speed (mph)/direction		5/NNW	8/NE	1/NE
Rainfall (in) 1 wk after APP:		1.61	0.37	1.96
GPA:		15	15	15
PSI:		16	21	21
Nozzle:		XR 11002	TTI 110015	TTI 110015
Nozzle spacing (in):		15	15	15
Boom Height (in):		20	24	24

Crop and weed information at application:

	Date:	5/10	6/1	6/9
Crop	Height (in):	-	6	10
	Stage:	-	V3	V5
AMBTR	Height (in):	-	2-6	2-6
	Density:	-	0.25-10/m ²	sparse
ABUTH	Height (in):	-	1-2	-
	Density:	-	5-40/m ²	-
CHEAL	Height (in):	-	0.5-2	-
	Density:	-	11-40/m ²	-
Grass	Height (in):	-	2	-
	Density:	-	0-1/ft ²	-

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Diflexx Duo	2.13 lb/gal	4, 27	32 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	16 fl oz/a	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
3	Diflexx Duo	2.13 lb/gal	4, 27	24 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	16 fl oz/a	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
4	Diflexx Duo	2.13 lb/gal	4, 27	24 fl oz/a	EPOST	B
	Liberty 280	2.34 lb/gal	10	32 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	16 fl oz/a	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
5	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	16 fl oz/a	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
6	Halex GT	4.27 lb/gal	9, 15, 27	57.6 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	16 fl oz/a	EPOST	B
	NIS			0.25 % v/v	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
7	Armezon Pro	5.35 lb/gal	15, 27	16 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	16 fl oz/a	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
8	Armezon	2.8 lb/gal	27	0.5717 fl oz/a	EPOST	B
	Status	56% ae w/w	4, 19	3 oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	16 fl oz/a	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
9	Callisto	4 lb/gal	27	3 fl oz/a	EPOST	B
	Anthem Maxx	4.3 lb/gal	14, 15	3.2 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	16 fl oz/a	EPOST	B
	NIS			0.25 % v/v	EPOST	B
	AMS			8.5 lb ai/100 gal	EPOST	B
10	Resicore	3.29 lb/gal	4, 15, 27	1.5 qt/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
11	Corvus	2.63 lba/ga	2, 27	4 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	24 fl oz/a	PRE	A
	Diflexx Duo	2.13 lb/gal	4, 27	24 fl oz/a	POST	C
	Roundup PowerMax	4.5 lbae/gal	9	28 fl oz/a	POST	C
	AMS			8.5 lb/100 gal	POST	C

Adjuvants: NIS=Induce

Trial Summary:

This trial compared the weed control and crop safety of Diflexx Duo applied POST to similar competitor products in the market. Leaf necrosis was observed 7 after the EPOST application (Figure 11). Injury was less than 5% on 6/15 (14 DAT-B) and 0% by 6/29 (28 DAT-B) for all treatments (data not shown). Control of giant ragweed, common lambsquarters, and all grass species exceeded 90, 90, and 95%, respectively, at both ratings (data not shown). The average control of velvetleaf ranged from 87 to 99% at 14 days and 89 to 100% at 28 days after the EPOST application (Figure 10). Grain yield did not differ significantly among herbicide treatments as all treatments were effective at controlling weeds (data not shown). Yield of the untreated check was reduced by 56% when compared to the average across all herbicide treatments (108 bu/acre vs 246 bu/acre).

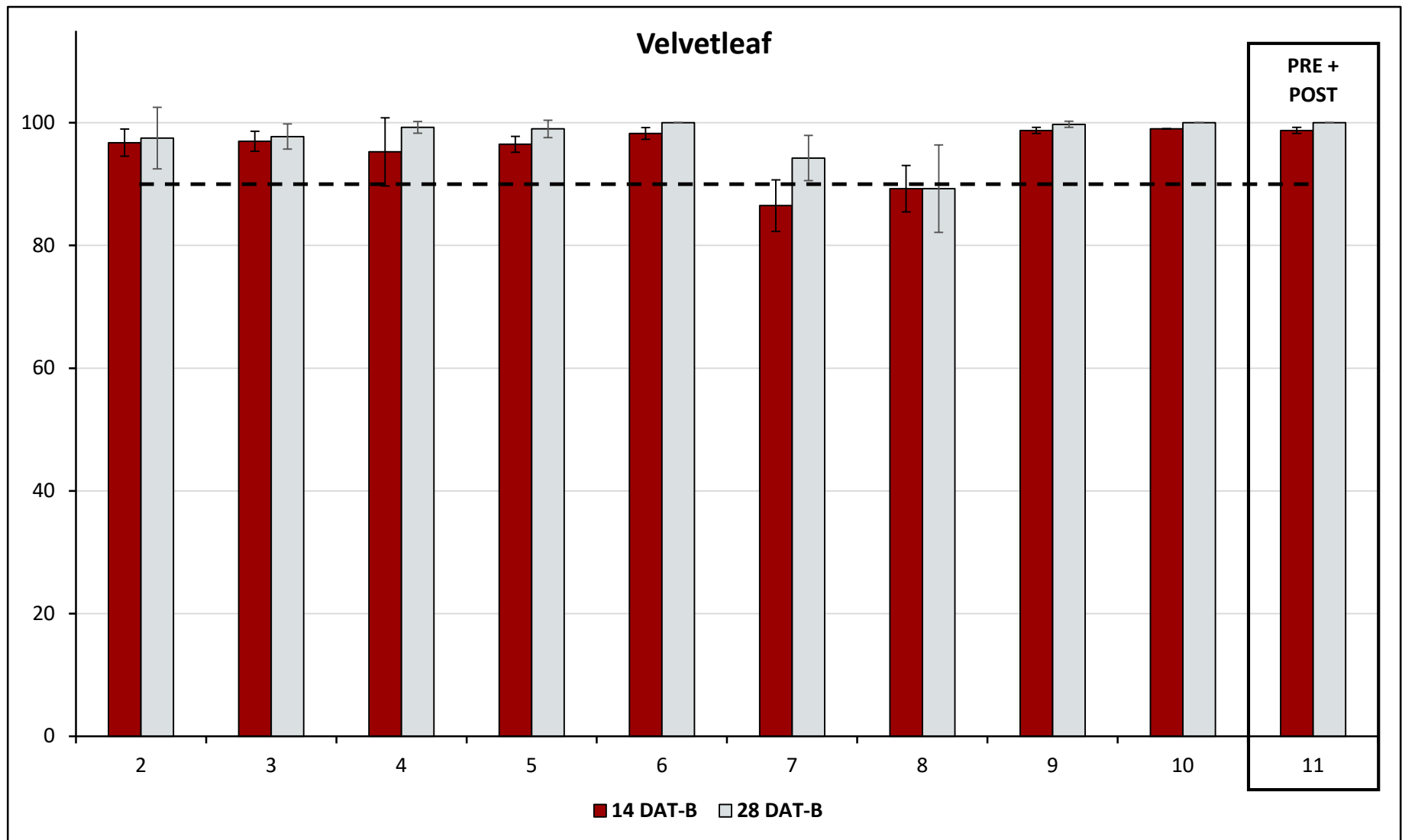


Figure 10. Velvetleaf efficacy ratings for trial #18-ROK-CN06. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Ratings for treatment 11 were 6 and 20 days after the POST (C) application. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

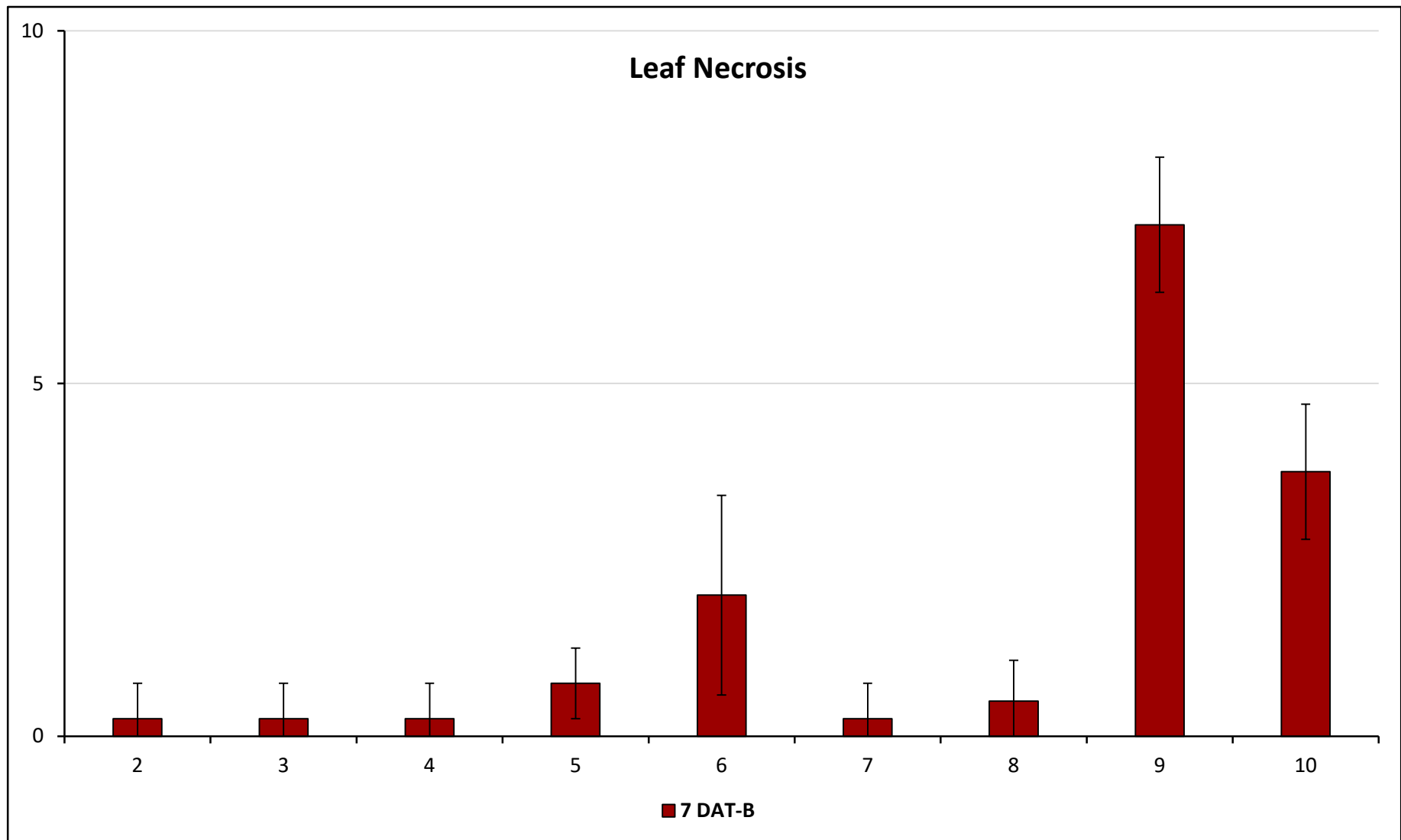


Figure 11. Corn injury ratings for trial #18-ROK-CN06. Bars indicate the average % leaf necrosis \pm the standard deviation of four replications on 6/8. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number.

Project Goal: Evaluate various herbicide programs for season long-weed control.

Site Description:

Location: Janesville, WI	Crop: Corn
Field #: 6	Variety: G01P52-3011A
Soil type: Plano silt loam	Planting Date: 5/25
% OM: 3.2	Emergence Date: 6/1
pH: 6.5	Population: 35,000 seeds/acre
Fertilization: 200 lbs N/acre	Depth: 2 in
Previous crop: Corn	Row spacing: 30 in
Tillage: Conventional	Plot Size: 10 x 30 ft
Weed species: giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), redroot pigweed (AMARE), giant foxtail (SETFA), green foxtail (SETVI), barnyardgrass (ECHCG)	

Herbicide Application Information:

Date:	5/25	6/12	6/15
Treatment:	PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):	88	73	72
2" Soil Temp (°F):	82	71	68
Soil moisture [surface]:	Moist	Wet	Wet
RH %:	46	81	83
Cloud cover %	30	100	80
Wind speed (mph)/direction	4-8/S	1-3/NE	4-7/SE
Rainfall (in) 1 wk after APP:	0.45	3.55	3.71
GPA:	15	15	15
PSI:	19	21	19
Nozzle:	TTI 110015	TTI 110015	TTI 110015
Nozzle spacing (in):	15	15	15
Boom Height (in):	20	23	26

Crop and weed information at application:

	Date:	5/25	6/12	6/15
Crop	Height (in):	-	5	10
	Stage:	-	V3	V4
AMBTR	Height (in):	-	1-3	1-6
	Density:	-	8-70/m ²	2-75/m ²
ABUTH	Height (in):	-	0.5-2	-
	Density:	-	0-3/m ²	-
AMARE	Height (in):	-	0.25-1	-
	Density:	-	1-7/m ²	-
CHEAL	Height (in):	-	0.25-1	-
	Density:	-	2-12/m ²	-
Grass	Height (in):	-	0.5-2	1-3
	Density:	-	8-70/m ²	0-30/m ²

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Corvus	2.63 lb/gal	2, 27	4 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	24 fl oz/a	PRE	A
	Diflexx Duo	2.13 lb/gal	4, 27	26 fl oz/a	V4	C
	AAtrex	4 lb/gal	5	16 fl oz/a	V4	C
	Roundup PowerMax	4.5 lbae/gal	9	26 fl oz/a	V4	C
3	Balance Flexx	2 lb/gal	27	3 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	16 fl oz/a	PRE	A
	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	V4	C
	AAtrex	4 lb/gal	5	16 fl oz/a	V4	C
	Roundup PowerMax	4.5 lbae/gal	9	26 fl oz/a	V4	C
4	TripleFlex II	4.25 lb/gal	2, 14, 15	2.5 pt/a	PRE	A
5	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	16 fl oz/a	PRE	A
	Diflexx Duo	2.13 lb/gal	4, 27	28 fl oz/a	V4	C
	Roundup PowerMax	4.5 lbae/gal	9	26 fl oz/a	V4	C
6	Harness Max	3.85 lb/gal	15, 27	40 fl oz/a	PRE	A
	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	V4	C
	AAtrex	4 lb/gal	5	16 fl oz/a	V4	C
	Roundup PowerMax	4.5 lbae/gal	9	26 fl oz/a	V4	C
	MSO			1% v/v	V4	C
	AMS			1.5 lb/a	V4	C
7	Harness Max	3.85 lba/gal	15, 27	40 fl oz/a	PRE	A
	Diflexx Duo	2.13 lb/gal	2, 27	28 fl oz/a	V4	C
	Roundup PowerMax	4.5 lbae/gal	9	26 fl oz/a	V4	C
	AAtrex	4 lb/gal	5	16 fl oz/a	V4	C
8	Acuron	3.44 lb/gal	5, 15, 27	3 qt/a	PRE	A
9	Acuron	3.44 lb/gal	5, 15, 27	1.25 qt/a	PRE	A
	Halex GT	4.39 lb/gal	9, 15, 27	3.6 ot/a	V4	C
	AAtrex	4 lb/gal	5	1 pt/a	V4	C
	NIS			0.25 % v/v	V4	C
	AMS			8.5 lb/100 gal	V4	C
10	Acuron	3.44 lb/gal	5, 15, 27	1.5 qt/a	PRE	A
	Callisto Xtra	3.7 lb/gal	5, 27	24 fl oz/a	V4	C
	Roundup PowerMax	4.5 lbae/gal	9	26 fl oz/a	V4	C
	AMS	100 %		8.5 lb/100 gal	V4	C
11	Halex GT	4.39 lb/gal	9, 15, 27	3.6 pt/a	V3	B
	AAtrex	4 lb/gal	5	1.5 pt/a	V3	B
	NIS			0.25 % v/v	V3	B
	AMS			8.5 lb/100 gal	V3	B

Adjuvants: NIS=Induce; MSO=Premium MSO

Trial Summary:

This trial compared PRE only, EPOST only, and PRE + POST herbicide programs. Treatment 11 (EPOST) had an average 4% leaf necrosis on 6/15 (3 DAT). All other herbicide treatments did not cause corn injury symptoms (data not shown). Control of common lambsquarters, redroot pigweed, and velvetleaf was equal to or greater than 99% at all ratings (data not shown). None of the PRE herbicides were effective at controlling giant ragweed, % control less than 60% (Figure 12). Inadequate rainfall may have contributed to the overall poor PRE control, as only 0.45 in of rain fell within 1 week of application. Giant ragweed pressure was also very high which may have also led to the lower than expected control ratings. In general, POST giant ragweed was at acceptable levels, greater than 90%, 14 DAT-C. However, reduced control (77 to 95%) was observed in some treatments at 56 DAT (Figure 12). Grass control of the PRE herbicides evaluated ranged from 68 to 98% at 21 DAT-A (Figure 13). Grass control exhibited a similar response as the giant ragweed where control was initially good (>90%) at 14 DAT-C, but reduced for some treatments at the later rating. Grain yield was also impacted by herbicide treatment (Figure 14). Due to poor giant ragweed control, yield of the PRE only treatments was significantly lower than the EPOST and the PRE + POST programs. Yield of the untreated check was 28 bu/acre compared to an average yield of 181 bu/acre across all treatments with a POST herbicide application, an 85% reduction.

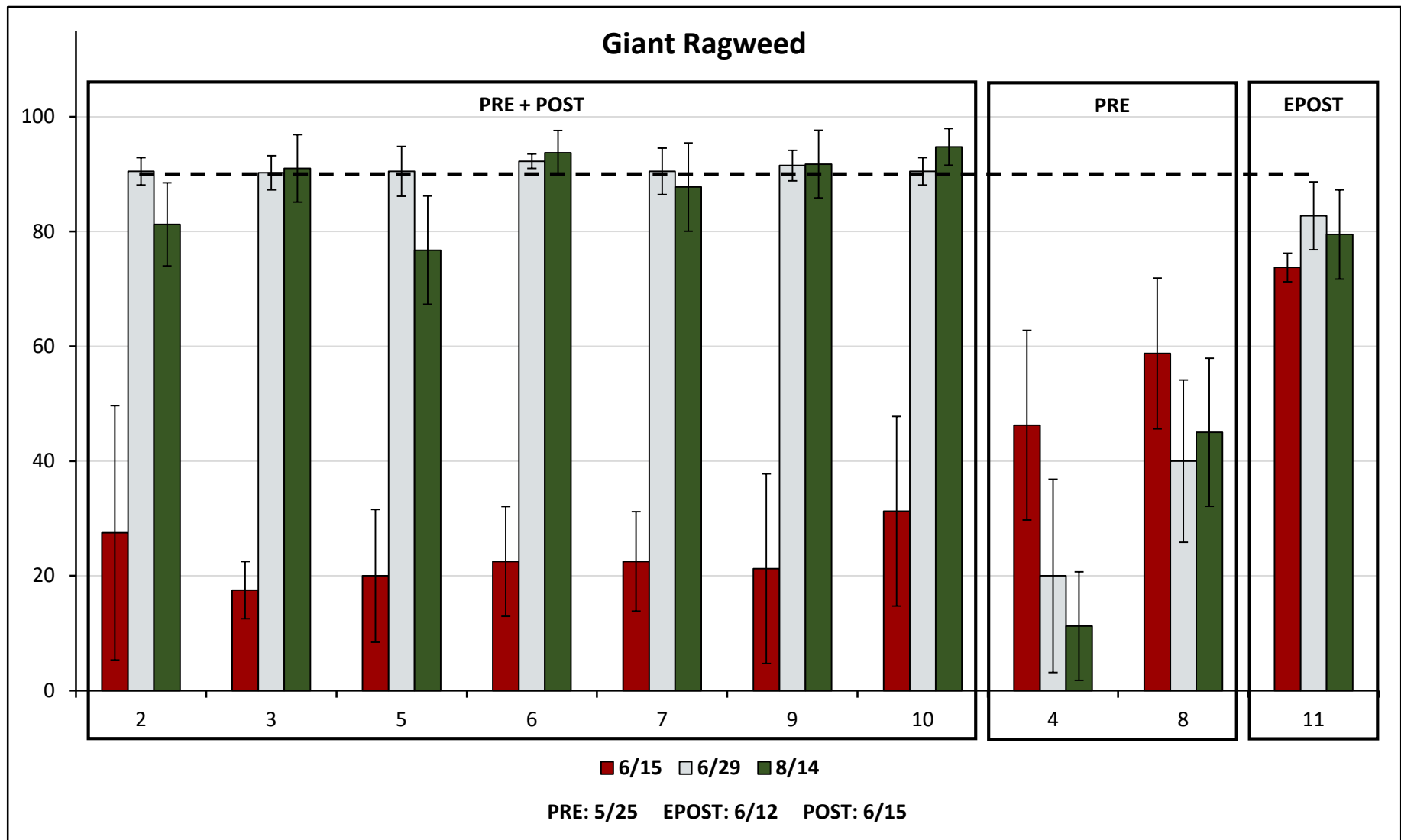


Figure 12. Giant ragweed efficacy ratings for trial #18-ROK-CN07. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. Treatments are grouped according to application timing. The dashed line indicates 90% control.

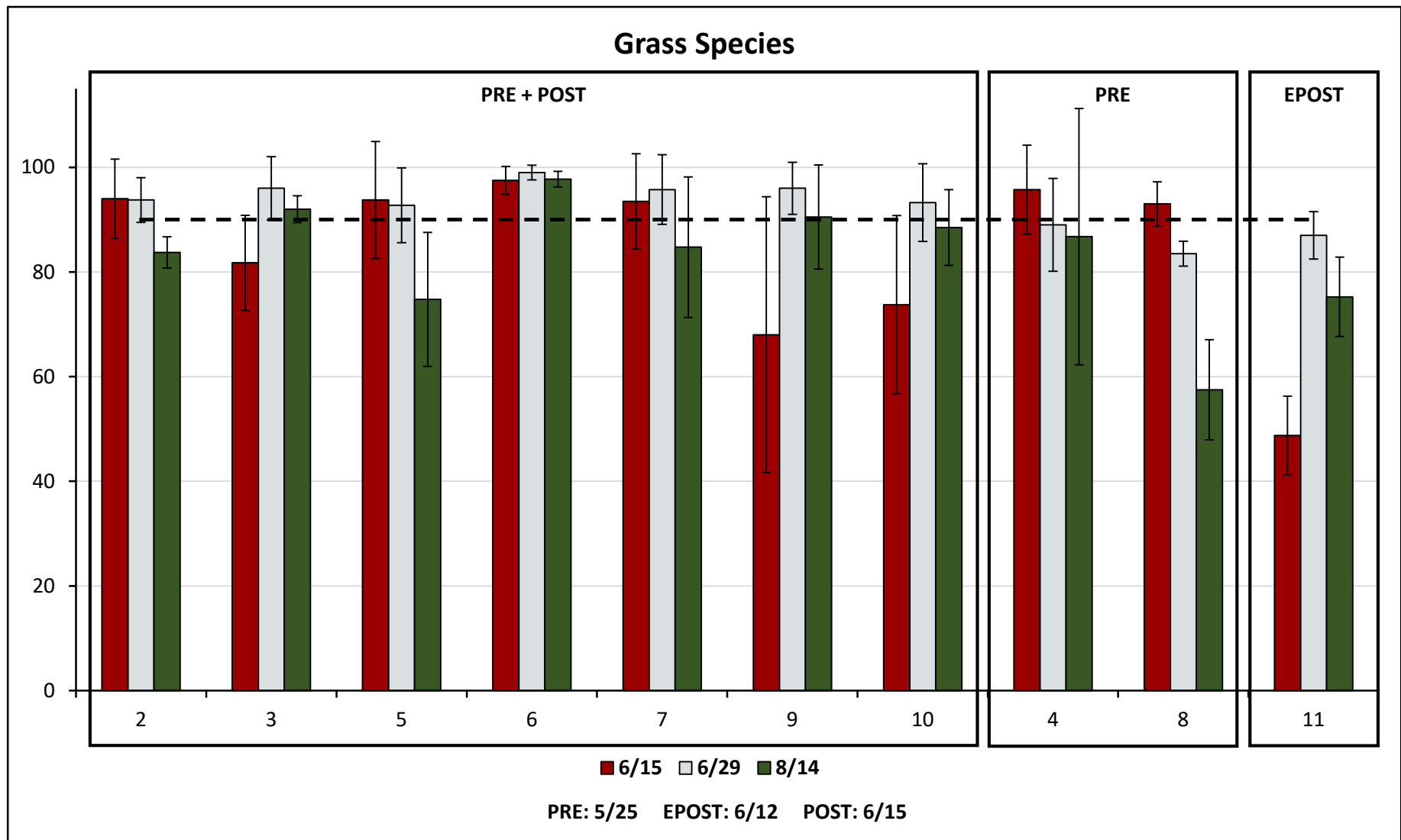


Figure 13. Grass efficacy ratings for trial #18-ROK-CN07. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. Treatments are grouped according to application timing. The dashed line indicates 90% control.

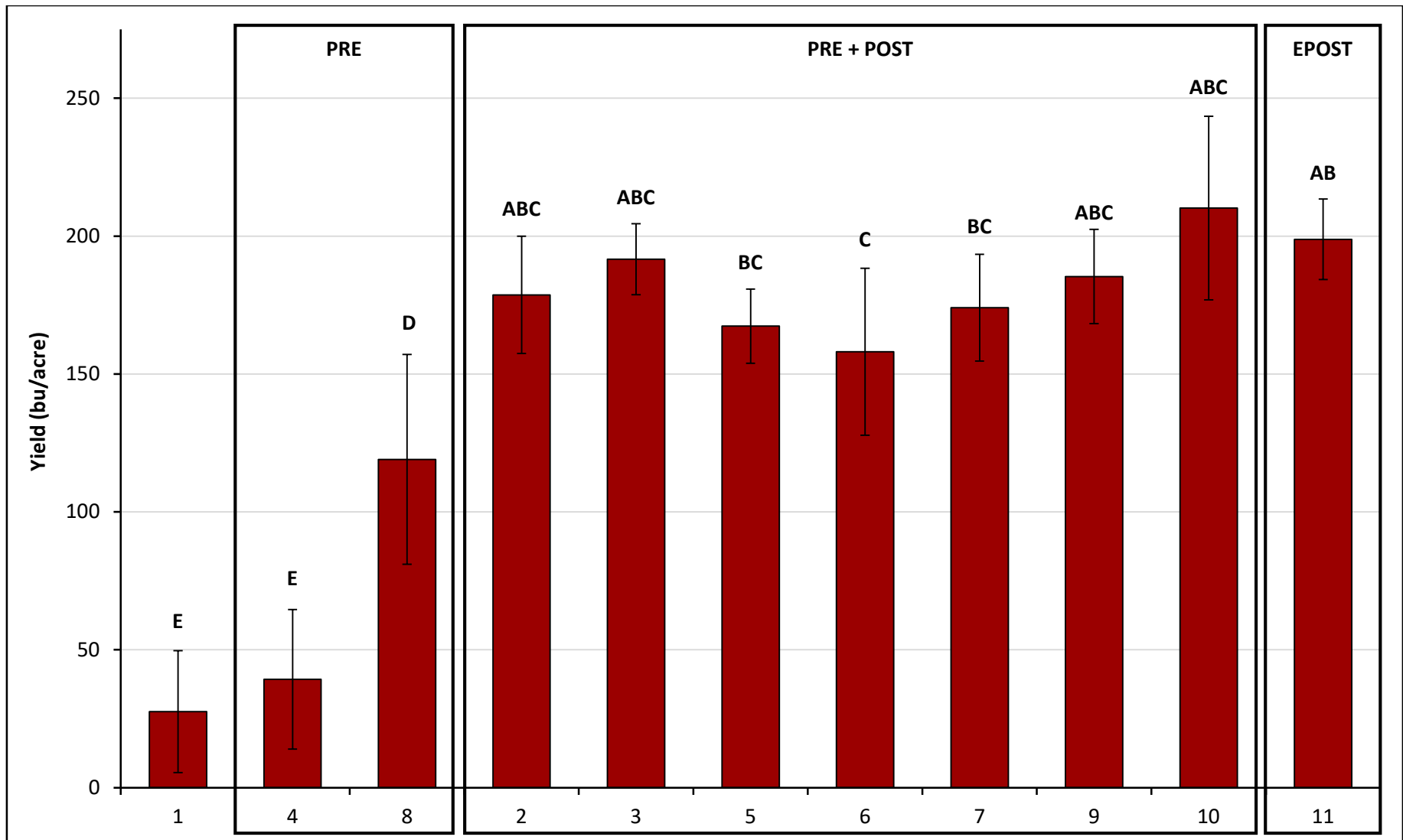


Figure 14. Grain yield for trial #18-ROK-CN07. Bars indicate the average yield in bushels per acre \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. Treatments are grouped according to application timing. Bars with the same letter are not significantly different ($p=0.0001$).

Project Goal: Compare the residual weed control of common corn herbicide pre-mixes with atrazine at two rates.

Site Description:

Location:	Janesville, WI	Crop:	Corn
Field #:	0	Variety:	Pioneer P0339
Soil type:	Plano silt loam	Planting Date:	5/8
% OM:	3.5	Emergence Date:	5/20
pH:	6.4	Population:	34,000 seeds/acre
Fertilization:	200 lb N/acre	Depth:	2 in
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	conventional	Plot Size:	10 x 30 ft
Weed species:	giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), barnyardgrass (ECHCG)		

Herbicide Application Information:

Date:	5/10
Treatment:	PRE (A)
Air Temp (°F):	66
2" Soil Temp (°F):	68
Soil moisture [surface]:	Wet
RH %:	63
Cloud cover %	90
Wind speed (mph)/direction	3-7/NNW
Rainfall (in) 1 wk after APP:	1.61
GPA:	15
PSI:	16
Nozzle:	XR11002
Nozzle spacing (in):	15
Boom Height (in):	20

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Corvus	2.63 lb/gal	2, 27	4.5 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	24 fl oz/a	PRE	A
3	Corvus	2.63 lb/gal	2, 27	4 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	24 fl oz/a	PRE	A
4	Acuron	3.44 lb/gal	5, 15, 27	64 fl oz/a	PRE	A
5	Acuron	3.44 lb/gal	5, 15, 27	48 fl oz/a	PRE	A
6	Lumax	3.95 lb/gal	5, 15, 27	70 fl oz/a	PRE	A
7	Lumax	3.95 lb/gal	5, 15, 27	55 fl oz/a	PRE	A
8	Resicore	3.35 lba/gal	4, 15, 27	64 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	24 fl oz/a	PRE	A
9	Resicore	3.35 lba/gal	4, 15, 27	48 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	24 fl oz/a	PRE	A
10	Harness Max	3.85 lb/gal	15, 27	64 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	24 fl oz/a	PRE	A
*11	Harness Max	3.85 lb/gal	15, 27	75 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	24 fl oz/a	PRE	A

*Treatment 11 was mixed incorrectly, so data from this treatment is not presented.

Trial Summary:

This trial compared weed control of five standard corn herbicide programs containing atrazine at two rate structures. Rates were structured within a range based on product labels. There was no visible corn injury at any of the rating dates (data not shown). Control of common lambsquarters and velvetleaf was greater than 95% 43 days after the PRE application (data not shown). Grass control exceeded 90% for all treatments at 26 DAT; however, control of treatment 3 fell to 88% at 43 DAT. All other treatments remained above 90% control (data not shown). The average control of giant ragweed was greater than 90% for all treatments at 26 DAT (Figure 15). However, at 43 DAT, some of the herbicide treatments at the lower rates started to break and the % control fell below 90%. All treatments at the higher rates remained at or above 90% at 43 DAT.

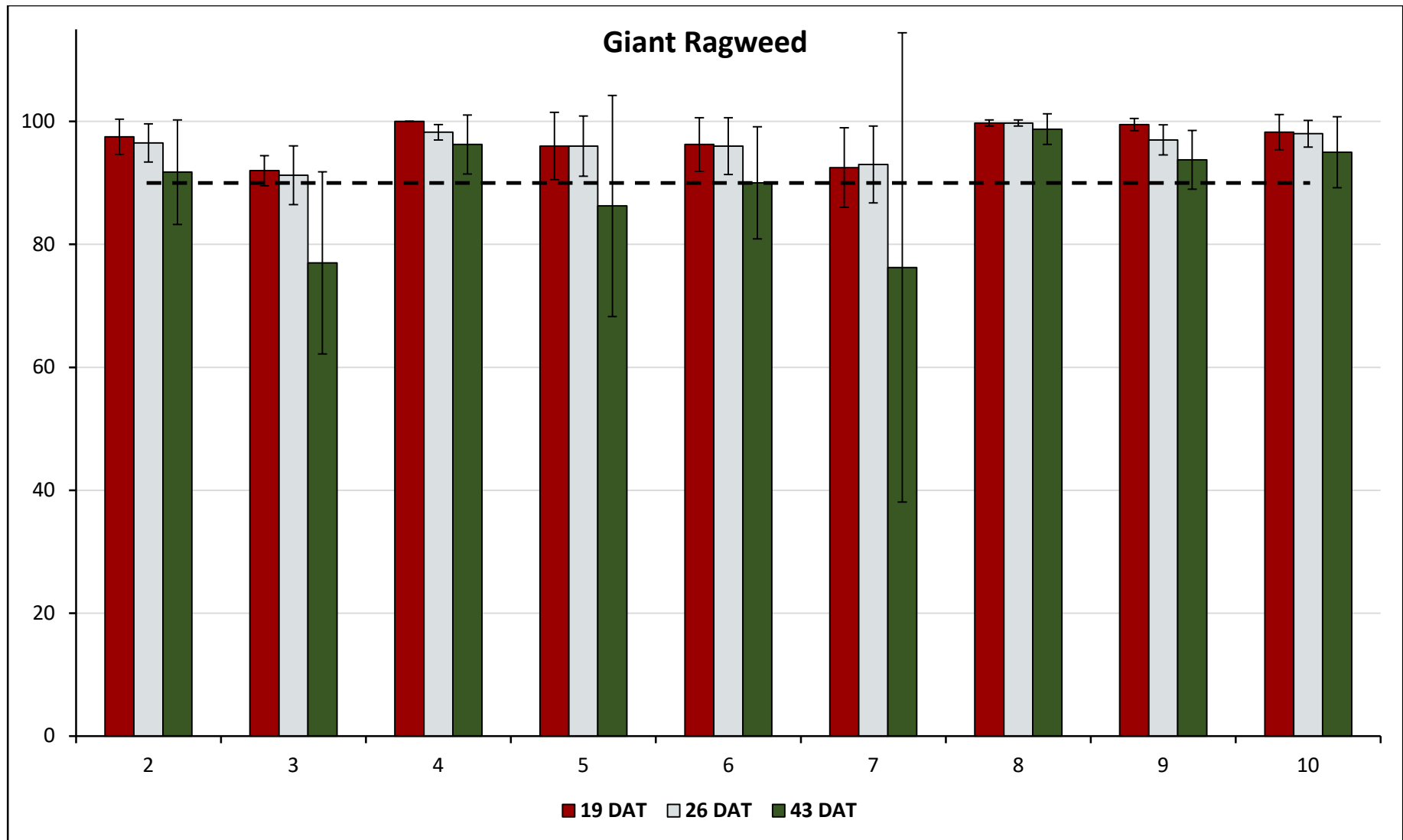


Figure 15. Giant ragweed efficacy ratings for trial #18-ROK-CN09. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

Project Goal: Compare weed control of Liberty based herbicide programs to glyphosate-based systems.

Site Description:

Location: Janesville, WI	Crop: Corn
Field #: 0	Variety: Pioneer P0339
Soil type: Plano silt loam	Planting Date: 5/8
% OM: 3.5	Emergence Date: 5/20
pH: 6.4	Population: 34,000 seeds/acre
Fertilization: 200 lb N/acre	Depth: 2 in
Previous crop: Soybean	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 30 ft
Weed species: giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), barnyardgrass (ECHCG)	

Herbicide Application Information:

Date:	5/10	6/5
Treatment:	PRE (A)	POST (B)
Air Temp (°F):	66	71
2" Soil Temp (°F):	68	73
Soil moisture [surface]:	Wet	Moist
RH %:	63	70
Cloud cover %	90	5
Wind speed (mph)/direction	3-7.5/NNW	5-7/NE
Rainfall (in) 1 wk after APP:	1.61	1.81
GPA:	15	15
PSI:	16	19
Nozzle:	XR11002	TTI 110015
Nozzle spacing (in):	15	15
Boom Height (in):	20	24

Crop and weed information at application:

	Date:	5/10	*6/5
Crop	Height (in):	-	8
	Stage:	-	V4
AMBTR	Height (in):	-	2-7
	Density:	-	
ABUTH	Height (in):	-	2-3
	Density:	-	
CHEAL	Height (in):	-	1-3
	Density:	-	
Grass	Height (in):	-	1-4
	Density:	-	

*Heights were measured from weeds in plots without a PRE herbicide. AMBTR was the only species present in plots with a PRE herbicide, and density varied depending on the treatment.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Balance Flexx	2 lb/gal	27	4 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	2 pt/a	PRE	A
	Liberty 280	2.34 lb/gal	10	32 fl oz/a	POST	B
	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	POST	B
	AAtrex	4 lb/gal	5	1 pt/a	POST	B
	AMS			8.5 lb/100 gal	POTS	B
3	Corvus	2.63 lb/gal	2, 27	3.5 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	2 pt/a	PRE	A
	Liberty 280	2.34 lb/gal	10	32 fl oz/a	POST	B
	Diflexx Duo	2.13 lb/gal	4, 27	24 fl oz/a	POST	B
	AAtrex	4 lb/gal	5	1 pt/a	POST	B
4	Harness Max	3.85 lb/gal	15, 27	40 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	2 pt/a	PRE	A
	Durango DMA	4 lbae/gal	9	32 fl oz/a	POST	B
	AAtrex	4 lb/gal	5	1 pt/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
5	Harness Max	3.85 lb/gal	15, 27	40 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	2 pt/a	PRE	A
	Liberty 280	2.34 lb/gal	10	32 fl oz/a	POST	B
	AAtrex	4 lb/gal	5	1 pt/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
6	Resicore	3.29 lb/gal	4, 15, 27	2.4 qt/a	PRE	A
	AAtrex	4 lb/gal	5	2 pt/a	PRE	A
	Durango DMA	4 lbae/gal	9	32 fl oz/a	POST	B
	AAtrex	4 lb/gal	5	1 pt/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
7	Resicore Herbicide	3.29 lb/gal	4, 15, 27	2.4 qt/a	PRE	A
	AAtrex	4 lb/gal	5	2 pt/a	PRE	A
	Liberty 280	2.34 lb/gal	10	32 fl oz/a	POST	B
	AAtrex	4 lb/gal	5	1 pt/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
8	Verdict	5.57 lb/gal	14, 15	14 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	2 pt/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AAtrex	4 lb/gal	5	1 pt/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
9	Verdict	5.57 lb/gal	14, 15	14 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	2 pt/a	PRE	A
	Liberty 280	2.34 lb/gal	10	32 fl oz/a	POST	B
	AAtrex	4 lb/gal	5	1 pt/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
10	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AAtrex	4 lb/gal	5	1 pt/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
11	Liberty 280	2.34 lb/gal	10	32 fl oz/a	POST	B
	AAtrex	4 lb/gal	5	1 pt/a	POST	B
	AMS			8.5 lb/100 gal	POST	B

Trial Summary:

This trial evaluated the postemergence weed control of Liberty and glyphosate following different standard PRE herbicide programs. There was no visual corn injury from the PRE herbicides evaluated at 26 days after application (data not shown). 6% leaf necrosis was observed in treatment 2 six days after the POST application. All other treatments were below 2%. Velvetleaf and grass control exceeded 95% at all rating timings (data not shown). There was a difference in common lambsquarters control at 30 days after the POST application. Treatment 11 had an average control rating of 77%, while all other treatments exceeded 97% control (data not shown). Giant ragweed control differed at each of the rating timings (Figure 15). The different PRE herbicides evaluated in the study had slightly different levels of control 26 days after application. When following a PRE herbicide, the POST efficacy of Liberty and glyphosate on giant ragweed were similar. When applied in a POST only system, the Liberty treatment initially had better control 91% vs 79% for the glyphosate treatment at 6 days after application. However, by 30 days after application the % control was similar between the Liberty and glyphosate treatments at 85 and 81%, respectively.

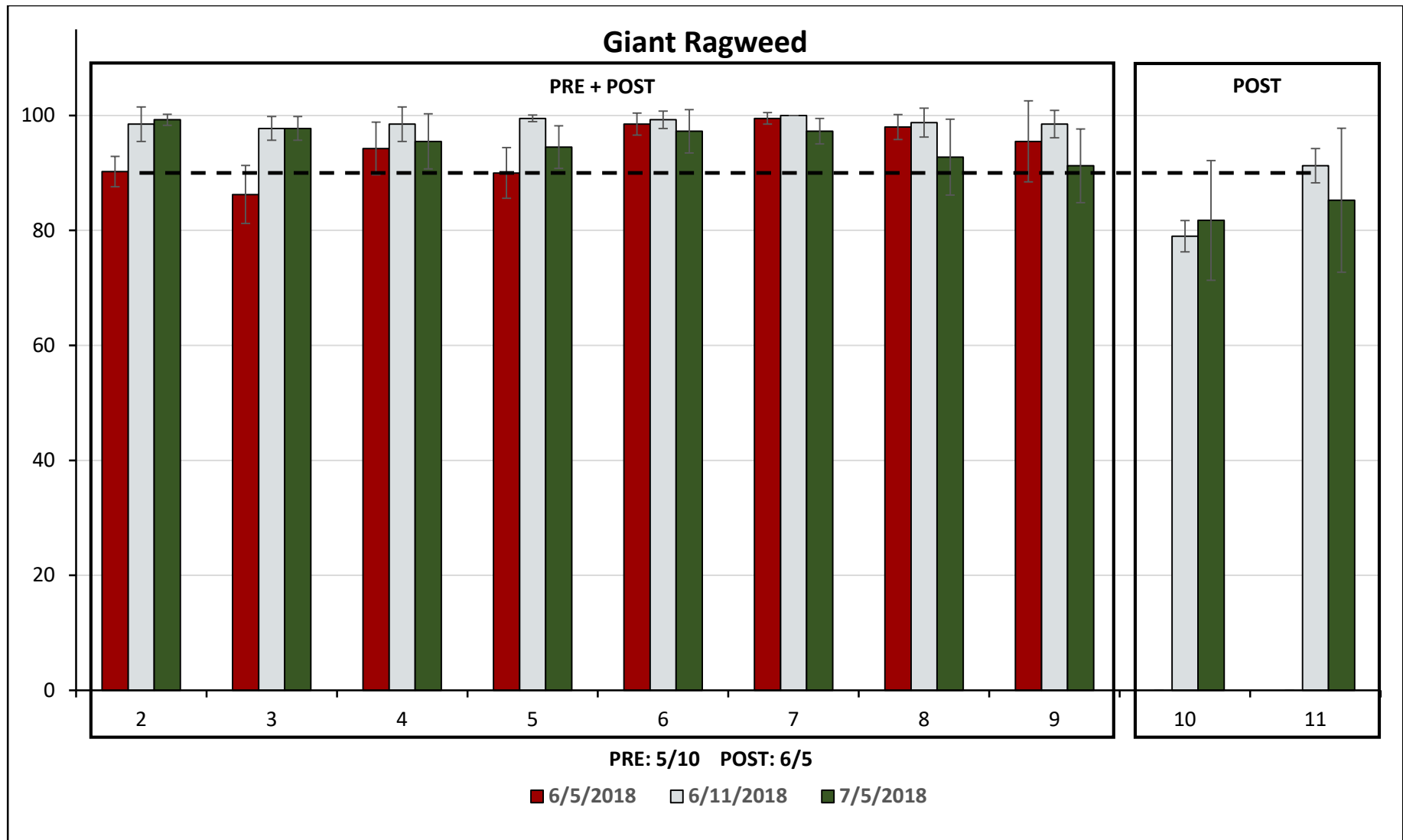


Figure 16. Giant ragweed efficacy ratings for trial #18-ROK-CN10. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. Treatments are grouped according to application timing. The dashed line indicates 90% control.

Project Goal: Evaluate herbicide programs without atrazine for season long-weed control.

Site Description:

Location: Arlington, WI	Crop: Corn
Field #: 454	Variety: NK0142 3120-EZ1
Soil type: Plano silt loam	Planting Date: 5/7
% OM: 3.5	Emergence Date: 5/19
pH: 6.7	Population: 36,000 seeds/acre
Fertilization: 5-14-42 @ 200 lb/a Urea (46-0-0) @ 300 lb/a	Depth: 2 in
Previous crop: Soybean	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 25 ft
Weed species: common lambsquarters (CHEAL), velvetleaf (ABUTH), redroot pigweed (AMARE), common ragweed (AMBEL), giant foxtail (SETFA), green foxtail (SETVI), woolly cupgrass (ERBVI)	

Herbicide Application Information:

Date:	5/7	5/31	6/7
Treatment:	PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):	82	80	75
2" Soil Temp (°F):	72	78	70
Soil moisture [surface]:	Moist	Moist	Moist
RH %:	38	55	66
Cloud cover %	0	17	15
Wind speed (mph)/direction	7-10/SW	5-9/NW	4-6/NE
Rainfall (in) 1 wk after APP:	1.5	0.37	1.07
GPA:	15	15	15
PSI:	17	33	33
Nozzle:	XR11002	TTI 110015	TTI 110015
Nozzle spacing (in):	15	20	20
Boom Height (in):	20	23	26

Crop and weed information at application:

	Date:	5/7	5/31	*6/7
Crop	Height (in):	-	5	9
	Stage:	-	V3	V5
CHEAL	Height (in):	-	0.5-1.5	-
	Density:	-	3-9/ft ²	-
ABUTH	Height (in):	-	0.5-3	<1
	Density:	-	1-5/ft ²	sparse
AMARE	Height (in):	-	0.5-1.5	-
	Density:	-	0-6/ft ²	-
AMBEL	Height (in):	-	0.5-2	-
	Density:	-	0-0.5/m ²	-
Grass	Height (in):	-	0.5-4	<1
	Density:	-	3-40/ft ²	sparse

*Very few weeds were present at the POST (C) application. All PREs still had > 95% control.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Acuron Flexi	3.26 lb/gal	15, 27	2.25 qt/a	PRE	A
3	Acuron Flexi	3.26 lb/gal	15, 27	2 qt/a	PRE	A
	Princep 4L	4 lb/gal	5	1.35 pt/a	PRE	A
4	Resicore	3.29 lb/gal	4, 15, 27	2.5 qt/a	PRE	A
5	Harness Max	3.85 lb/gal	15, 27	75 fl oz/a	PRE	A
6	Corvus	2.63 lb/gal	2, 27	5.6 fl oz/a	PRE	A
7	Acuron Flexi	3.26 lb/gal	15, 27	1 qt/a	PRE	A
	Halex GT	4.39 lb/gal	9, 15, 27	3.6 pt/a	POST	C
	Clarity	4 lb ae/gal	4	3 fl oz/a	POST	C
	NIS			0.25 % v/v	POST	C
	AMS			8.5 lb/100 gal	POST	C
8	Acuron Flexi	3.26 lb/gal	15, 27	1.2 qt/a	PRE	A
	Callisto	4.39 lb/gal	27	3 fl oz/a	POST	C
	Clarity	4 lb ae/gal	4	3 fl oz/a	POST	C
	Roundup PowerMax		9	26 fl oz/a	POST	C
	AMS			8.5 lb/100 gal	POST	C
9	Halex GT	4.39 lb/gal	9, 15, 27	3.6 pt/a	POST	B
	Clarity	4 lb ae/gal	4	3 fl oz/a	POST	B
	NIS			0.25 % v/v	POST	B
	AMS			8.5 lb/100 gal	POST	B

Adjuvants: NIS=Induce

Trial Summary:

This trial compared PRE only, EPOST only, and PRE + POST herbicide programs without atrazine in corn. None of the herbicide treatments caused significant corn injury symptoms (data not shown). Control of common lambsquarters, redroot pigweed, velvetleaf, and common ragweed was greater than 95% at all ratings (data not shown). Note that common ragweed pressure in the trial area was very low. Giant foxtail control remained above 90% for all treatments until the last rating on 8/2 (Figure 17). In general, the level of foxtail control decreased at this rating timing, indicating that the PRE herbicides were starting to break. Control also tended to be much more variable in the PRE only treatments when compared to the PRE + POST and EPOST treatments. Corn yield did not significantly differ among the herbicide treatments (data not shown). Yield across all herbicide treatments was 227 bu/acre, while the untreated check was 188 bu/acre, a 17% reduction.

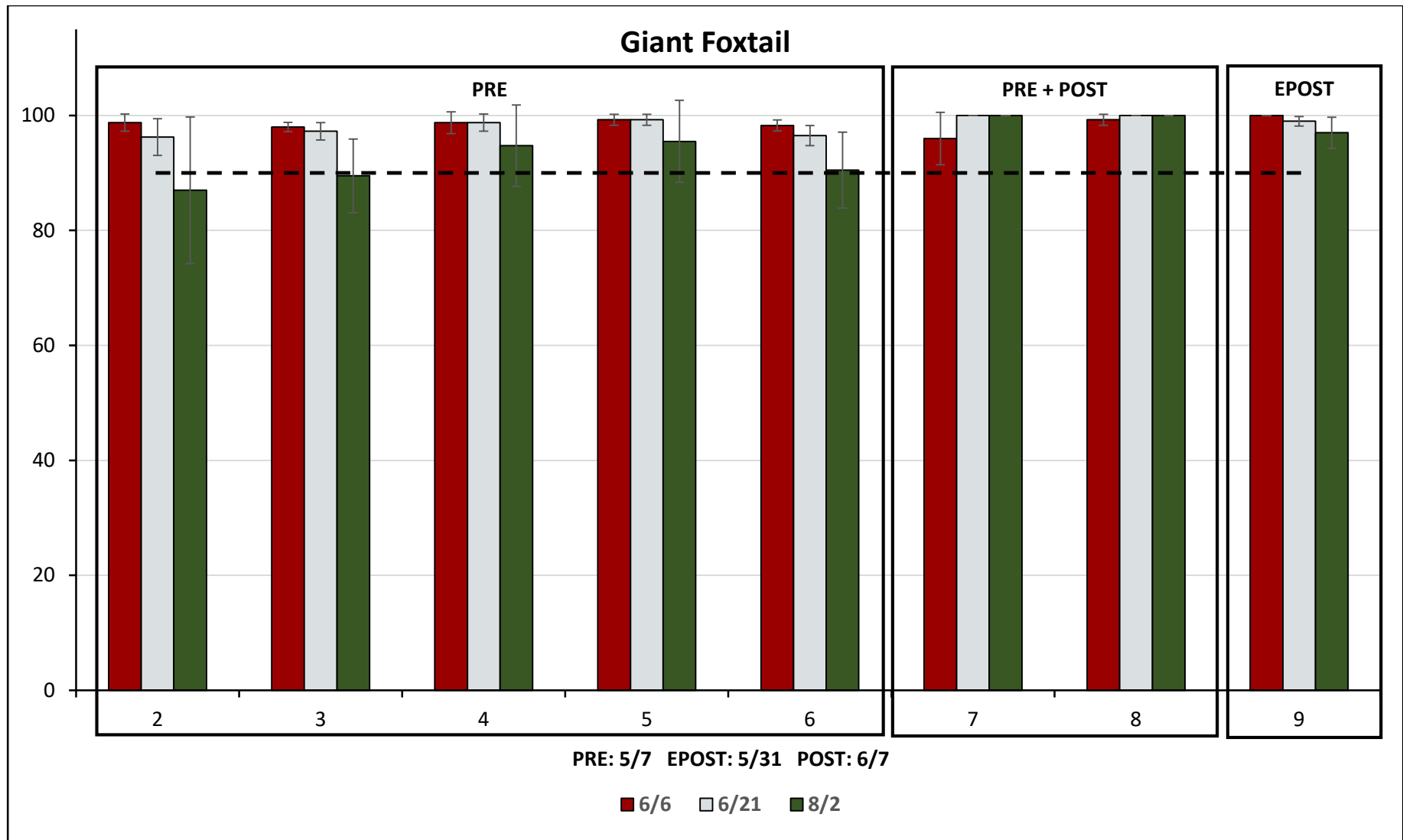


Figure 17. Giant foxtail efficacy ratings for trial #18-ARL-CN11. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. Treatments are grouped according to application timing. The dashed line indicates 90% control.

Project Goal: Evaluate the season long weed control and crop safety of Impact and ImpactZ in 1 and 2 pass programs.

Site Description:

Location: Janesville, WI	Crop: Corn
Field #: 6	Variety: G01P52-3011A
Soil type: Plano silt loam	Planting Date: 5/25
% OM: 3.2	Emergence Date: 6/1
pH: 6.5	Population: 35,000 seeds/acre
Fertilization: 200 lbs N/acre	Depth: 2 in
Previous crop: Corn	Row spacing: 30 in
Tillage: Conventional	Plot Size: 10 x 30 ft
Weed species: giant ragweed (AMBTR), common lambsquarters (CHEAL), redroot pigweed (AMARE), giant foxtail (SETFA), green foxtail (SETVI), barnyardgrass (ECHCG)	

Herbicide Application Information:

Date:	5/25	6/12	6/15
Treatment:	PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):	90	73	72
2" Soil Temp (°F):	85	71	68
Soil moisture [surface]:	Moist	Wet	Wet
RH %:	42	81	83
Cloud cover %	35	100	80
Wind speed (mph)/direction	3-6/S	1-3/NE	4-7/SE
Rainfall (in) 1 wk after APP:	0.45	3.55	3.71
GPA:	15	15	15
PSI:	19	21	18
Nozzle:	TTI 110105	TTI 110015	TTI 110015
Nozzle spacing (in):	15	15	15
Boom Height (in):	20	23	23

Crop and weed information at application:

	Date:	5/25	6/12	*6/15
Crop	Height (in):	-	5	10
	Stage:	-	V3	V4
AMBTR	Height (in):	-	1-3	1-6
	Density:	-	1-30/m ²	1-30/m ²
AMARE	Height (in):	-	0.25-1	-
	Density:	-	1-7/m ²	-
CHEAL	Height (in):	-	0.25-1	-
	Density:	-	2-12/m ²	-
Grass	Height (in):	-	0.5-2	-
	Density:	-	8-70/m ²	-

*AMBTR was the only species present in plots with a PRE herbicide. The % control of AMBTR was very low as group 15 herbicides have very little activity on large seeded broadleaves.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Harness	7.0 lb/gal	15	1.75 pt/a	PRE	A
3	Harness	7.0 lb/gal	15	1.75 pt/a	PRE	A
	ImpactZ	4.26 lb/gal	5, 27	10.7 fl oz/a	MPOST	C
	MSO			1% v/v	MPOST	C
	AMS (liquid)			2.5% v/v	MPOST	C
4	Harness	7.0 lb/gal	15	1.75 pt/a	PRE	A
	ImpactZ	4.26 lb/gal	5, 27	8.0 fl oz/a	MPOST	C
	Roundup PowerMax	4.5 lbae/gal	9	32.0 fl oz/a	MPOST	C
	MSO			0.5 v/v	MPOST	C
	AMS (liquid)			2.5% v/v	MPOST	C
5	Harness	7.0 lb/gal	15	1.75 pt/a	PRE	A
	ImpactZ	4.26 lb/gal	5, 27	8.0 fl oz/a	MPOST	C
	Liberty 280 SL	2.34 lb/gal	10	22.0 fl oz/a	MPOST	C
	AMS (liquid)	100 %		2.5% v/v	MPOST	C
6	Harness	7 lb/gal	15	1.75 pt/a	EPOST	B
	Impact	2.8 lb/gal	27	1.0 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	1 pt/a	EPOST	B
	MSO			0.25% v/v	EPOST	B
	AMS (liquid)			2.5% v/v	EPOST	B
7	Harness	7 lb/gal	15	1.75 pt/a	EPOST	B
	Impact	2.8 lb/gal	27	0.75 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32.0 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	1 pt/a	EPOST	B
	MSO			0.25% v/v	EPOST	B
	AMS (liquid)			2.5% v/v	EPOST	B
8	Halex GT	4.39 lb/gal	9, 15, 27	3.6 pt/a	EPOST	B
	AAtrex	4 lb/gal	5	1 pt/a	EPOST	B
	NIS			0.25% v/v	EPOST	B
	AMS (liquid)			2.5% v/v	EPOST	B

Adjuvants: AMS=Amsol; NIS=Induce; MSO=Premium MSO

Trial Summary:

This trial evaluated the season long weed control and crop safety of Impact and ImpactZ in both 1 and 2 pass herbicide programs. None of the herbicide treatments evaluated caused significant corn injury symptoms (data not shown). Control of common lambsquarters, redroot pigweed, and grass species was greater than 90% at all ratings (data not shown). All the PRE + POST and EPOST herbicide programs evaluated were effective at controlling giant ragweed late in the season (Figure 18). The PRE only treatment of Harness had very poor control throughout the entire season. This is expected as group 15 herbicides have poor efficacy on large seed broadleaves like giant ragweed.

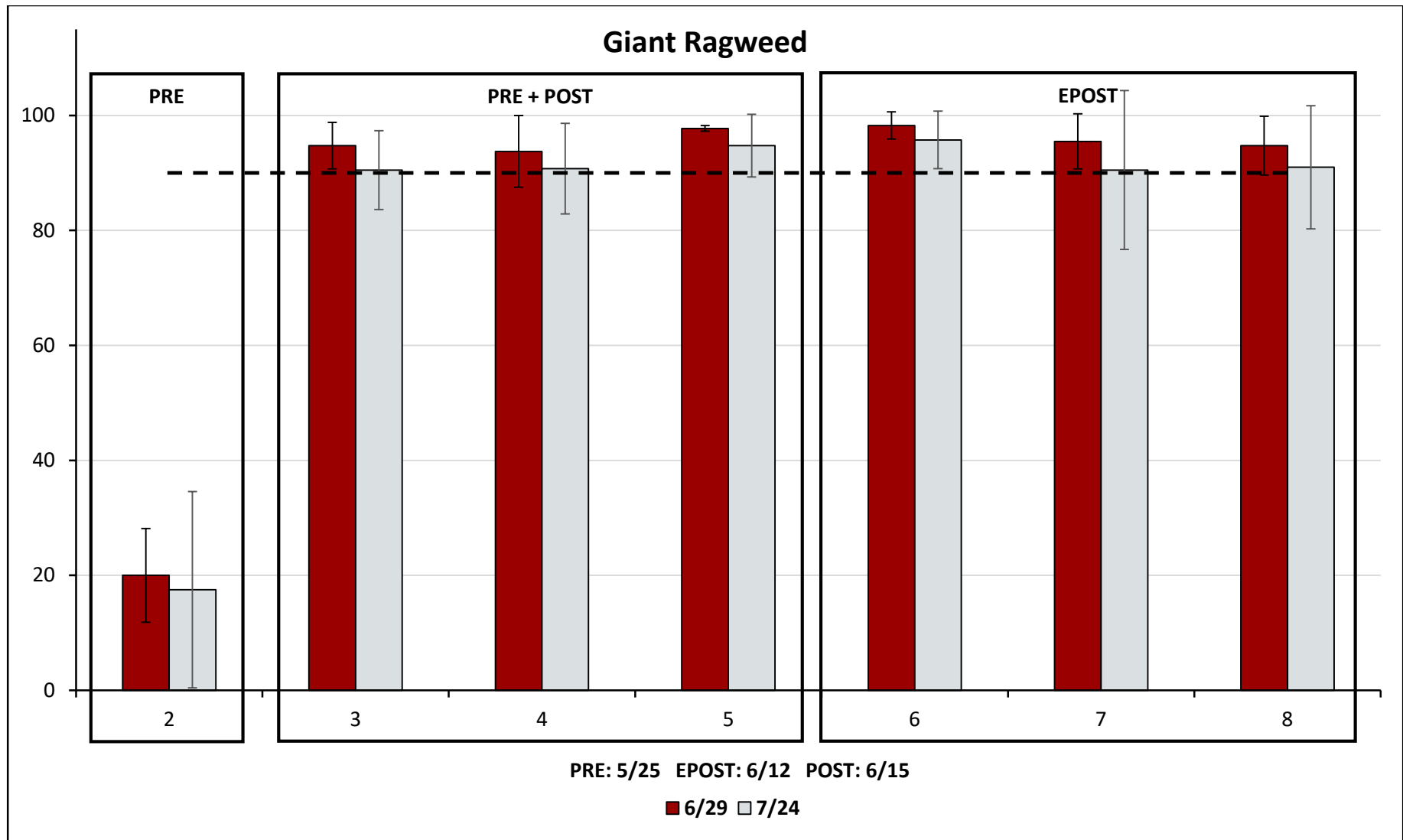


Figure 18. Giant ragweed efficacy ratings for trial #18-ROK-CN12. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. Treatments are grouped according to application timing. The dashed line indicates 90% control.

Project Goal: Evaluate weed control and crop safety of Enlist Duo in Enlist traited corn.

Site Description:

Location: Arlington, WI	Crop: Corn
Field #: 454	Variety: MY00T28 (Enlist corn)
Soil type: Plano silt loam	Planting Date: 5/7
% OM: 3.5	Emergence Date: 5/19
pH: 6.7	Population: 36,000 seeds/acre
Fertilization: 5-14-42 @ 200 lb/a Urea (46-0-0) @ 300 lb/a	Depth: 2 in
Previous crop: Soybean	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 25 ft
Weed species: common lambsquarters (CHEAL), velvetleaf (ABUTH), redroot pigweed (AMARE), common ragweed (AMBEL), giant foxtail (SETFA), green foxtail (SETVI), woolly cupgrass (ERBVI), large crabgrass (DIGSA)	

Herbicide Application Information:

Date:	5/7	5/31	6/7
Treatment:	PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):	83	80	75
2" Soil Temp (°F):	71	78	70
Soil moisture [surface]:	Moist	Moist	Moist
RH %:	34	55	65
Cloud cover %	5	17	15
Wind speed (mph)/direction	6-9/SW	5-9/NW	4-6/NE
Rainfall (in) 1 wk after APP:	1.5	0.37	1.07
GPA:	15	15	15
PSI:	17	33	33
Nozzle:	XR11002	TTI 110015	TTI 110015
Nozzle spacing (in):	15	20	20
Boom Height (in):	20	22	24

Crop and weed information at application:

	Date:	5/7	5/31	*6/7
Crop	Height (in):	-	6	9
	Stage:	-	V3	V4
CHEAL	Height (in):	-	0.5-1.5	<1
	Density:	-	8-60/ft ²	sparse
ABUTH	Height (in):	-	0.5-3	<1
	Density:	-	0-2/ft ²	sparse
AMARE	Height (in):	-	0.5-1.5	-
	Density:	-	3-52/ft ²	-
AMBEL	Height (in):	-	0.5-2	<1
	Density:	-	0-1/ft ²	sparse
Grass	Height (in):	-	0.5-4	<1
	Density:	-	22-50/ft ²	sparse

*Very few weeds were present at the POST (C) application.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Surestart II	4.25 lb/gal	2, 4, 15	2 pt/a	PRE	A
	Enlist Duo	3.3 lbae/gal	4, 9	3.5 pt/a	POST	C
	AMS (liquid)			2.5 % v/v	MPOST	C
3	Surestart II	4.25 lb/gal	2, 4, 15	2 pt/a	PRE	A
	Enlist Duo	3.3 lbae/gal	4, 9	4.75 pt/a	POST	C
	AMS (liquid)			2.5 % v/v	POST	C
4	Resicore	3.29 lb/gal	4, 15, 27	1.25 qt/a	PRE	A
	Resicore	3.29 lb/gal	4, 15, 27	1.25 qt/a	POST	C
	Durango DMA	4 lbae/gal	9	2 pt/a	POST	C
	AMS (liquid)			2.5 % v/v	POST	C
5	Surestart II	4.25 lb/gal	2, 4, 15	2 pt/a	PRE	A
	Resicore	3.29 lb/gal	4, 15, 27	1.25 qt/a	POST	C
	Durango DMA	4 lbae/gal	9	2 pt/a	POST	C
	AMS (liquid)			2.5 % v/v	POST	C
6	Surestart II	4.25 lb/gal	2, 4, 15	2 pt/a	PRE	A
	Realm Q	38.75% w/w	2, 27	4 oz/a	POST	C
	Clarity	4 lbae/gal	4	4 fl oz/a	POST	C
	Durango DMA	4 lbae/gal	9	2 pt/a	POST	C
	AMS (liquid)			2.5 % v/v	POST	C
7	Resicore	3.29 lb/gal	4, 15, 27	1.75 qt/a	EPOST	B
	Enlist Duo	3.3 lbae/gal	4, 9	3.5 pt/a	EPOST	B
	AMS (liquid)			2.5 % v/v	EPOST	B
8	Resicore	3.29 lb/gal	4, 15, 27	1.75 qt/a	EPOST	B
	Enlist Duo	3.3 lbae/gal	4, 9	4.75 pt/a	EPOST	B
	AMS (liquid)			2.5 % v/v	EPOST	B
9	Resicore	3.29 lb/gal	4, 15, 27	1.75 qt/a	EPOST	B
	Durango DMA	4 lbae/gal	9	2 pt/a	EPOST	B
	AMS (liquid)			2.5 % v/v	EPOST	B
10	Realm Q	38.75% w/w	2, 27	4 oz/a	EPOST	B
	Clarity	4 lbae/gal	4	4 fl oz/a	EPOST	B
	Durango DMA	4 lbae/gal	9	2 pt/a	EPOST	B
	AMS (liquid)			2.5 % v/v	EPOST	B

Adjuvants: AMS=Bronc

Trial Summary:

This trial evaluated the weed control and crop safety of Enlist Duo in Enlist trait corn. The Enlist trait confers resistance to glyphosate, glufosinate, 2,4-D, and group 1 herbicides in the “FOPs” chemical family. Minor leaf necrosis was observed at 6 DAT-B and 14 DAT-C (Figure 20). There was no visible injury at the later rating dates. Control of common lambsquarters, redroot pigweed, velvetleaf, and common ragweed was greater than 90% at all ratings (data not shown). Note that common ragweed pressure in the trial area was very low. Giant foxtail control remained above 90% for all treatments until the last rating on 8/2 (Figure 19). All treatments with a group 15 herbicide maintained control levels greater than 90% throughout the entire season. Only treatment 10 did not have a group 15 herbicide and foxtail control fell to 81% by the last rating on 8/2. Corn yield did not significantly differ among the herbicide treatments (data not shown). Yield across all herbicide treatments was 238 bu/acre, while the untreated check was 155 bu/acre, a 35% reduction.

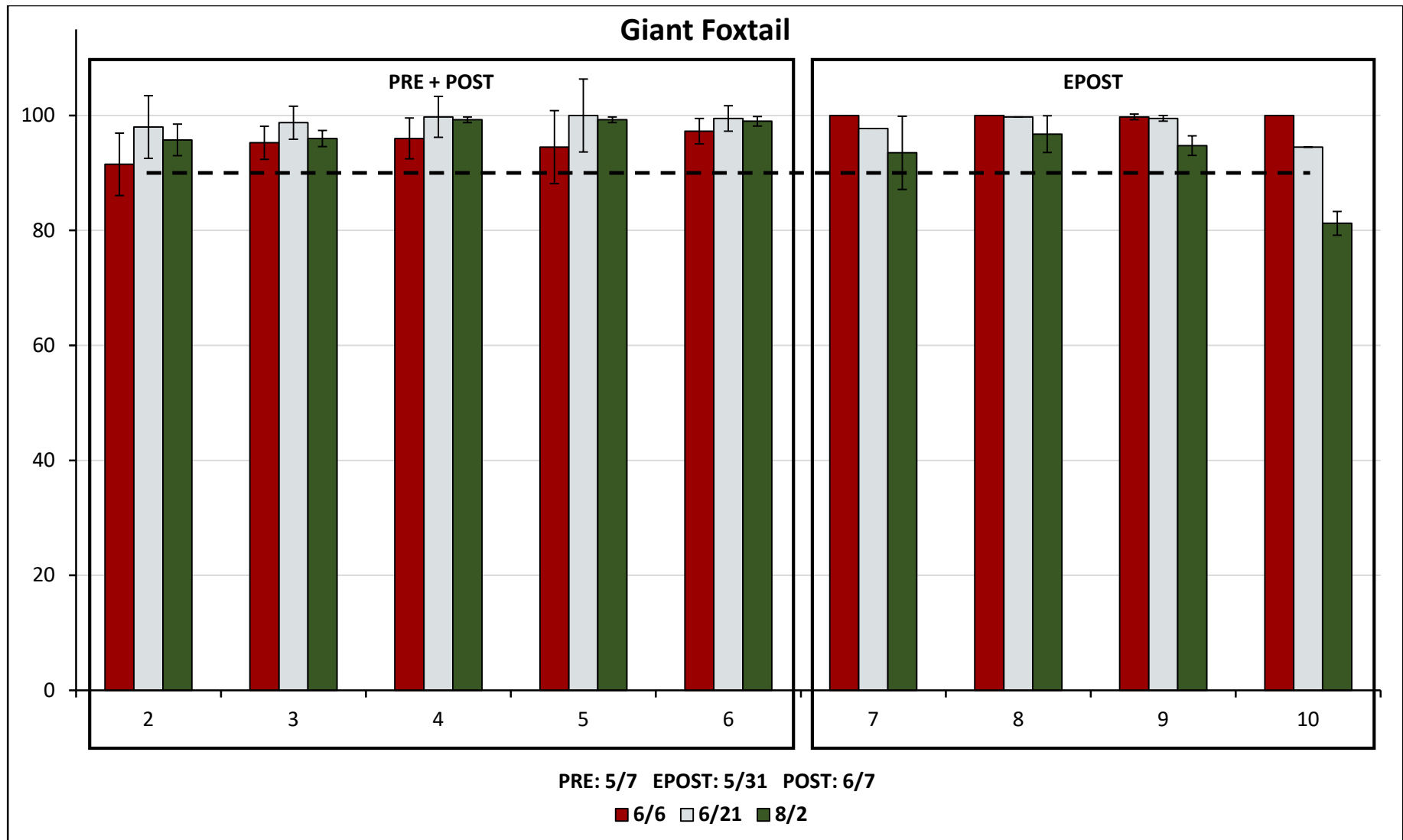


Figure 19. Giant foxtail efficacy ratings for trial #18-ARL-CN13. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. Treatments are grouped according to application timing. The dashed line indicates 90% control.

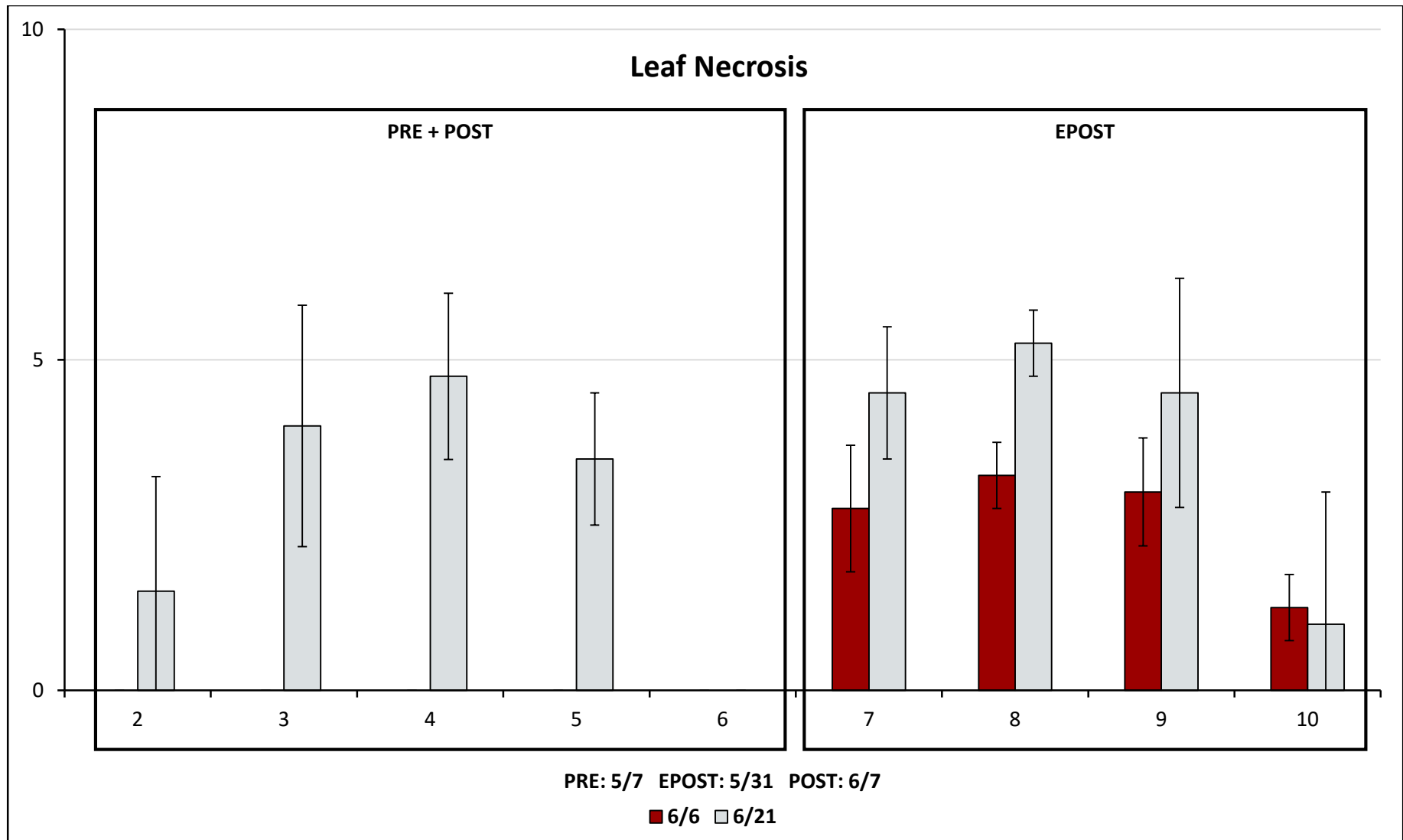


Figure 20. Corn injury ratings for trial #18-ARL-CN13. Bars indicate the average % leaf necrosis \pm the standard deviation of four replications on 6/6 and 6/21, 6 days after the EPOST and 14 days after the POST application, respectively. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number.

Project Goal: Evaluate the season long weed control of 1 and 2 pass programs containing multiple effective sites of action from 3 different companies.

Site Description: Janesville, WI

Field #: 6	Variety: G01P52-3011A
Soil type: Plano silt loam	Planting Date: 5/25
% OM: 3.2	Emergence Date: 6/1
pH: 6.5	Population: 35,000 seeds/acre
Fertilization: 200 lbs N/acre	Depth: 2 in
Previous crop: Corn	Row spacing: 30 in
Tillage: Conventional	Plot Size: 10 x 25 ft
Weed species: giant ragweed (AMBTR), common lambsquarters (CHEAL), redroot pigweed (AMARE), giant foxtail (SETFA), green foxtail (SETVI), barnyardgrass (ECHCG)	

Herbicide Application Information: Janesville, WI

	Date: 5/25	6/12	6/15
Treatment:	PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):	88	73	72
2" Soil Temp (°F):	81	71	68
Soil moisture [surface]:	Moist	Wet	Wet
RH %:	51	82	83
Cloud cover %	18	100	80
Wind speed (mph)/direction	5-9/SSW	1-3/NE	4-7/SE
Rainfall (in) 1 wk after APP:	0.45	3.55	3.71
Rainfall (in) 2 wk after APP:	0.81	4.84	4.68
Rainfall (in) 3 wk after APP:	2.92	5.71	5.37

Crop and weed information at application: Janesville, WI

	Date: 5/25	6/12	*6/15	
Corn	Height (in):	-	5	10
	Stage:	-	V3	V4
AMBTR	Height (in):	-	1-3	1-6
	Density:	-	8-70/m ²	2-75/m ²
AMARE	Height (in):	-	0.25-1	-
	Density:	-	1-7/m ²	-
CHEAL	Height (in):	-	0.25-1	-
	Density:	-	2-12/m ²	-
Grass	Height (in):	-	0.5-2	-
	Density:	-	8-70/m ²	-

*AMBTR was the only species present in plots with a PRE herbicide.

Site Description: Arlington, WI

Field #:	454	Variety:	MY00T28 (Enlist corn)
Soil type:	Plano silt loam	Planting Date:	5/7
% OM:	3.5	Emergence Date:	5/19
pH:	6.7	Population:	36,000 seeds/acre
Fertilization:	5-14-42 @ 200 lb/a Urea (46-0-0) @ 300 lb/a	Depth:	2 in
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	conventional	Plot Size:	10 x 25 ft
Weed species:	common lambsquarters (CHEAL), velvetleaf (ABUTH), redroot pigweed (AMARE), common ragweed (AMBEL), giant foxtail (SETFA), green foxtail (SETVI), woolly cupgrass (ERBVI), large crabgrass (DIGSA)		

Herbicide Application Information: Arlington, WI

	Date:	5/7	5/31	6/12
Treatment:		PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):		83	80	80
2" Soil Temp (°F):		72	78	80
Soil moisture [surface]:		Moist	Moist	Moist
RH %:		32	55	68
Cloud cover %		5	17	100
Wind speed (mph)/direction		8-11/SW	5-9/NW	2-4/WSW
Rainfall (in) 1 wk after APP:		1.5	0.37	2.15
Rainfall (in) 2 wk after APP:		2.13	1.44	3.39
Rainfall (in) 3 wk after APP:		2.13	4.41	3.54

Crop and weed information at application:

	Date:	5/7	5/31	*6/12
Crop	Height (in):	-	6	9
	Stage:	-	V3	V4
CHEAL	Height (in):	-	0.5-1.5	1-2
	Density:	-	7-47/ft ²	0-2/m ²
ABUTH	Height (in):	-	0.5-3	1-5
	Density:	-	1-7/ft ²	0-17/m ²
AMARE	Height (in):	-	0.5-1.5	1
	Density:	-	0-6/ft ²	sparse
AMBEL	Height (in):	-	0.5-2	1-3
	Density:	-	0-0.25/ft ²	sparse
Grass	Height (in):	-	0.5-4	1-5
	Density:	-	2-50/ft ²	0-10/m ²

*Weed heights and densities varied depending on efficacy of the PRE treatment.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Harness Max	3.85 lb/gal	15, 27	75 fl oz/a	PRE	A
3	Diflexx Duo	2.13 lb/gal	4, 27	28 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	EPOST	B
	COC			0.5 % v/v	EPOST	B
	Ammonium Sulfate			8.5 lb/100 gal	EPOST	B
4	Harness Max	3.85 lb/gal	15, 27	64 fl oz/a	PRE	A
	Diflexx	4 lbae/gal	4	8 fl oz/a	EPOST	C
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	EPOST	C
	NIS			0.25 % v/v	EPOST	C
	Ammonium Sulfate			8.5 lb/100 gal	EPOST	C
5	Harness Max	3.85 lb/gal	15, 27	64 fl oz/a	PRE	A
	Diflexx Duo	2.13 lb/gal	4, 27	28 fl oz/a	POST	C
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	POST	C
	COC			0.25 % v/v	POST	C
	Ammonium Sulfate			8.5 lb/100 gal	POST	C
6	Acuron Flexi	3.26 lba/gal	15, 27	2.25 qt/a	PRE	A
7	Halex GT	4.39 lb/gal	9, 15, 27	4 pt/a	EPOST	B
	Clarity	4 lbae/gal	4	8 fl oz/a	EPOST	B
	NIS			0.25 % v/v	EPOST	B
	Ammonium Sulfate			8.5 lb/100 gal	EPOST	B
8	Acuron Flexi	3.26 lb/gal	15, 27	1.5 qt/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	POST	C
	Clarity	4 lbae/gal	4	8 fl oz/a	POST	C
	NIS			0.25 % v/v	POST	C
	Ammonium Sulfate			8.5 lb/100 gal	POST	C
9	Acuron Flexi	3.26 lb/gal	15, 27	1.1 qt/a	PRE	A
	Halex GT	4.39 lb/gal	9, 15, 27	3.6 pt/a	POST	C
	Clarity	4 lbae/gal	4	8 fl oz/a	POST	C
	NIS			0.25 %	POST	C
	Ammonium Sulfate			8.5 lb/100 gal	POST	C
10	Surestart II	4.25 lb/gal	2, 4, 15	2.5 pt/a	PRE	A
11	Realm Q	38.75 %w/w	2, 27	4 oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	EPOST	B
	Clarity	4 lbae/gal	4	8 fl oz/a	EPOST	B
	COC			0.5 % v/v	EPOST	B
	Ammonium Sulfate			8.5 lb/100 gal	EPOST	B
12	Surestart II	4.25 lb/gal	2, 4, 15	2.5 pt/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	POST	C
	Clarity	4 lbae/gal	4	8 fl oz/a	POST	C
	NIS			0.25 % v/v	POST	C
	Ammonium Sulfate			8.5 lb/100 gal	POST	C
13	Surestart II	4.25 lb/gal	2, 4, 15	2.5 pt/a	PRE	A
	Realm Q	38.75 %w/w	2, 27	4 oz/a	POST	C
	Roundup PowerMax	4.5 lbae/gal	9	30 fl oz/a	POST	C
	Clarity	4 lbae/gal	4	8 fl oz/a	POST	C
	COC			0.5 % v/v	POST	C
	Ammonium Sulfate			8.5 lb/100 gal	POST	C

Adjuvants: NIS=Induce; COC=FS COC Supreme

Results:

Table 1. 2018 end of season weed control (%) and grain yield (bu/A) at Arlington and Janesville, WI.

Trt #	Herbicide Program	Arlington, WI		Janesville, WI	
		Weed control (%)	Grain yield** (bu/A)	Weed control (%)	Grain yield** (bu/A)
1	CHECK	0 D	166 B	0 D	43 C
2	PRE (Bayer)	99 AB	238 A	51 BC	117 B
3	Early-POST (Bayer)	90 C	223 A	86 A	189 A
4	PRE <i>fb</i> POST (Bayer)	100 A	227 A	93 A	200 A
5	PRE <i>fb</i> POST w/residual (Bayer)	100 A	229 A	99 A	190 A
6	PRE (Syngenta)	98 AB	222 A	64 B	155 AB
7	Early-POST (Syngenta)	99 AB	228 A	91 A	180 A
8	PRE <i>fb</i> POST (Syngenta)	98 AB	235 A	96 A	199 A
9	PRE <i>fb</i> POST w/residual (Syngenta)	100 A	234 A	98 A	181 A
10	PRE (Corteva)	93 BC	230 A	38 C	114 B
11	Early-POST (Corteva)	94 AC	235 A	91 A	173 A
12	PRE <i>fb</i> POST (Corteva)	96 AC	225 A	90 A	177 A
13	PRE <i>fb</i> POST w/residual (Corteva)	99 AB	227 A	97 A	175 A

* means within a column followed by the same letter are not different at $P \leq 0.05$.

**yield data were corrected to 15% moisture.

Trial Summary:

1 and 2 pass programs provided good weed control at Arlington (Table 1). At Janesville, a 2 pass program provided best levels of weed control; when comparing the 1 pass systems, an Early-POST program resulted in better weed control than a PRE only program. A more difficult to control weed spectrum is present at Janesville (heavy giant ragweed pressure) compared to Arlington (heavy grass and common lambsquarters pressure), thus, explaining the weed control differences between sites. Overall, no yield advantage was noticed between the 1 pass Early-POST compared to a 2 pass program; however, a 2 pass program resulted in almost complete weed control, thus, reducing weed seed depositions in the seedbank. Weed control across company portfolios was comparable. This study will be replicated in 2019.

Project Goal: Evaluate the weed control and crop safety of PRE herbicide programs in soybeans.

Site Description:	
Location: Arlington, WI	Crop: Soybean
Field #: 453	Variety: AG24X7
Soil type: Plano silt loam	Planting Date: 5/17
% OM: 3.3	Emergence Date: 5/26
pH: 7	Population: 140,000
Fertilization: none	Depth: 1.25 in
Previous crop: Corn	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 25 ft
Weed species: common lambsquarters (CHEAL), common ragweed (AMBEL), velvetleaf (ABUTH), eastern black nightshade (SOLPT), giant foxtail (SETFA)	

Herbicide Application Information:		
Date:	5/17	6/20
Treatment:	PRE	POST
Air Temp (°F):	74	67
2" Soil Temp (°F):	72	66
Soil moisture [surface]:	moist	wet
RH %:	52	86
Cloud cover %	20	100
Wind speed (mph)/direction	6-12/NE	1-4/NE
Rainfall (in) 1 wk after APP:	0.59	0.66
GPA:	15	15
PSI:	17	38
Nozzle:	TTI 11002	TTI 110015
Nozzle spacing (in):	15	20
Boom Height (in):	20	24

Crop and Weed Information at Application:			
	Date:	5/17	6/20*
Soybean	Height (in):	-	-
	Stage:	-	V3/V4
CHEAL	Height (in):	-	1-3
	Density:	-	1-12/m ²
AMBEL	Height (in):	-	1-5
	Density:	-	3-25/m ²
ABUTH	Height (in):	-	1-5
	Density:	-	3-5/m ²
SOLPT	Height (in):	-	1-3
	Density:	-	2-9/m ²
SETFA	Height (in):	-	2-8
	Density:	-	86-140/m ²

*Weed density recorded from untreated checks

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2*	Authority First DF	70% w/w	2, 14	5 oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
3	Authority Assist	4 lb/gal	2, 14	8 fl oz/a	PRE	A
	Anthem Maxx	4.3 lb/gal	14, 15	32 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	8.5 lb/100 gal	POST	B
	AMS				POST	B
4	Authority First DF	70% w/w	2, 14	6.4 oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
5	Authority Elite	7 lb/gal	14, 15	28 fl oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
6	Authority Supreme	4.16 lb/gal	14, 15	7 fl oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
7	Authority MTZ	45% w/w	5, 14	14 oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
8*	Authority First DF	70% w/w	2, 14	5 oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
9	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
10	Fierce	76% w/w	14, 15	3 oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
11	Boundary	6.5 lb/gal	5, 15	29 fl oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
12	Tricor DF	75% w/w	5	4 oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B

*Treatments 2 and 8 are the same due to an application error.

Trial Summary:

This trial evaluated the weed control and crop safety of FMC's Authority herbicide brands. There was no significant herbicide injury from the PRE herbicides evaluated. The POST treatment of Anthem Maxx (treatment 3) resulted in minor leaf necrosis (4.5%) 14 days after application (data not shown). All of the PRE herbicides provided excellent common lambsquarters control (>95%) throughout the entire season (data not shown). Only Tricor (treatment 12) failed to control eastern black nightshade, as average control was 25% 34 days after treatment. Common ragweed, velvetleaf, and giant foxtail control varied at 21 and 34 days after the PRE application (Figures 21, 22, 23). Broadleaf and grass weed densities at the time of POST application also varied among the PRE herbicides (Figure 24). The POST application of glyphosate was effective at controlling all weed species as control was greater than or equal to 95% 28 days after application. Soybean yield did not differ among the herbicide treatments (data not shown). Yield across all herbicide treatments was 63 bu/acre, while the untreated check was 19 bu/acre, a 70% reduction.

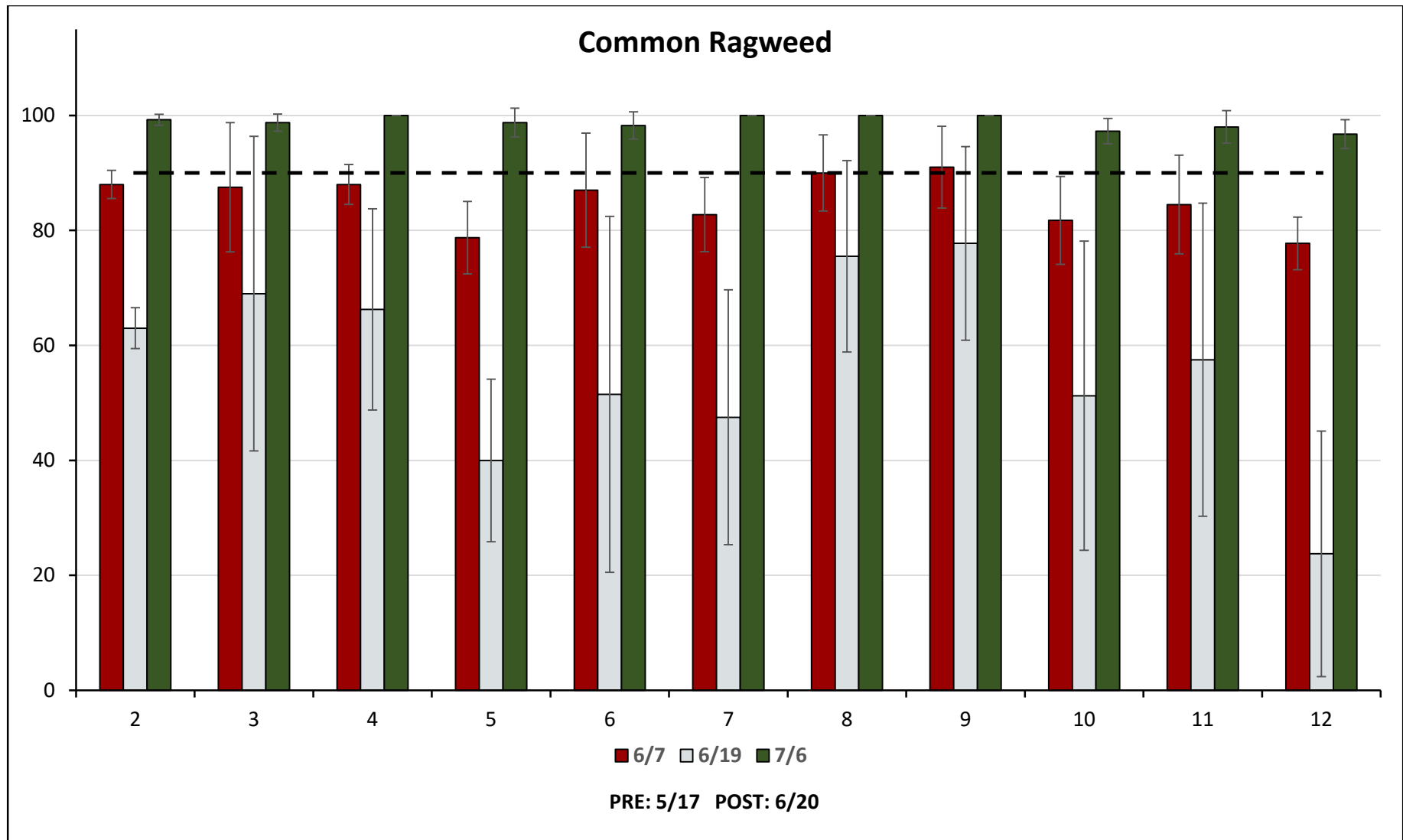


Figure 21. Common ragweed efficacy ratings for trial #18-ARL-SB06. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

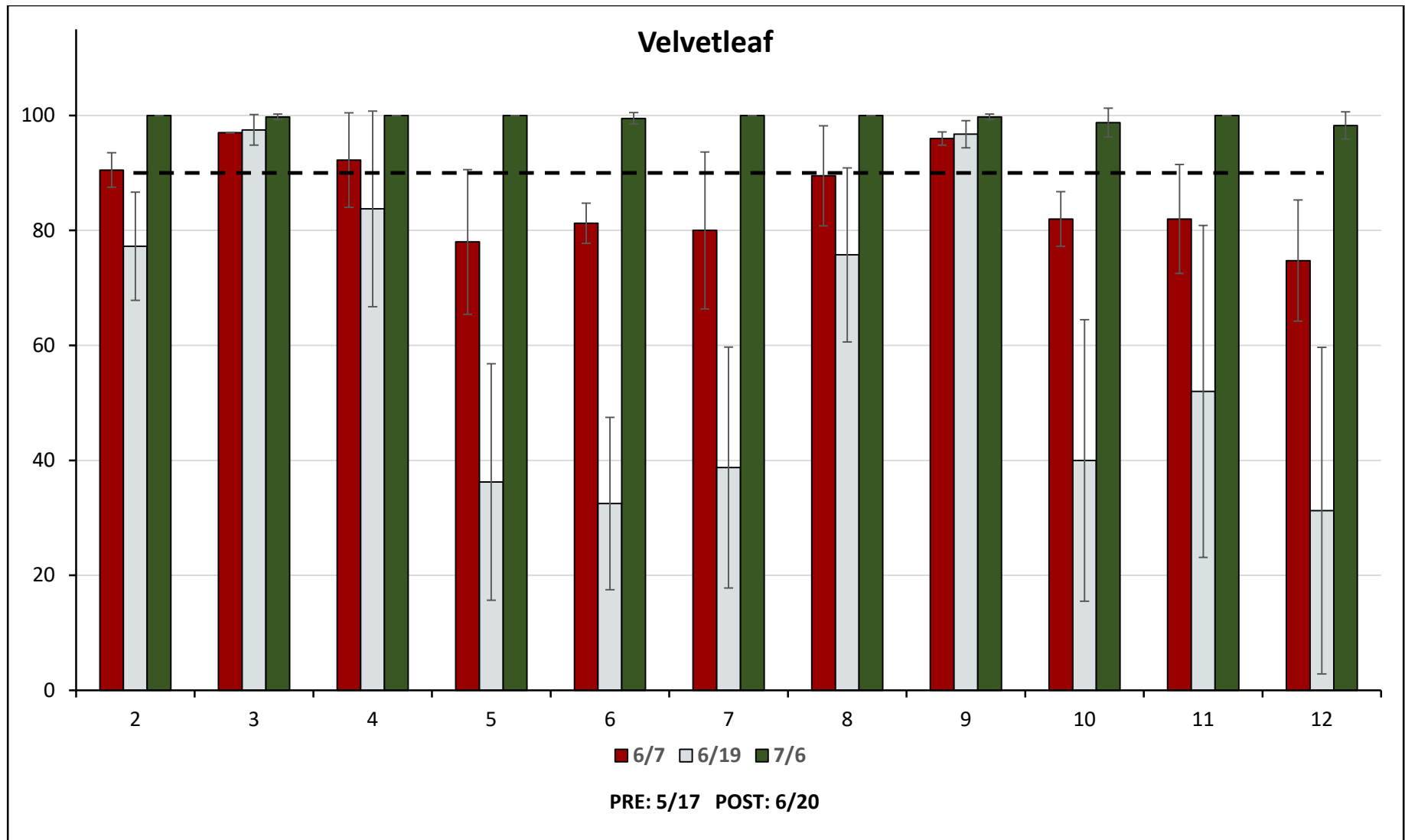


Figure 22. Velvetleaf efficacy ratings for trial #18-ARL-SB06. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

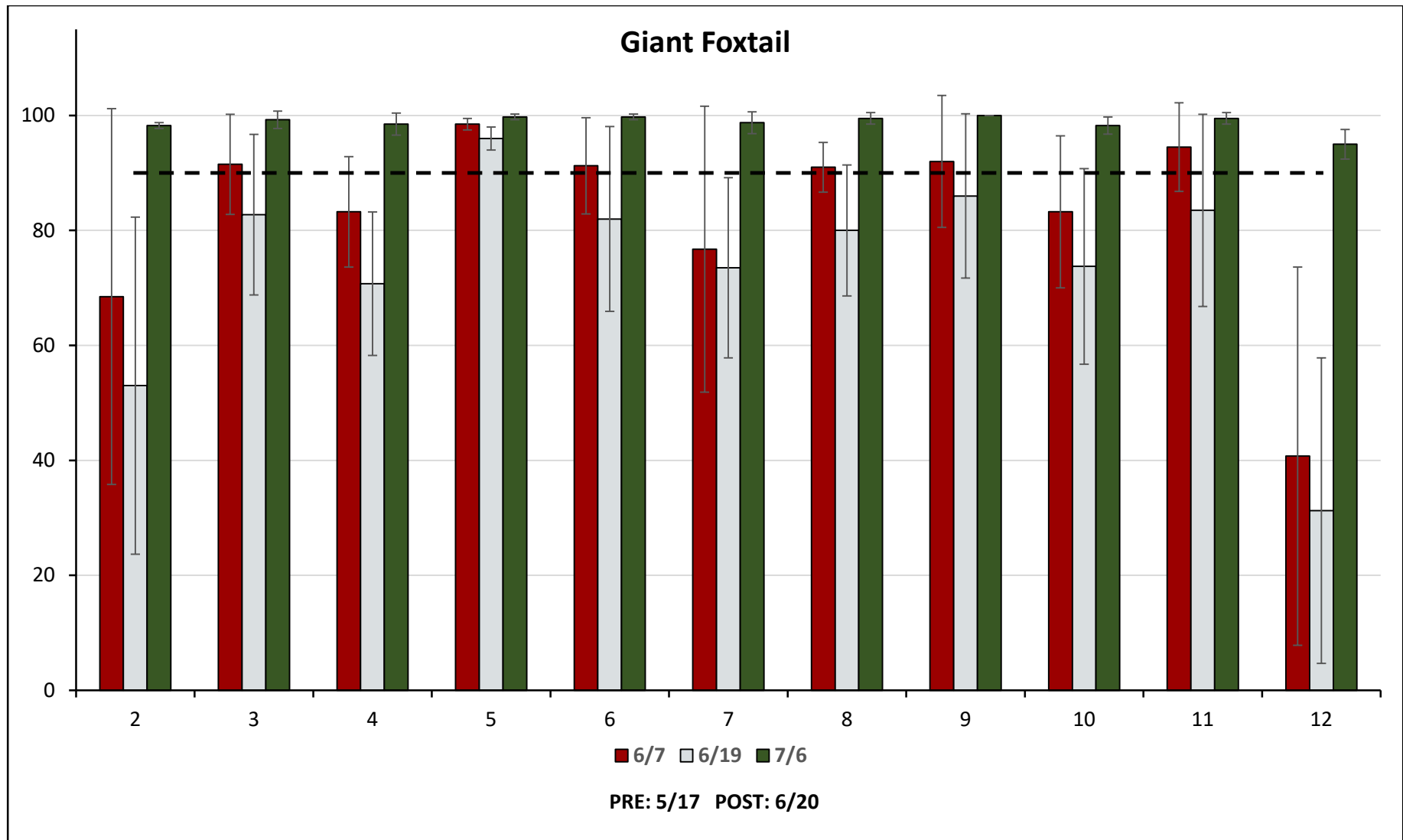


Figure 23. Giant foxtail efficacy ratings for trial #18-ARL-SB06. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

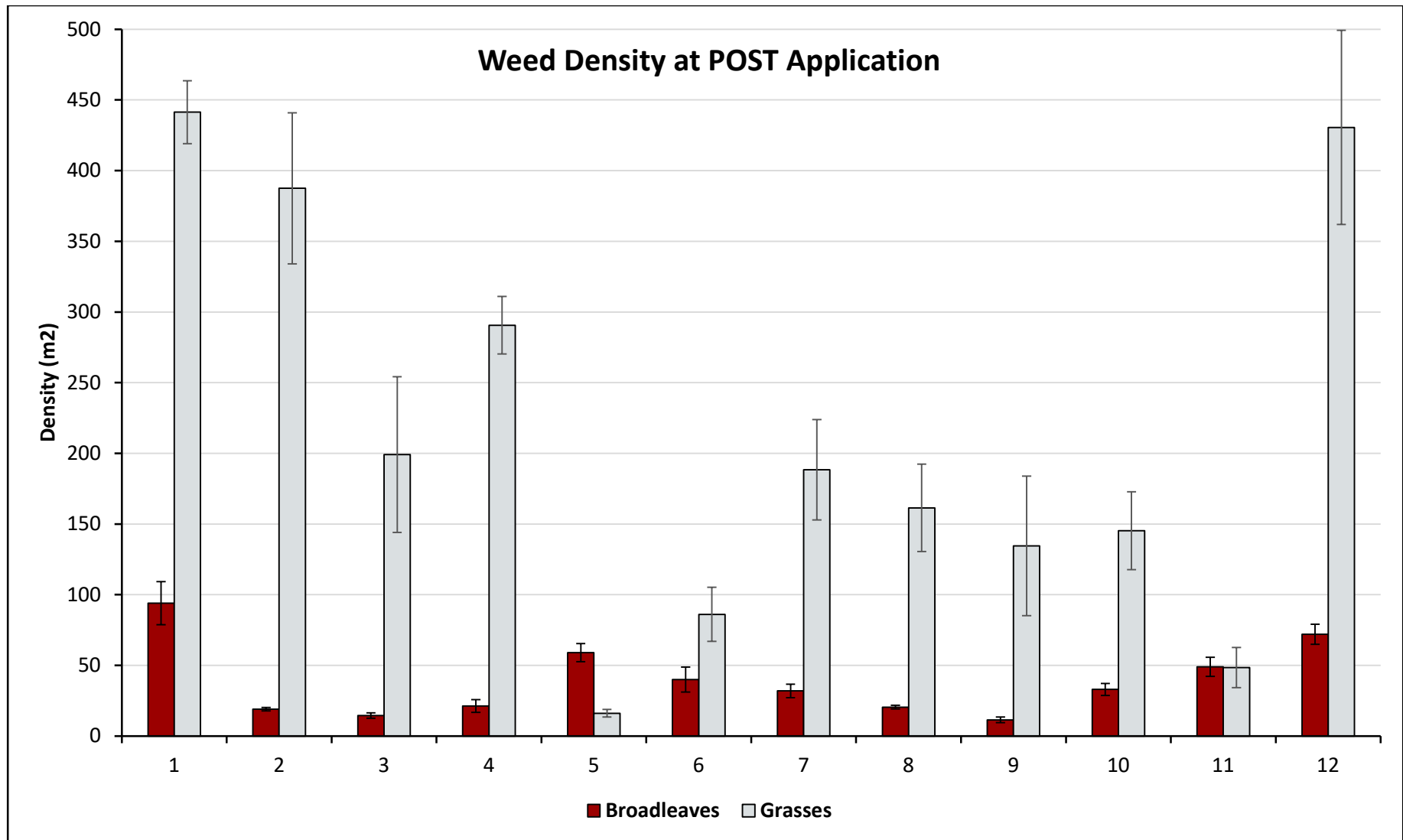


Figure 24. Total broadleaf and grass weed density at the POST application. Bars indicate the total weed density in plants/m² ± the standard deviation of four replications following PRE herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number.

Project Goal: Compare the weed control and crop safety of Anthem Maxx to industry standard PRE herbicide programs.

Site Description:

Location: Lancaster, WI	Crop: Soybean
Field #: -	Variety: AG21X7
Soil type: Fayette silt loam	Planting Date: 5/24
% OM: 2.4	Emergence Date: 5/29
pH: 7.3	Population: 145,000
Fertilization: none	Depth: 1.25 in
Previous crop: Corn	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 30 ft
Weed species: common waterhemp (AMATU), common lambsquarters (CHEAL)	

Herbicide Application Information:

Date:	5/25	6/22
Treatment:	PRE	POST
Air Temp (°F):	80	72
2" Soil Temp (°F):	73	66
Soil moisture [surface]:	dry	wet
RH %:	62	73
Cloud cover %	40	80
Wind speed (mph)/direction	3-4/NNW	4-7/NE
Rainfall (in) 1 wk after APP:	0.83	0.15
GPA:	15	15
PSI:	19	23
Nozzle:	XR 11002	TTI 110015
Nozzle spacing (in):	20	20
Boom Height (in):	20	23

Crop and Weed Information at Application:

	Date:	5/25	6/22
Soybean	Height (in):	-	6.5
	Stage:	-	V3
AMATU*	Height (in):	-	2
	Density:	-	3/ft ²
CHEAL	Height (in):	-	1.5
	Density:	-	3/ft ²

*waterhemp population density was variable within the trial area

Trial Summary:

There was minor soybean injury (<5%) from the PRE herbicides evaluated 20 and 28 days after application (data not shown). Observed symptoms were leaf drawstringing and plant stunting. Waterhemp and common lambsquarters control varied at 20 days after the PRE application (Figures 25, 26). The addition of Tricor DF to Anthem Maxx improved common lambsquarters control. The POST application of glyphosate was effective at controlling both waterhemp and common lambsquarters as control was greater than or equal to 98% 14 days after application. Soybean yield was not taken.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Anthem Maxx	4.3 lb/gal	14, 15	3.25 fl oz/a	PRE	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	
3	Anthem Maxx	4.3 lb/gal	14, 15	4 fl oz/a	PRE	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	
4	Anthem Maxx	4.3 lb/gal	14, 15	3.25 fl oz/a	PRE	
	Tricor DF	75% w/w	5	6 oz/a	PRE	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	
5	Anthem Maxx	4.3 lb/gal	14, 15	4 fl oz/a	PRE	
	Tricor DF	75% w/w	5	6 oz/a	PRE	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	
6	Anthem Maxx	4.3 lb/gal	14, 15	3.25 fl oz/a	PRE	
	Anthem Maxx	4.3 lb/gal	14, 15	2.5 fl oz/a	POST	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	
7	Boundary	6.5 lb/gal	5, 15	29 fl oz/a	PRE	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	
8	Zidua PRO	4.09 lb/gal	2, 14, 15	6 fl oz/a	PRE	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	
9	Prefix	5.29 lb/gal	14, 15	32 fl oz/a	PRE	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	
10	Outlook	6 lb/gal	15	14 fl oz/a	PRE	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	
11	Warrant	3 lb/gal	15	48 fl oz/a	PRE	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	
12	Tricor DF	75% w/w	5	6 oz/a	PRE	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	
13	Authority First DF	70% w/w	2, 14	6.4 oz/a	PRE	
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	
	AMS			8.5 lb/100 gal	POST	

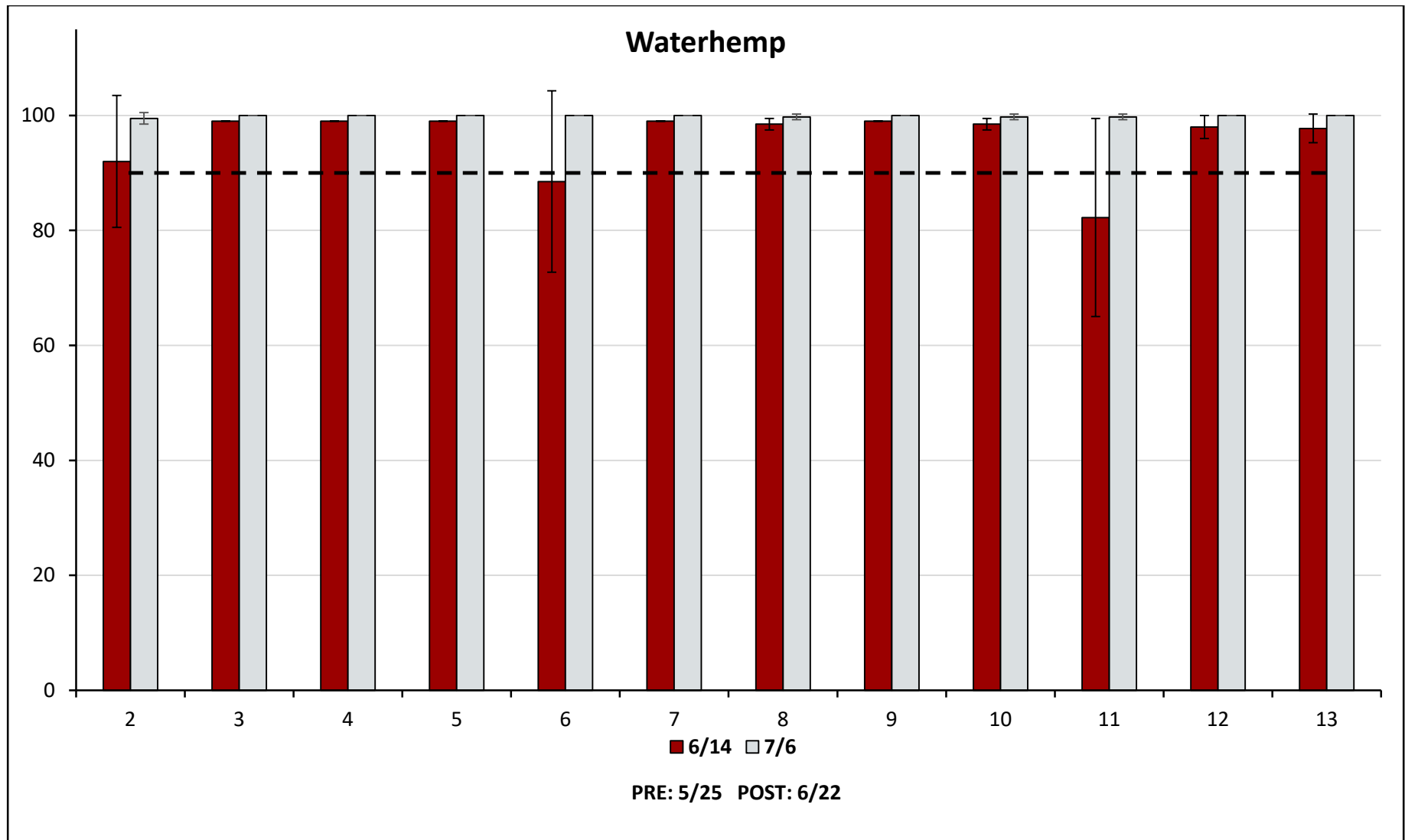


Figure 25. Waterhemp efficacy ratings for trial #18-LAN-SB07. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

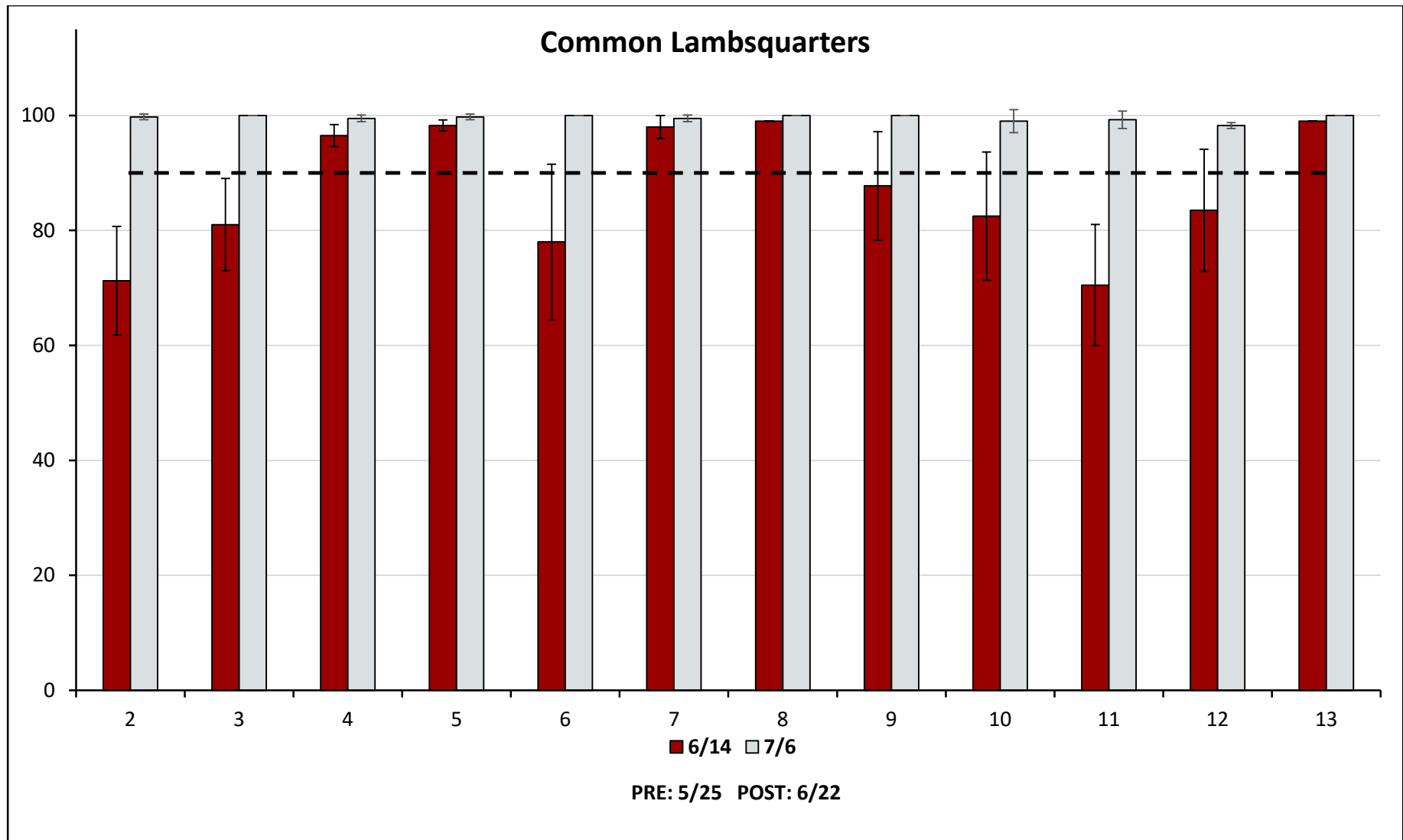


Figure 26. Common lambsquarters efficacy ratings for trial #18-LAN-SB07. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

Project Goal: Evaluate the efficacy and crop safety of Fierce and other industry standard PRE herbicides in Liberty Link soybeans.

Site Description:

Location: Arlington, WI	Crop: Soybean
Field #: 453	Variety: Stine 21LH02 (Liberty Link)
Soil type: Plano silt loam	Planting Date: 5/16
% OM: 3.3	Emergence Date: 5/26
pH: 7	Population: 140,000
Fertilization: none	Depth: 1.25 in
Previous crop: Corn	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 25 ft
Weed species: common lambsquarters (CHEAL), velvetleaf (ABUTH), eastern black nightshade (SOLPT), giant foxtail (SETFA)	

Herbicide Application Information:

Date:	5/17	6/12	6/23
Treatment:	PRE	EPOST	POST
Air Temp (°F):	72	80	81
2" Soil Temp (°F):	65	80	72
Soil moisture [surface]:	moist	moist	wet
RH %:	55	68	74
Cloud cover %	10	100	0
Wind speed (mph)/direction	5-10/NE	1-4/WSW	0-4/N
Rainfall (in) 1 wk after APP:	0.59	2.15	0.41
GPA:	15	15	15
PSI:	18	33	35
Nozzle:	XR 11002	TTI 110015	TTI 110105
Nozzle spacing (in):	15	20	20
Boom Height (in):	20	22	24

Crop and Weed Information at Application:

	Date:	5/17	6/12	6/23
Soybean	Height (in):	-	3-5	7-8
	Stage:	-	V1	V4
CHEAL	Height (in):	-	1-3	1-3
	Density:	-	7-9/m ²	
ABUTH*	Height (in):	-	1-3	2-4
	Density:	-	0-7/m ²	
SOLPT	Height (in):	-	1-3	-
	Density:	-	0-10/m ²	-
SETFA	Height (in):	-	1-5	3-9
	Density:	-	6-86/m ²	

*velvetleaf population density was variable within the trial area

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Liberty 280	2.34 lb/gal	10	29 fl oz/a	EPOST	B
	AMS			2.5 lb/a	EPOST	B
	Liberty 280	2.34 lb/gal	10	29 fl oz/a	POST	C
	Select Max	1 lb/gal	1	6 fl oz/a	POST	C
	NIS			0.25% v/v	POST	C
	AMS			2.5 lb/a	POST	C
3	Fierce	76% w/w	14, 15	3 oz/a	PRE	A
	Liberty 280	2.34 lb/gal	10	29 fl oz/a	POST	C
	Select Max	1 lb/gal	1	6 fl oz/a	POST	C
	NIS			0.25% v/v	POST	C
	AMS			2.5 lb/a	POST	C
	4	Boundary	6.5 lb/gal	5, 15	2 pt/a	PRE
Liberty 280		2.34 lb/gal	10	29 fl oz/a	POST	C
Select Max		1 lb/gal	1	6 fl oz/a	POST	C
NIS				0.25% v/v	POST	C
AMS				2.5 lb/a	POST	C
5		Authortity Elite	7 lb/gal	14, 15	25 fl oz/a	PRE
	Liberty 280	2.34 lb/gal	10	29 fl oz/a	POST	C
	Select Max	1 lb/gal	1	6 fl oz/a	POST	C
	NIS			0.25% v/v	POST	C
	AMS			2.5 lb/a	POST	C
	6	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz	PRE
Liberty 280		2.34 lb/gal	10	29 fl oz/a	POST	C
Select Max		1 lb/gal	1	6 fl oz/a	POST	C
NIS				0.25% v/v	POST	C
AMS				2.5 lb/a	POST	C
7		Fierce MTZ	2.64 lb/gal	5, 14, 15	1 pt/a	PRE
	Liberty 280	2.34 lb/gal	10	29 fl oz/a	POST	C
	Select Max	1 lb/gal	1	6 fl oz/a	POST	C
	NIS			0.25% v/v	POST	C
	AMS			2.5 lb/a	POST	C
	8	Fierce	76% w/w	14, 15	3.75 oz/a	PRE
Liberty 280		2.34 lb/gal	10	29 fl oz/a	POST	C
Select Max		1 lb/gal	1	6 fl oz/a	POST	C
NIS				0.25% v/v	POST	C
AMS				2.5 lb/a	POST	C
9		Authority Supreme	4.16 lb/gal	14, 15	6 fl oz/a	PRE
	Liberty 280	2.34 lb/gal	10	29 fl oz/a	POST	C
	Select Max	1 lb/gal	1	6 fl oz/a	POST	C
	NIS			0.25% v/v	POST	C
	AMS			2.5 lb/a	POST	C

Adjuvants: NIS=Induce

Trial Summary:

There was no observable soybean injury from the PRE herbicides 21 and 28 days after application. The POST Liberty application caused 8-9% leaf bronzing/necrosis and minor stunting 5 days after application (data not shown). Soybeans recovered by 19 days after application as injury was <2%. All herbicide treatments were effective at controlling common lambsquarters and eastern black nightshade throughout the entire season (>95% control at all ratings). Velvetleaf and giant foxtail control varied at 21 and 28 days after the PRE application (Figures 27, 28). The POST application of Liberty and Select was effective at controlling all weeds not controlled by the PRE herbicides. as control of all species was greater than 98% 19 days after application. Soybean yield did not differ among the herbicide treatments (data not shown). Yield across all herbicide treatments was 56 bu/acre, while the untreated check was 31 bu/acre, a 45% reduction.

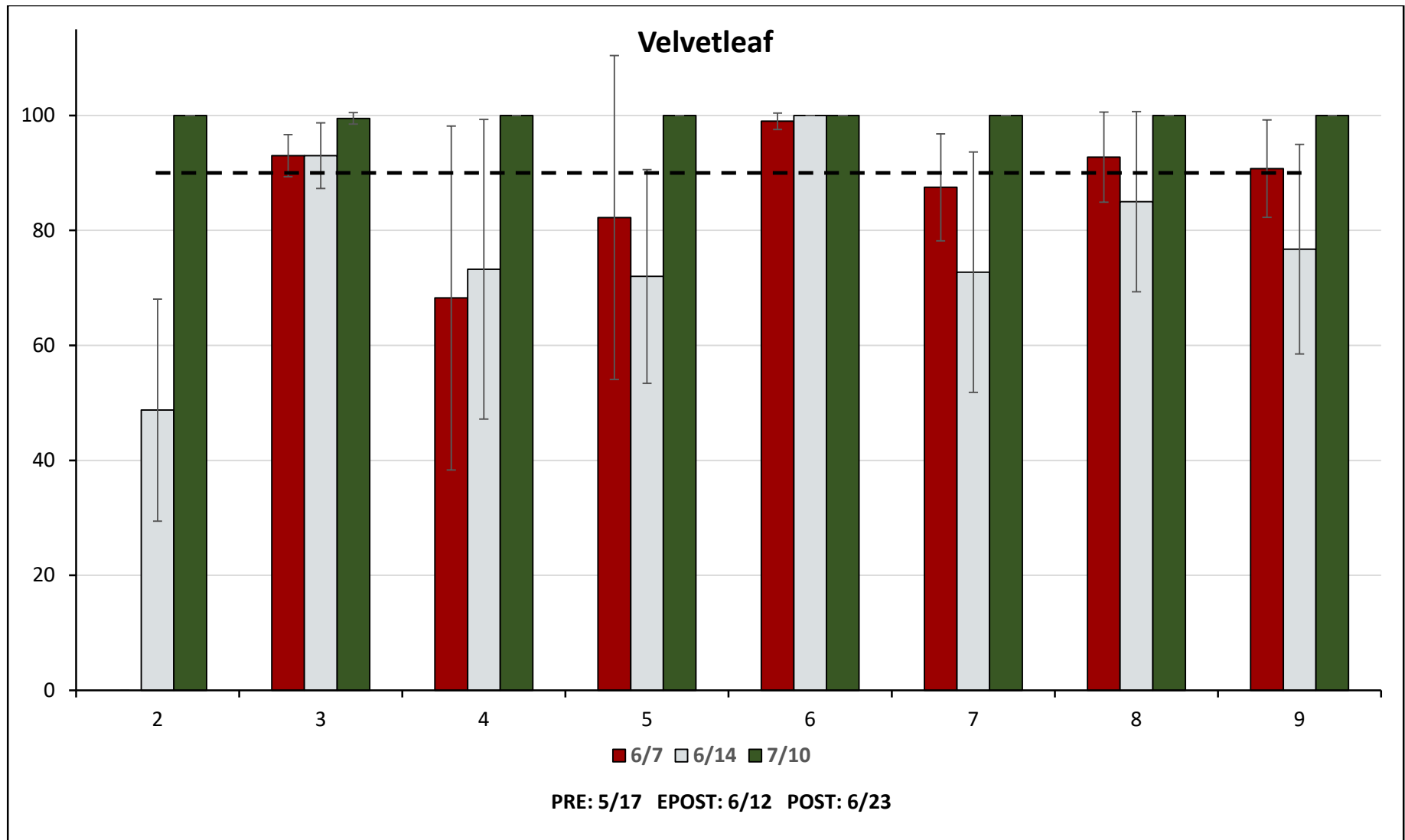


Figure 27. Velvetleaf efficacy ratings for trial #18-ARL-SB08. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

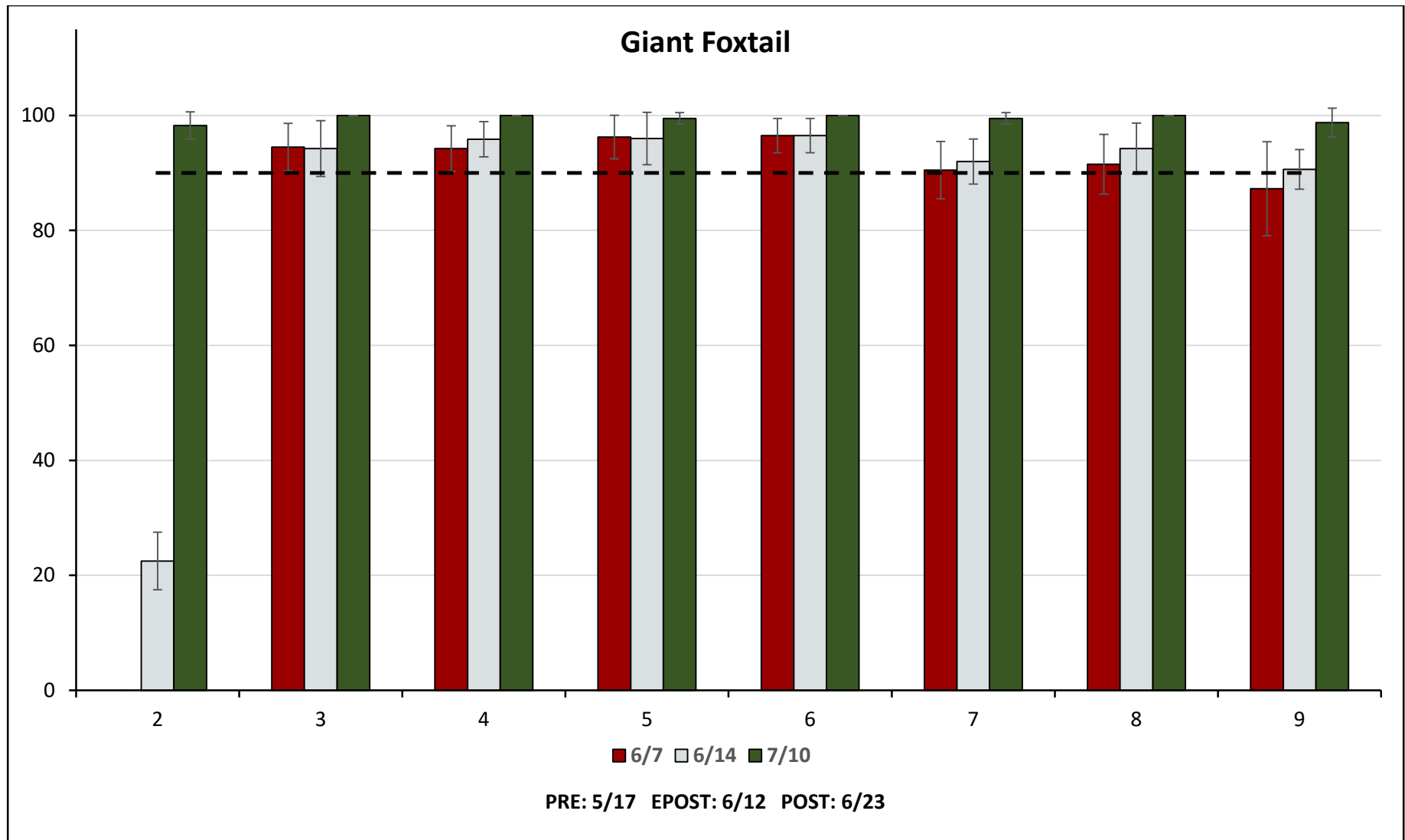


Figure 28. Giant foxtail efficacy ratings for trial #18-ARL-SB08. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

Project Goal: Evaluate the weed control and crop safety of multiple Balance Bean herbicide tank mixes in isoxaflutole tolerant soybeans.

Site Description:

Location: Arlington, WI	Crop: Soybean (isoxaflutole tolerant)
Field #: 361	Variety: Stine 19BA23
Soil type: Plano silt loam	Planting Date: 5/18
% OM: 3.2	Emergence Date: 5/27
pH: 5.6	Population: 140,000
Fertilization: none	Depth: 1.25 in
Previous crop: Corn	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 30 ft
Weed species: common lambsquarters (CHEAL), common ragweed (AMBEL), velvetleaf (ABUTH), redroot pigweed (AMARE), giant foxtail (SETFA), yellow foxtail (SETPU)	

Herbicide Application Information:

Date:	5/21	6/22
Treatment:	PRE	POST
Air Temp (°F):	52	74
2" Soil Temp (°F):	56	78
Soil moisture [surface]:	damp	wet
RH %:	95	68
Cloud cover %	100	90
Wind speed (mph)/direction	5-8/E	3-9/NE
Rainfall (in) 1 wk after APP:	0.41	0.4
GPA:	15	15
PSI:	16	20
Nozzle:	XR 11002	TTI 110015
Nozzle spacing (in):	15	15
Boom Height (in):	18	22

Crop and Weed Information at Application:

	Date:	5/21	6/22
Soybean	Height (in):	-	7
	Stage:	-	V4
CHEAL	Height (in):	-	1-4
	Density:	-	heavy
AMBEL	Height (in):	-	2-5
	Density:	-	heavy
ABUTH*	Height (in):	-	2-4
	Density:	-	light
AMARE	Height (in):	-	2-3
	Density:	-	moderate
SETFA/SETPU	Height (in):	-	4-7
	Density:	-	heavy

*velvetleaf population density was variable within the trial area

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Balance Bean	4 lb/gal	27	3 fl oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
3	Balance Bean	4 lb/gal	27	3 fl oz/a	PRE	A
	Valor SX	51% w/w	14	2 oz/a	PRE	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
4	Balance Bean	4 lb/gal	27	3 fl oz/a	PRE	A
	Outlook	6 lb/gal	15	12 fl oz/a	PRE	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
5	Balance Bean	4 lb/gal	27	3 fl oz/a	PRE	A
	Zidua	85% w/w	15	1.5 oz/a	PRE	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
6	Balance Bean	4 lb/gal	27	3 fl oz/a	PRE	A
	Tricor DF	75% w/w	5	5.33 oz/a	PRE	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
7	Sonic	70% w/w	2, 14	6.45 oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
8	Balance Bean	4 lb/gal	27	3 fl oz/a	PRE	A
	Anthem Maxx	4.3 lb/gal	14, 15	2.5 fl oz/a	PRE	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
9	Balance Bean	4 lb/gal	27	3 fl oz/a	PRE	A
	Boundary	6.5 lb/gal	5, 15	2 pt/a	PRE	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			8.5 lb/100 gal	POST	B
10	Authority First DF	70% w/w	2, 14	5 oz/a	PRE	A

Trial Summary:

This trial evaluated the weed control and crop safety of Balance Bean tank mixes in Balance GT soybeans (pending EPA approval). The Balance GT trait confers resistance to isoxaflutole (PRE applications only) and glyphosate. Minor soybean injury was observed at 14 and 31 days after the PRE application (Figure 31). Balance Bean herbicide provided excellent control of common lambsquarters, redroot pigweed, velvetleaf, and common ragweed (Figure 29). Balance Bean also provided good giant and yellow foxtail control 31 DAT-A (Figure 30). However, the addition of another herbicide to the mix did improve overall control, particularly of yellow foxtail. The POST application of glyphosate was effective at controlling all weeds not controlled by the PRE. Soybean yield was not taken.

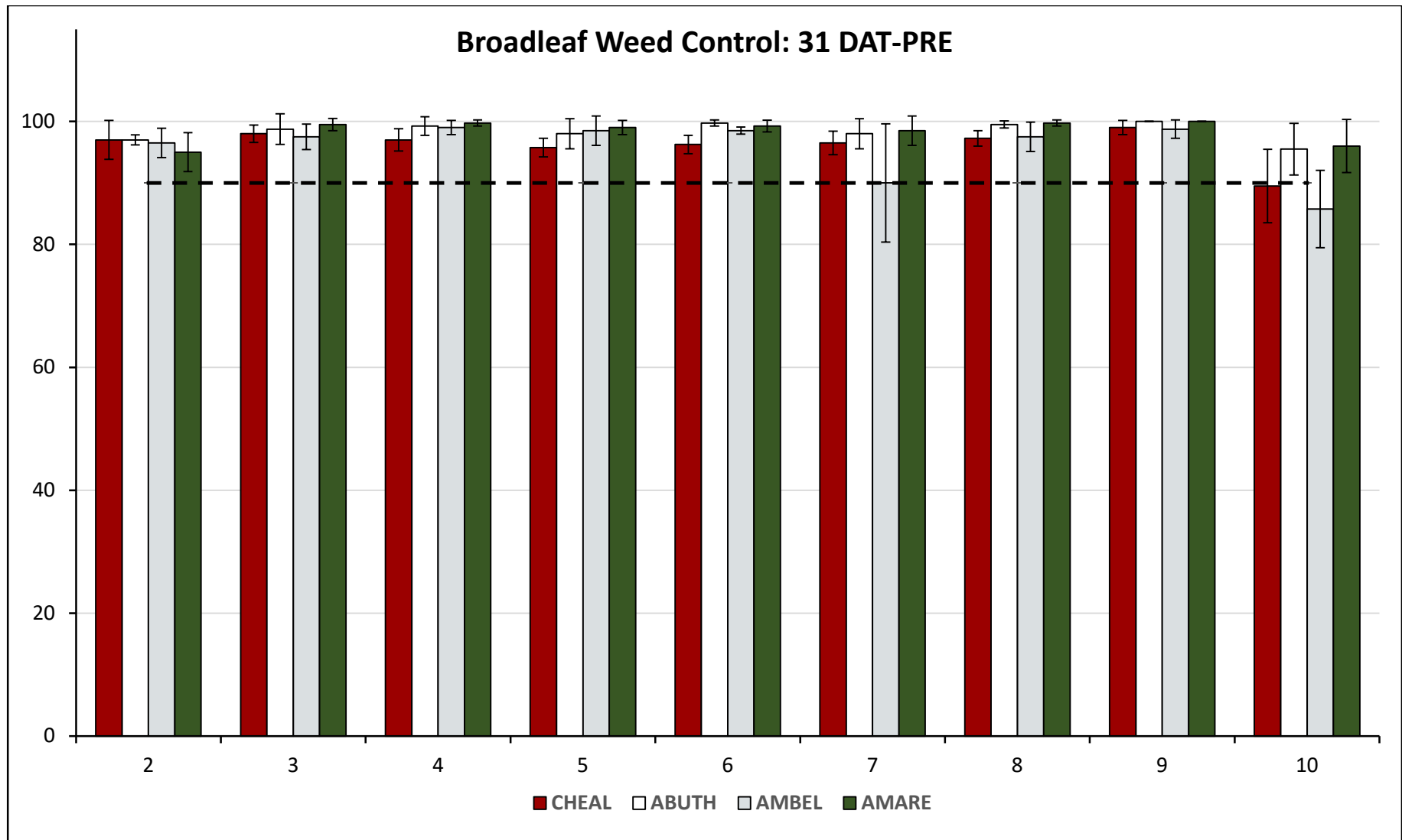


Figure 29. Broadleaf efficacy ratings for trial #18-ARL-SB09. Bars or color coded by weed species and indicate the average % control \pm the standard deviation of four replications 31 days after the PRE application. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

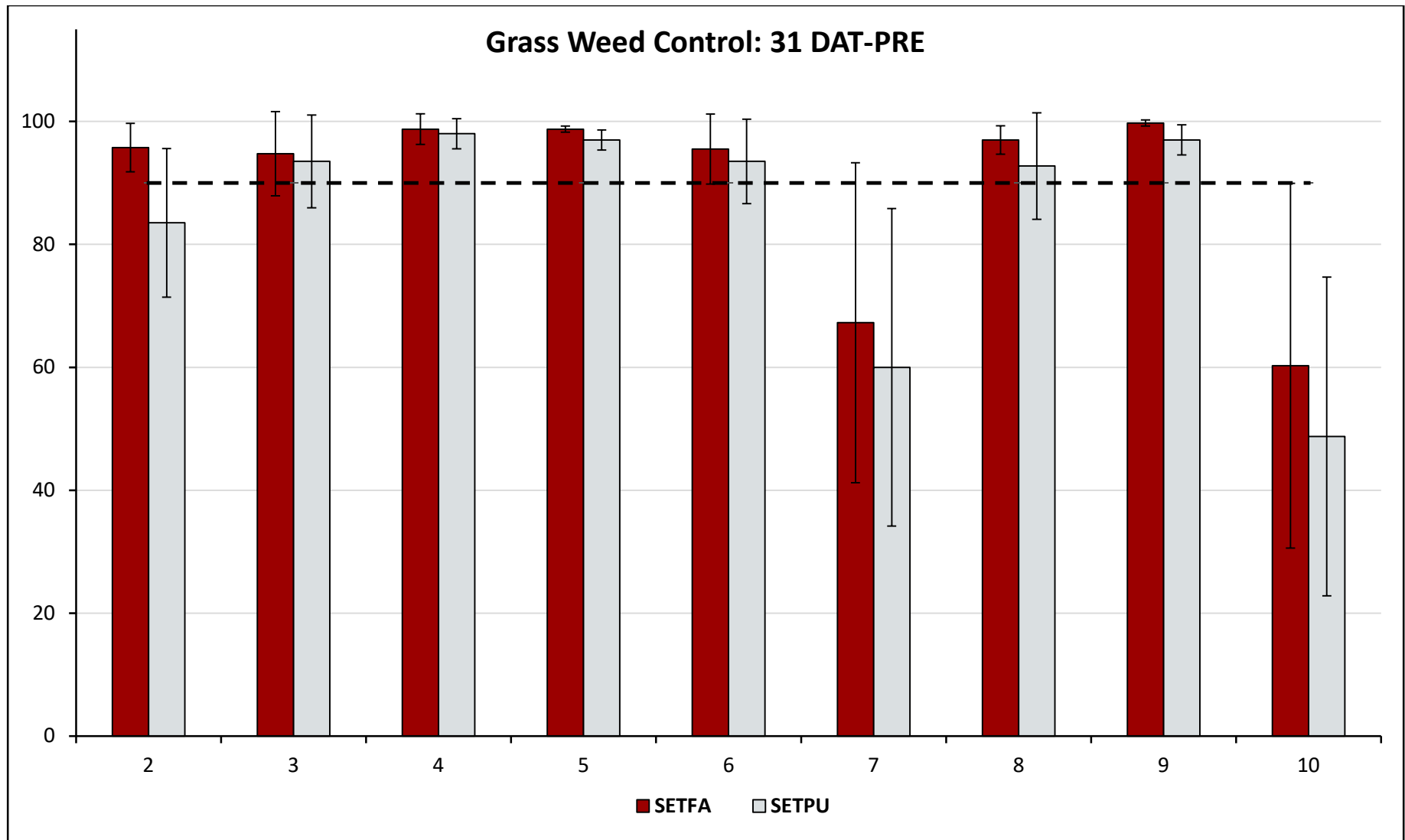


Figure 30. Grass efficacy ratings for trial #18-ARL-SB09. Bars or color coded by weed species and indicate the average % control \pm the standard deviation of four replications 31 days after the PRE application. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

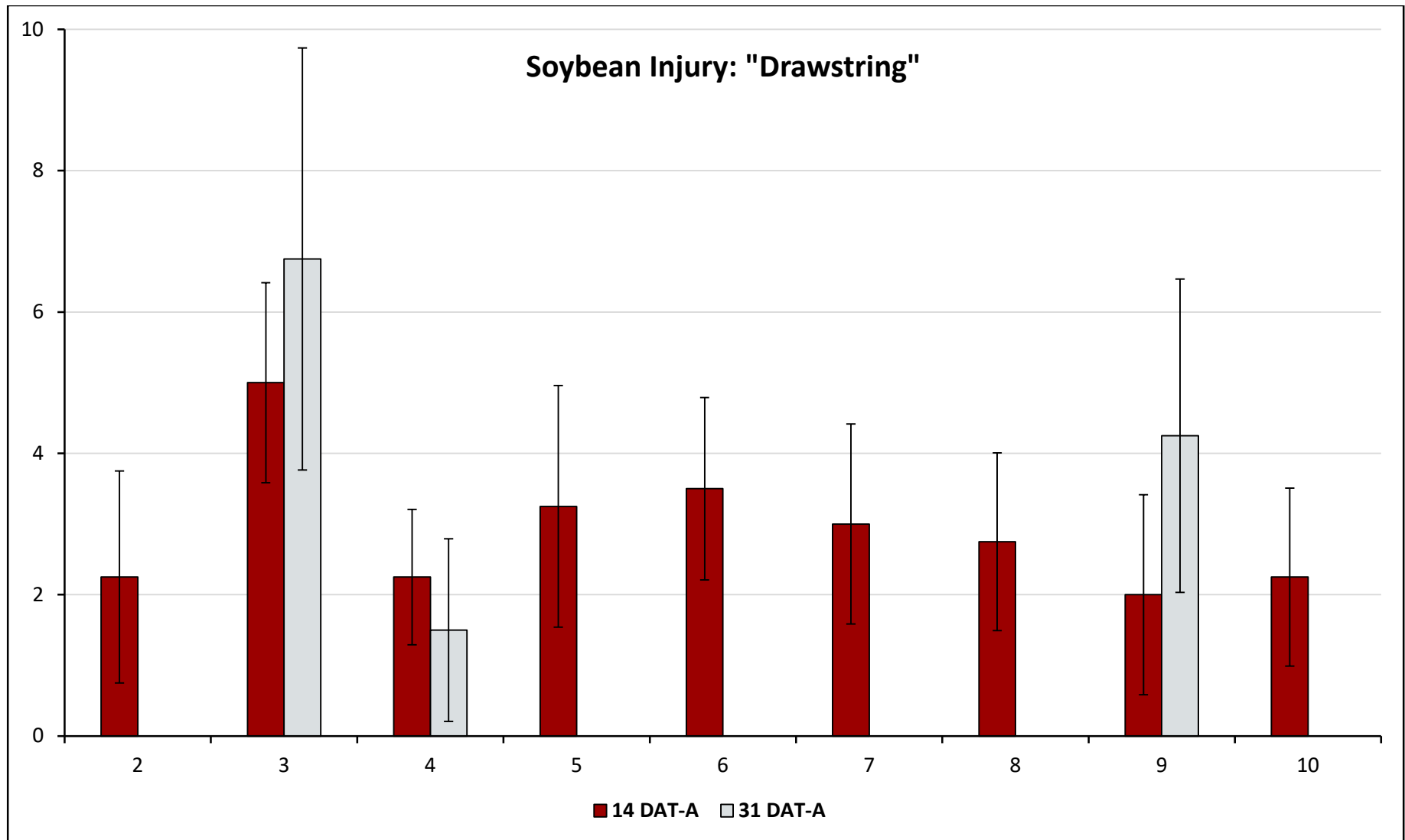


Figure 31. Soybean injury ratings for trial #18-ARL-SB09. Bars indicate the average % soybean leaf drawstringing \pm the standard deviation of four replications on 6/4 and 6/21, 14 and 31 days after the PRE application. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number.

Project Goal: Evaluate the weed control and crop safety of Corteva layered residual herbicide programs in dicamba tolerant soybeans.

Site Description:

Location: Arlington, WI	Crop: Soybean
Field #: 453	Variety: P15A63X
Soil type: Plano silt loam	Planting Date: 5/16
% OM: 3.3	Emergence Date: 5/26
pH: 7	Population: 140,000
Fertilization: none	Depth: 1.25 in
Previous crop: Corn	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 25 ft
Weed species: common lambsquarters (CHEAL), common ragweed (AMBEL), velvetleaf (ABUTH), eastern black nightshade (SOLPT), giant foxtail (SETFA)	

Herbicide Application Information:

Date:	5/17	6/20
Treatment:	PRE	POST
Air Temp (°F):	74	67
2" Soil Temp (°F):	72	66
Soil moisture [surface]:	moist	wet
RH %:	52	86
Cloud cover %	20	100
Wind speed (mph)/direction	6-12/NE	1-4/NE
Rainfall (in) 1 wk after APP:	0.59	0.66
GPA:	15	15
PSI:	17	38
Nozzle:	TTI 11002	TTI 110015
Nozzle spacing (in):	15	20
Boom Height (in):	20	24

Crop and Weed Information at Application:

	Date:	5/17	6/20*
Soybean	Height (in):	-	
	Stage:	-	V3/V4
CHEAL	Height (in):	-	1-2
	Density:	-	4-8/m ²
AMBEL	Height (in):	-	2-8
	Density:	-	1-5/m ²
ABUTH	Height (in):	-	1-4
	Density:	-	1-3/m ²
SOLPT	Height (in):	-	1-2
	Density:	-	1-7/m ²
SETFA	Height (in):	-	3-8
	Density:	-	15-107/m ²

*Weed density recorded from untreated checks

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Sonic	70% w/w	2, 14	5 oz/a	PRE	A
	Durango DMA	4 lbae/gal	9	32 fl oz/a	POST	B
	Flexstar	1.88 lb/gal	14	12 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
2	Enlite	47.86% w/w	2, 14	2.8 oz/a	PRE	A
	Durango DMA	4 lbae/gal	9	32 fl oz/a	POST	B
	Flexstar	1.88 lb/gal	14	12 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
3	Afforia	50.8% w/w	2, 14	2.5 oz/a	PRE	A
	Durango DMA	4 lbae/gal	9	32 fl oz/a	POST	B
	EverpreX	7.6 lb/gal	15	1 pt/a	POST	B
	AMS			2.5% v/v	POST	B
4	Surveil	48% w/w	2, 14	3.5 oz/a	PRE	A
	Durango DMA	4 lbae/gal	9	32 fl oz/a	POST	B
	EverpreX	7.6 lb/gal	15	1 pt/a	POST	B
	AMS			2.5% v/v	POST	B
5	Sonic	70% w/w	2, 14	5 oz/a	PRE	A
	FeXapan	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Abundit Edge	4.5 lbae/gal	9	28 fl oz/a	POST	B
	EverpreX	7.6 lb/gal	15	1 pt/a	POST	B
	Intact			0.5% v/v	POST	B
6	Enlite	47.86% w/w	2, 14	2.8 oz/a	PRE	A
	FeXapan	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Abundit Edge	4.5 lbae/gal	9	28 fl oz/a	POST	B
	EverpreX	7.6 lb/gal	15	1 pt/a	POST	B
	Intact			0.5% v/v	POST	B
7	Afforia	50.8% w/w	2, 14	2.5 oz/a	PRE	A
	FeXapan	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Abundit Edge	4.5 lbae/gal	9	28 fl oz/a	POST	B
	EverpreX	7.6 lb/gal	15	1 pt/a	POST	B
	Intact			0.5% v/v	POST	B
8	Surveil	48% w/w	2, 14	3.5 oz/a	PRE	A
	FeXapan	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Abundit Edge	4.5 lbae/gal	9	28 fl oz/a	POST	B
	EverpreX	7.6 lb/gal	15	1 pt/a	POST	B
	Intact			0.5% v/v	POST	B
9	Untreated Check					

Adjuvants: AMS=Amsol, DRA=Intact

Trial Summary:

There was no observable soybean injury from the PRE herbicides 21 and 33 days after application. The POST treatments caused varying levels of leaf necrosis at 13 days after application (data not shown). Treatments containing Flexstar showed more injury (7-10% necrosis) than the other POST applied herbicides (2-6% necrosis). Soybeans recovered by 28 days after application as no significant injury was observed. All herbicide treatments were effective at controlling common lambsquarters and eastern black nightshade throughout the entire season (>97% control at all ratings). Velvetleaf, common ragweed, and giant foxtail control varied at 21 and 33 days after the PRE application (Figures 32, 33, 34). All POST applications were effective at controlling all weeds not controlled by the PRE herbicides. POST control was greater than 99% for all species at 13 and 28 days after application (data not shown). Adding an additional residual herbicide to the tank at the POST application was likely not necessary given the weed species in the trial. Layering residual herbicides may be more beneficial in a field with more difficult to control weeds, like waterhemp. Soybean yield did not differ among the herbicide treatments (data not shown). Yield across all herbicide treatments was 63 bu/acre, while the untreated check was 27 bu/acre, a 57% reduction.

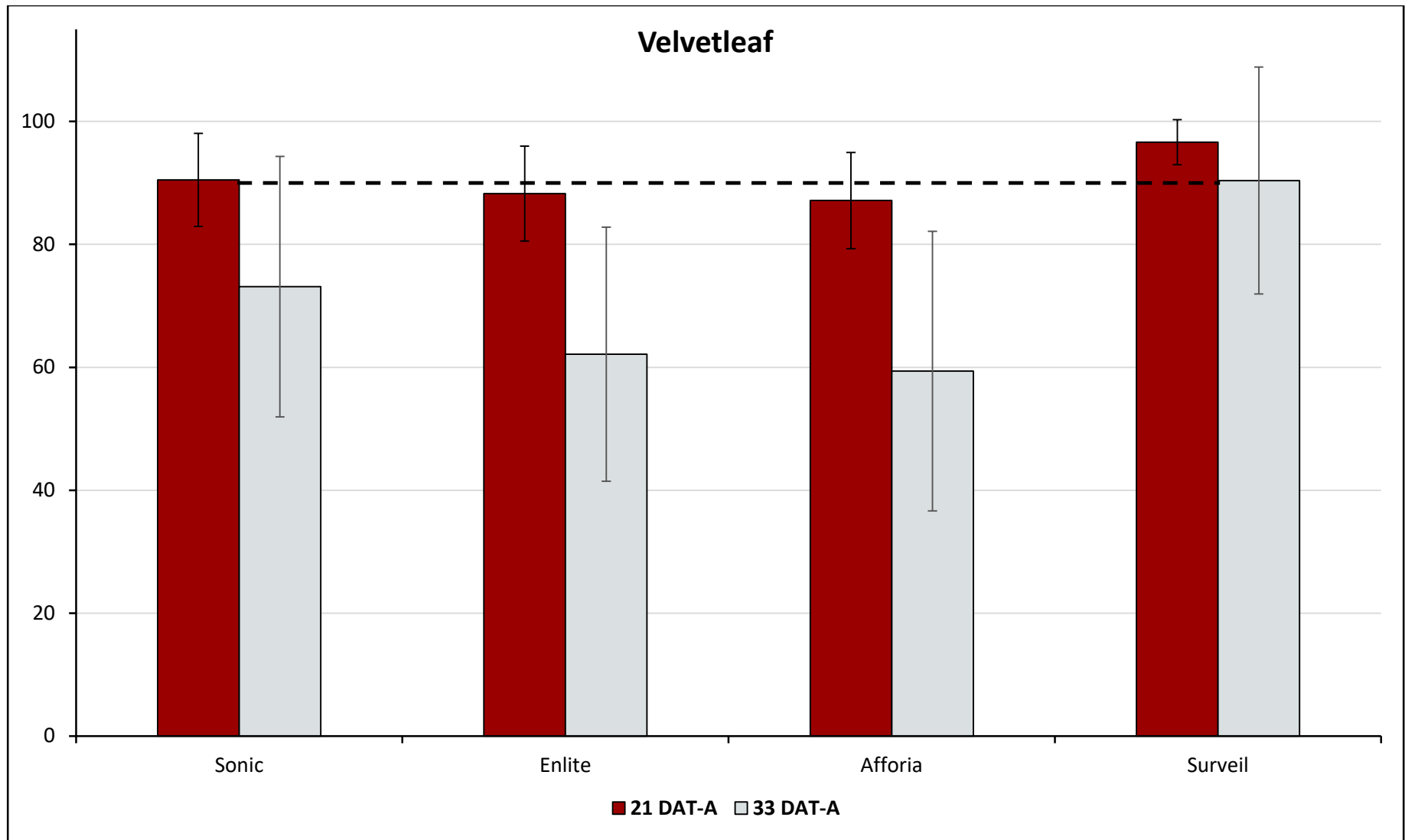


Figure 32. Velvetleaf efficacy ratings for trial #18-ARL-SB12. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. The PRE herbicides applied are listed along the x axis. The dashed line indicates 90% control.

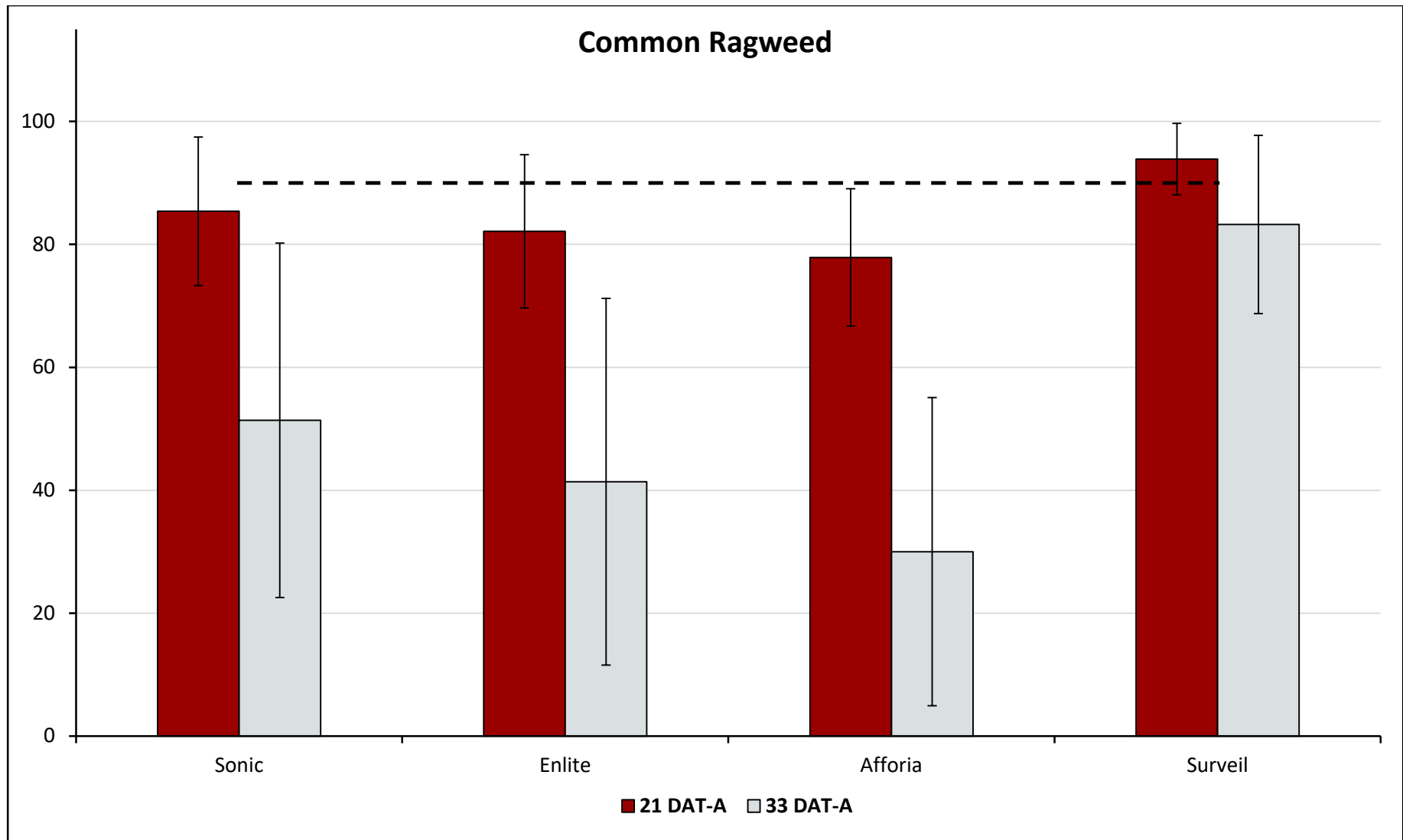


Figure 33. Common ragweed efficacy ratings for trial #18-ARL-SB12. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. The PRE herbicides applied are listed along the x axis. The dashed line indicates 90% control.

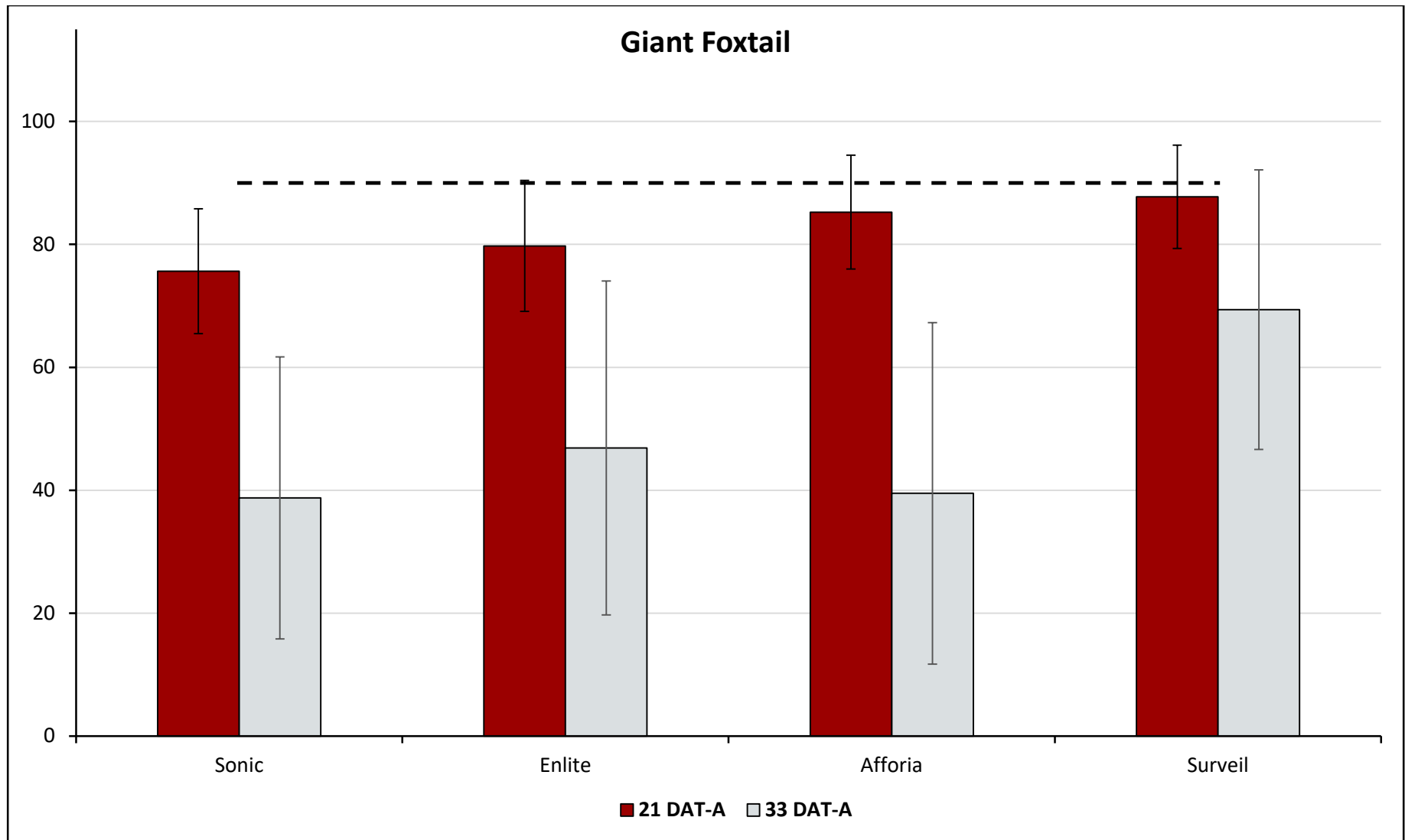


Figure 34. Giant foxtail efficacy ratings for trial #18-ARL-SB12. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. The PRE herbicides applied are listed along the x axis. The dashed line indicates 90% control.

Project Goal: Evaluate the efficacy of glyphosate + dicamba applied POST at different timings in RR2Xtend soybeans and the value of adding a layered group 15 soil-residual herbicide POST.

Site Description:

Location: Janesville, WI	Crop: Soybean
Field #: 5	Variety: AG21X7
Soil type: Plano silt loam	Planting Date: 5/25
% OM: 2.9	Emergence Date: 5/30
pH: 6.1	Population: 120,000 seeds/acre
Fertilization: none	Depth: 1.25
Previous crop: Corn	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 25 ft
Weed species: giant ragweed (AMBTR), common lambsquarters (CHEAL), redroot pigweed (AMARE), giant foxtail (SETFA), green foxtail (SETVI)	

Herbicide Application Information:

	Date:	5/25	6/20	6/29	7/2
Treatment:		PRE (A)	EPOST (B)	MPOST (C)	LPOST (D)
Air Temp (°F):		92	65	86	82
2" Soil Temp (°F):		80	70	80	72
Soil moisture [surface]:		moist	moist	moist	moist
RH %:		42	93	76	83
Cloud cover %		90	95	5	0
Wind speed (mph)/direction		1-7/S	4-6/NE	3-8/S	3-4/NE
Rainfall (in) 1 wk after APP:		0.45	1.51	0.70	0.05
GPA:		15	15	15	15
PSI:		19	21	21	21
Nozzle:		TTI 110015	TTI 110015	TTI 110015	TTI 110015
Nozzle spacing (in):		15	15	15	15
Boom Height (in):		20	23	23	26

Crop and Weed Information at Application:

	Date:	5/25	6/20	6/29	7/2
Soybean	Height (in):	-			
	Stage:	-	V2	V4	R1
AMBTR	Height (in):	-	3	11	12
	Density:	-	1-6/ft ²	1-3/ft ²	1-4/ft ²

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Valor SX	51% w/w	14	3 oz/A	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	28 fl oz/A	EPOST	B
	Xtendimax	2.89 lbae/gal	4	22 fl oz/A	EPOST	B
	Intact			0.5% v/v	EPOST	B
	Class Act Ridion			1.0% v/v	EPOST	B
2	Valor SX	51% w/w	14	3 oz/A	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	28 fl oz/A	MPOST	C
	Xtendimax	2.89 lbae/gal	4	22 fl oz/A	MPOST	C
	Intact			0.5% v/v	MPOST	C
	Class Act Ridion			1.0% v/v	MPOST	C
3	Valor SX	51% w/w	14	3 oz/A	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	28 fl oz/A	LPOST	D
	Xtendimax	2.89 lbae/gal	4	22 fl oz/A	LPOST	D
	Intact			0.5% v/v	LPOST	D
	Class Act Ridion			1.0% v/v	LPOST	D
4	Valor SX	51% w/w	14	3 oz/A	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	28 fl oz/A	EPOST	B
	Xtendimax	2.89 lbae/gal	4	22 fl oz/A	EPOST	B
	Warrant	3 lba/gal	15	1.5 qt/A	EPOST	B
	Intact			0.5% v/v	EPOST	B
	Class Act Ridion			1.0% v/v	EPOST	B
5	Valor SX	51% w/w	14	3 oz/A	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	28 fl oz/A	MPOST	C
	Xtendimax	2.89 lbae/gal	4	22 fl oz/A	MPOST	C
	Warrant	3 lba/gal	15	1.5 qt/A	MPOST	C
	Intact			0.5% v/v	MPOST	C
	Class Act Ridion			1.0% v/v	MPOST	C
6	Valor SX	51% w/w	14	3 oz/A	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	28 fl oz/A	LPOST	D
	Xtendimax	2.89 lbae/gal	4	22 fl oz/A	LPOST	D
	Warrant	3 lba/gal	15	1.5 qt/A	LPOST	D
	Intact			0.5% v/v	LPOST	D
	Class Act Ridion			1.0% v/v	LPOST	D
7	Valor SX	51% WG	14	3 oz/A	PRE	A
8	Untreated Check					

Adjuvants: DRA=Intact; non-AMS water conditioner= Class Act Ridion

Results:**Table 2: 2018 weed control (%) and grain yield (bu/A) at Janesville, WI. Systems approach to weed control in Xtend soybeans.***

Janesville, WI			
Trt #	Herbicide Program	Weed control** (%)	Grain yield*** (bu/A)
1	PRE <i>fb</i> E POST (<i>gly + dicamba</i>)	97 A	63 A
2	PRE <i>fb</i> Mid POST (<i>gly + dicamba</i>)	99 A	61 A
3	PRE <i>fb</i> L POST (<i>gly + dicamba</i>)	99 A	56 A
4	PRE <i>fb</i> E POST (<i>gly + dicamba + residual</i>)	96 A	65 A
5	PRE <i>fb</i> Mid POST (<i>gly + dicamba + residual</i>)	99 A	56 A
6	PRE <i>fb</i> L POST (<i>gly + dicamba + residual</i>)	99 A	57 A
7	PRE-only	67 B	17 B
8	CHECK	0 C	12 B

*means within a column followed by the same letter are not significantly different at $p \leq 0.05$

**Weed control data collected on 7/30/18

***Grain yield was corrected to 13% moisture

Trial Summary:

This study was conducted to evaluate the efficacy of glyphosate + dicamba applied POST at different timings in RR2Xtend soybeans and the value of adding a layered group 15 soil-residual herbicide POST. Visual control and weed biomass collected 28 days after final POST treatment showed no significant difference in visual control for all PRE fb POST treatments, regardless of POST application timing, while the PRE-only treatment only had 67% control of giant ragweed, the dominant weed pressure (data not shown). The addition of acetochlor in combination with dicamba + glyphosate did not enhance the giant ragweed control when compared to glyphosate + dicamba for this site-year. Likewise, weed biomass showed no significant difference between all PRE fb POST treatments (Table 2). Significant reduction in giant ragweed seed production was observed for PRE fb POST treatments, although some seed was collected from plots receiving an early POST treatment. There was no significant yield difference for all PRE fb POST treatments (Table 2). This study was replicated at two other sites in 2018 and will be replicated in 2019.

Future Directions:

This study is a component of Sarah Striegel's MS research. In addition to the efficacy and yield data, this study is also investigating the potential off-target movement of dicamba. One hour after each POST application, indicator soybean plants (RR2Y trait) were placed approximately 1 foot above canopy secured to posts. Plants remained in field until 72 hours after POST application and were transported to greenhouse and grown until 28 d after exposure. At that time, visual injury (%) was recorded. Observed visual injury was correlated with site-specific weather parameters (monitored with Watchdog station) including air temperature, soil temperature, soil moisture, relative humidity, and precipitation.

Project Goal: Compare Syngenta PRE herbicide programs followed by Tavium to similar competitor programs.

Site Description:

Location: Arlington, WI	Crop: Soybean
Field #: 453	Variety: AG24X7
Soil type: Plano silt loam	Planting Date: 5/16
% OM: 3.3	Emergence Date: 5/26
pH: 7	Population: 140,000
Fertilization: none	Depth: 1.25 in
Previous crop: Corn	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 25 ft
Weed species: common lambsquarters (CHEAL), common ragweed (AMBEL), velvetleaf (ABUTH), giant foxtail (SETFA)	

Herbicide Application Information:

Date:	5/17	6/12
Treatment:	PRE	POST
Air Temp (°F):	74	80
2" Soil Temp (°F):	72	80
Soil moisture [surface]:	moist	moist
RH %:	52	68
Cloud cover %	20	100
Wind speed (mph)/direction	6-12/NE	1-4/WSW
Rainfall (in) 1 wk after APP:	0.59	2.15
GPA:	15	15
PSI:	17	33
Nozzle:	TTI 11002	TTI 110015
Nozzle spacing (in):	15	20
Boom Height (in):	20	22

Crop and Weed Information at Application:

	Date:	5/17	6/12*
Soybean	Height (in):	-	3-5
	Stage:	-	V1
CHEAL	Height (in):	-	1
	Density:	-	0-1/m ²
AMBEL	Height (in):	-	1-4
	Density:	-	1-5/m ²
ABUTH	Height (in):	-	1-3
	Density:	-	0-5/m ²
SETFA	Height (in):	-	1-4
	Density:	-	4-25/m ²

*Weed density recorded from plots with a PRE herbicide. Density varied depending on the effectiveness of the PRE.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Boundary	6.5 lb/gal	5, 15	1.8 pt/a	PRE	A
	Tavium	3.4 lbae/gal	4, 15	56.5 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	28.4 fl oz/a	POST	B
	Class Act Ridion			1.0% v/v	POST	B
	Intact			0.5% v/v	POST	B
3	Broadaxe XC	7 lb/gal	14, 15	25 fl oz/a	PRE	A
	Tavium	3.4 lbae/gal	4, 15	56.5 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	28.4 fl oz/a	POST	B
	Class Act Ridion			1.0% v/v	POST	B
	Intact			0.5% v/v	POST	B
4	Prefix	5.29 lb/gal	14, 15	2 pt/a	PRE	A
	Tavium	3.4 lbae/gal	4, 15	56.5 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	28.4 fl oz/a	POST	B
	Class Act Ridion			1.0% v/v	POST	B
	Intact			0.5% v/v	POST	B
5	Valor XLT	40.3% w/w	2, 14	3 oz/a	PRE	A
	Xtendimax	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	28.4 fl oz/a	POST	B
	Class Act Ridion			1.0% v/v	POST	B
	Intact			0.5% v/v	POST	B
6	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Engenia	5 lbae/gal	4	12.8 fl oz/a	POST	B
	Roundup PowerMax	4.5 lbae/gal	9	28.4 fl oz/a	POST	B
	Class Act Ridion			1.0% v/v	POST	B
	Intact			0.5% v/v	POST	B
7	Authority First	70% w/w	2, 14	5 oz/a	PRE	A
	Flexstar GT	3.5 lb/gal	9, 14	3.5 pt/a	POST	B
	MSO			1.0% v/v	POST	B
	AMS			2.5% v/v	POST	B

Adjuvants: AMS=Amsol, Non-AMS water conditioner=Class Act Ridion, DRA=Intact, MSO=Premium MSO

Trial Summary:

Tavium plus VaporGrip Technology is a new premix formulation of two herbicide active ingredients, dicamba and S-metolachlor, from Syngenta (pending EPA approval). There was minor soybean injury (drawstringing) from the PRE herbicides 18 DAT. The POST treatments caused varying levels of leaf necrosis at 7 and 13 days after application (Figure 38). All herbicide treatments were effective at controlling common lambsquarters throughout the entire season (>98% control at all ratings). Velvetleaf, common ragweed, and giant foxtail control varied at 26 days after the PRE application (Figures 35, 36, 37). All POST applications were effective at controlling all weeds not controlled by the PRE herbicides. POST control remained above 90% for all species at 13 and 28 days after application. Giant foxtail control did decrease slightly at the 28 DAT-B rating in the treatments without a layered residual (treatments 5, 6, 7). Adding an additional residual herbicide to the tank at the POST application was likely not necessary given the weed species in the trial. Layering residual herbicides may be more beneficial in a field with more difficult to control weeds, like waterhemp. Soybean yield did not differ among the herbicide treatments (data not shown). Yield across all herbicide treatments was 62 bu/acre, while the untreated check was 11 bu/acre, an 82% reduction.

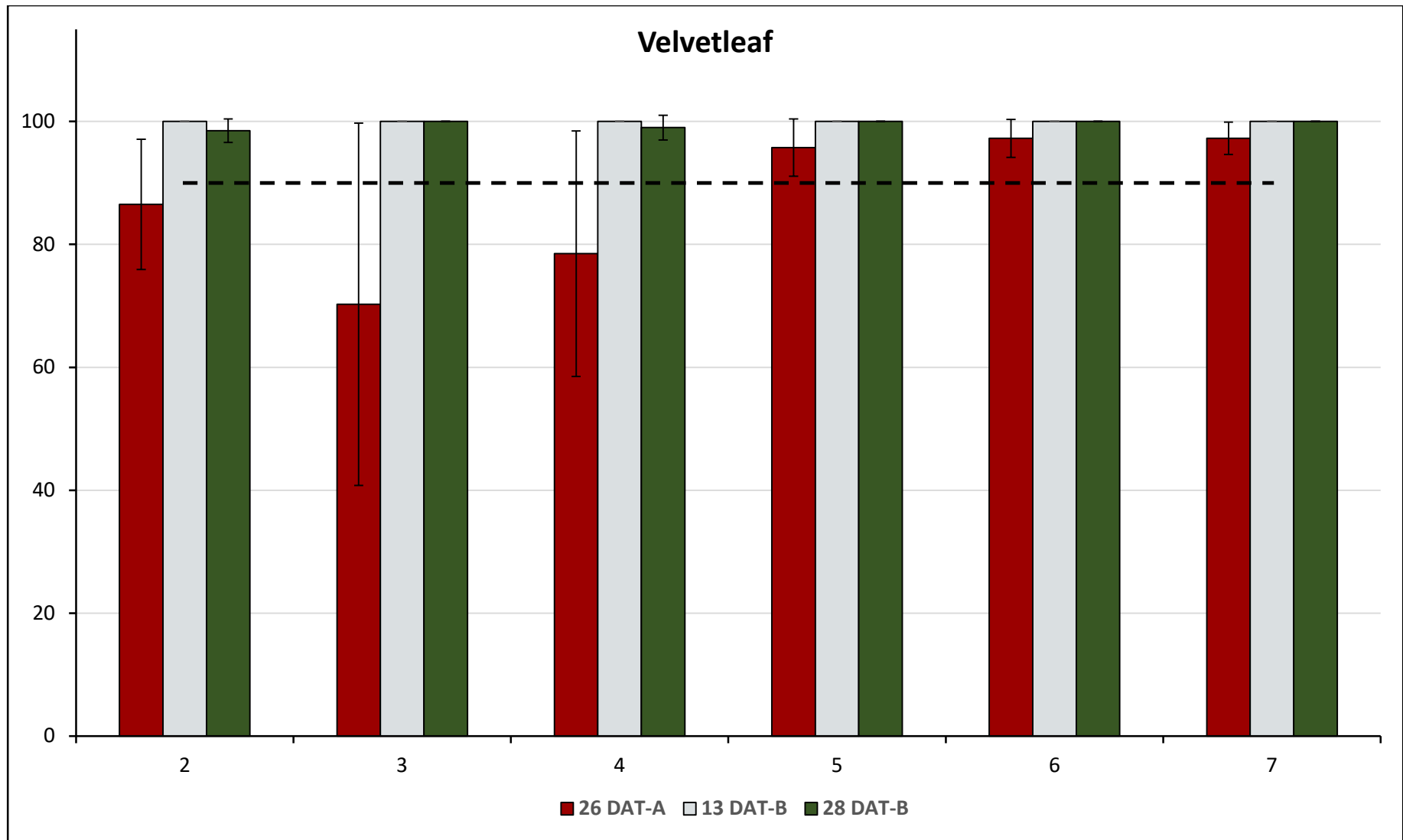


Figure 35. Velvetleaf efficacy ratings for trial #18-ARL-SB14. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

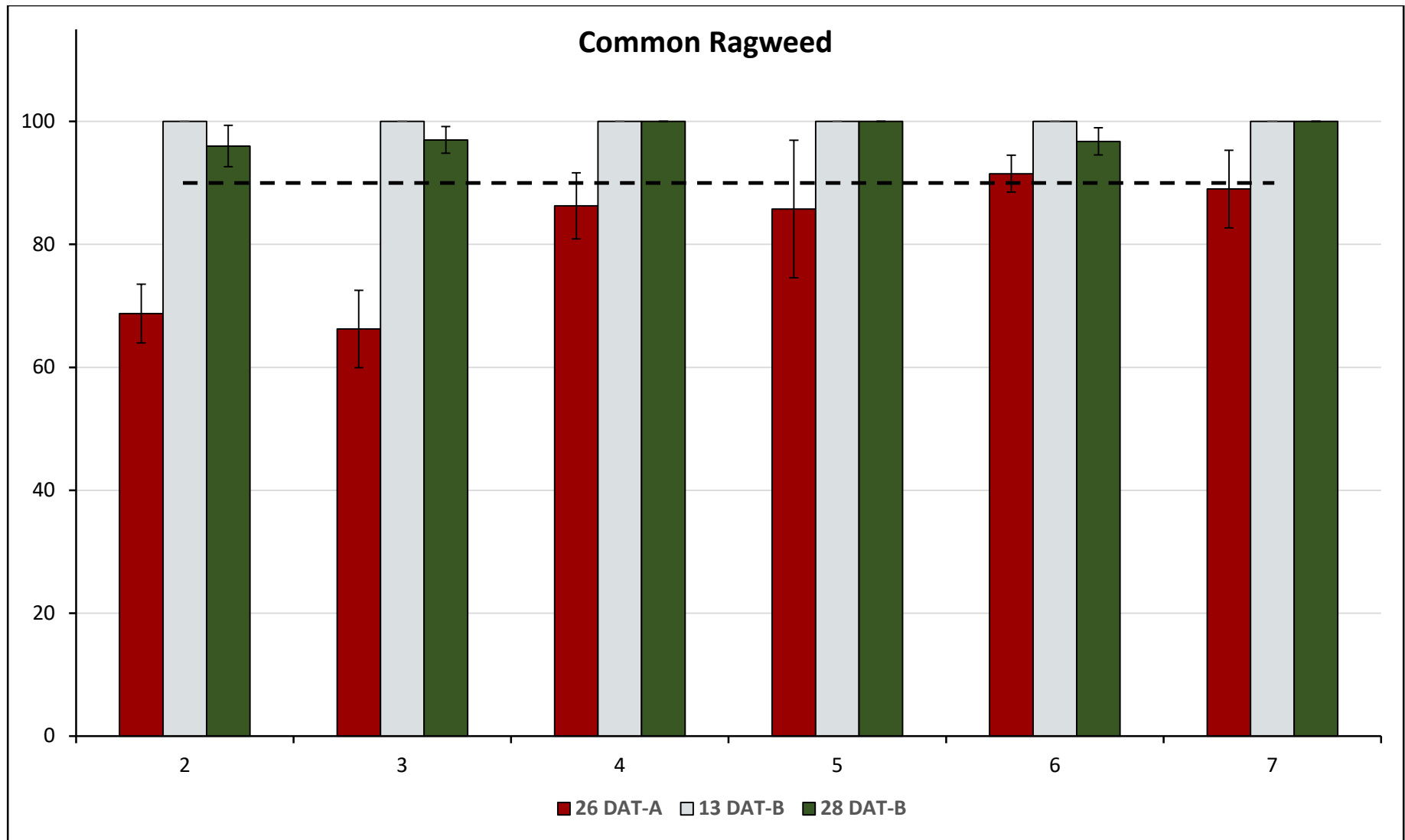


Figure 36. Common ragweed efficacy ratings for trial #18-ARL-SB14. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

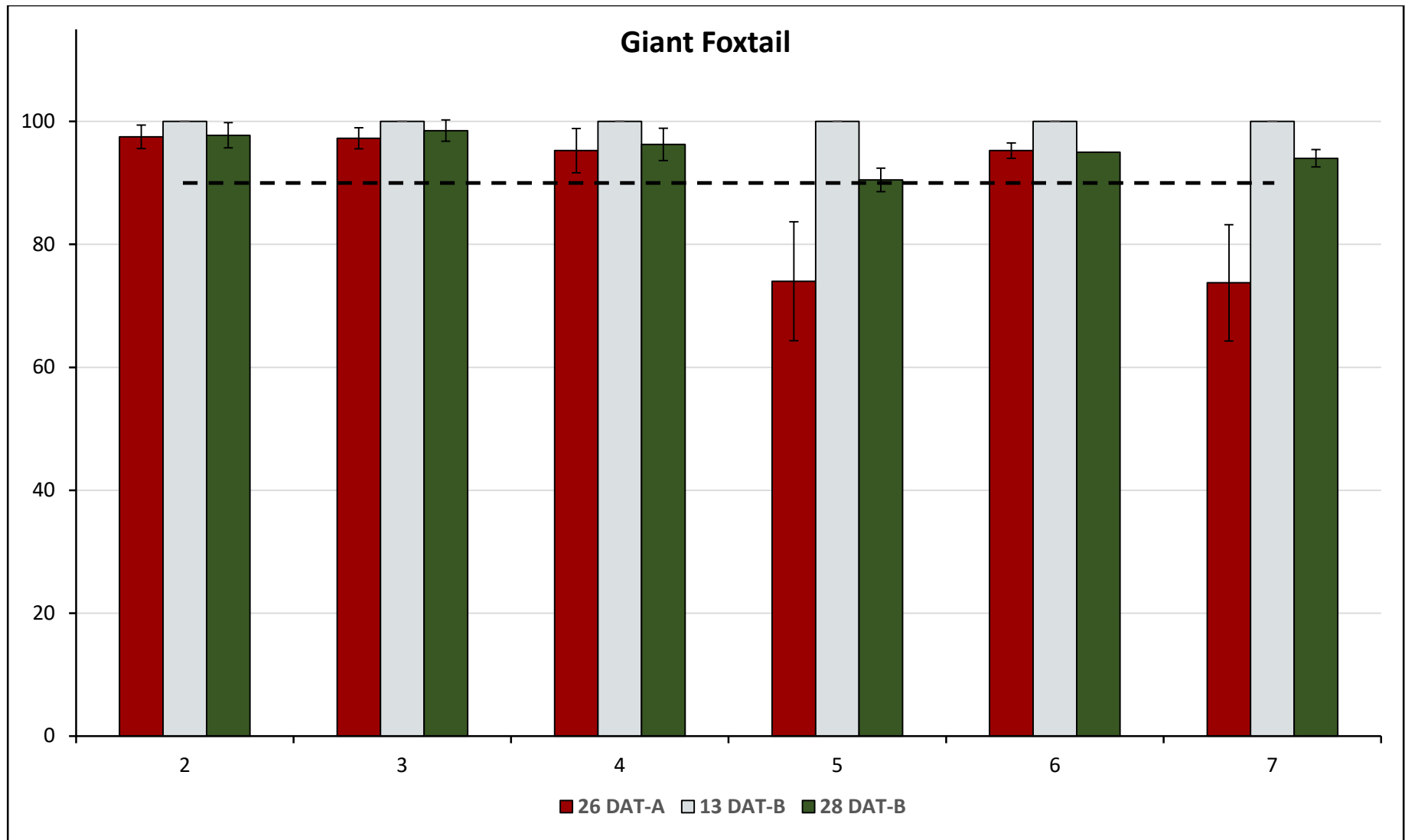


Figure 37. Giant foxtail efficacy ratings for trial #18-ARL-SB14. Bars indicate the average % control \pm the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

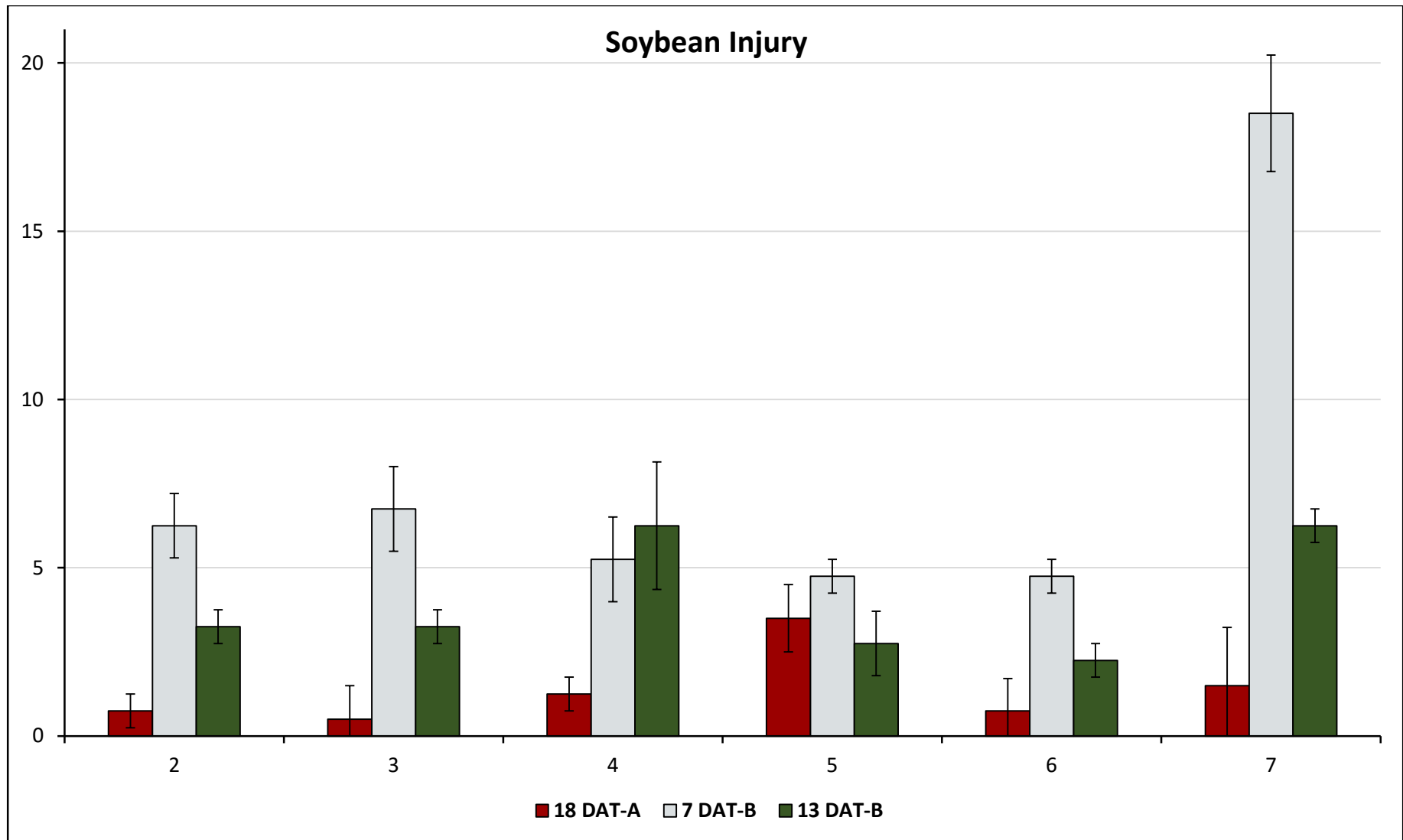


Figure 38. Soybean injury ratings for trial #18-ARL-SB14. Bars indicate the average % soybean injury \pm the standard deviation of four replications following herbicide applications. Leaf drawstringing was the injury observed at 18 DAT-A. Leaf necrosis was rated at 7 and 13 DAT-B. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number

Project Goal: Evaluate Engenia PRO applied PRE/EPOST against similar competitive premix programs.

Site Description:

Location: Janesville, WI	Crop: Soybean
Field #: 5	Variety: P24A80X
Soil type: Plano silt loam	Planting Date: 5/25
% OM: 2.9	Emergence Date: 5/30
pH: 6.1	Population: 120,000 seeds/acre
Fertilization: none	Depth: 1.25 in
Previous crop: Corn	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 25 ft
Weed species: giant ragweed (AMBTR), common lambsquarters (CHEAL), redroot pigweed (AMARE), giant foxtail (SETFA), green foxtail (SETVI)	

Herbicide Application Information:

Date:	5/25	6/15	6/23
Treatment:	PRE	EPOST	POST
Air Temp (°F):	92	72	84
2" Soil Temp (°F):	80	68	90
Soil moisture [surface]:	moist	wet	moist
RH %:	42	83	47
Cloud cover %	90	80	20
Wind speed (mph)/direction	1-7/S	4-7/SE	3-4/SW
Rainfall (in) 1 wk after APP:	0.45	3.71	0.96
GPA:	15	15	15
PSI:	19	18	21
Nozzle:	TTI 110015	TTI 110015	TTI 110015
Nozzle spacing (in):	15	15	15
Boom Height (in):	20	23	23

Crop and Weed Information at Application:

	Date:	5/25	6/15*	6/23*
Soybean	Height (in):	-	4-5	-
	Stage:	-	V1	V3
AMBTR	Height (in):	-	1-4	1-6
	Density:	-	2-24/m ²	8-29/m ²
CHEAL	Height (in):	-	1-2	1-3
	Density:	-	5-20/m ²	11-30/m ²
AMARE	Height (in):	-	1-2	1-3
	Density:	-	0-6/m ²	0-19/m ²
SETFA/SETVI	Height (in):	-	1-3	1-5
	Density:	-	1-10/m ²	1-13/m ²

*Weed density recorded from check plots. AMBTR density was heavier in rep 4. Height measurements were taken from weeds in plot with a PRE application.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Engenia PRO		4, 15	16 fl oz/a	PRE	A
	Engenia	5 lbae/gal	4	12.8 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	Induce			0.25% v/v	EPOST	B
3	Engenia PRO		4, 15	16 fl oz/a	PRE	A
	Engenia PRO		4, 15	16 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	Induce			0.25% v/v	EPOST	B
4	Engenia PRO		4, 15	16 fl oz/a	PRE	A
	Engenia PRO		4, 15	16 fl oz/a	POST	C
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	POST	C
	Induce			0.25% v/v	POST	C
5	Zidua SC	4.17 lb/gal	15	3.3 fl oz	PRE	A
	Tricor	75% w/w	5	0.67 lb/a	PRE	A
	Engenia PRO		4, 15	16 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	Induce			0.25% v/v	EPOST	B
6	Xtendimax	2.9 lbae/gal	4	22 fl oz/a	PRE	A
	Dual II Magnum	7.64 lb/gal	15	16 fl oz/a	PRE	A
	Xtendimax	2.9 lbae/gal	4	22 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	Induce			0.25% v/v	EPOST	B
7	Xtendimax	2.9 lbae/gal	4	22 fl oz/a	PRE	A
	Dual II Magnum	7.64 lb/gal	15	16 fl oz/a	PRE	A
	Xtendimax	2.9 lbae/gal	4	22 fl oz/a	EPOST	B
	Dual II Magnum	7.64 lb/gal	15	16 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
Induce			0.25% v/v	EPOST	B	
8	Xtendimax	2.9 lbae/gal	4	22 fl oz/a	PRE	A
	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Xtendimax	2.9 lbae/gal	4	22 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	Induce			0.25% v/v	EPOST	B
9	Xtendimax	2.9 lbae/gal	4	22 fl oz/a	PRE	A
	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Xtendimax	2.9 lbae/gal	4	22 fl oz/a	EPOST	B
	Warrant	3 lb/gal	15	48 fl oz/a	EPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	EPOST	B
	Induce			0.25% v/v	EPOST	B

Adjuvants: NIS=Induce

Trial Summary:

Engenia PRO is a new premix formulation of two herbicide active ingredients, dicamba and pyroxasulfone, from BASF (pending EPA approval). There was no observable soybean injury from the PRE herbicides 21 DAT. All herbicide treatments were effective at controlling common lambsquarters, redroot pigweed, and the foxtail species throughout the entire season (>97% control at all ratings) (data not shown). Giant ragweed control differed among the treatments on 6/15 and 7/30, 21 DAT-A and 45 DAT-B, respectively (Figure 39). All PRE herbicide treatments containing dicamba had adequate giant ragweed control 21 DAT-A (>85%), while treatment 5 (no dicamba) had almost no control (8%). All POST herbicides were effective at controlling emerged giant ragweed; however, a new flush emerged after the EPOST application. This is evident in the control ratings of all EPOST treatments at 45 days after application (54-68%). In this trial, delaying the POST application by 8 days greatly improved giant ragweed control later in the season (98%). The delay in application allowed more giant ragweed to emerge and be controlled by the POST herbicide. Soybean yield was not taken.

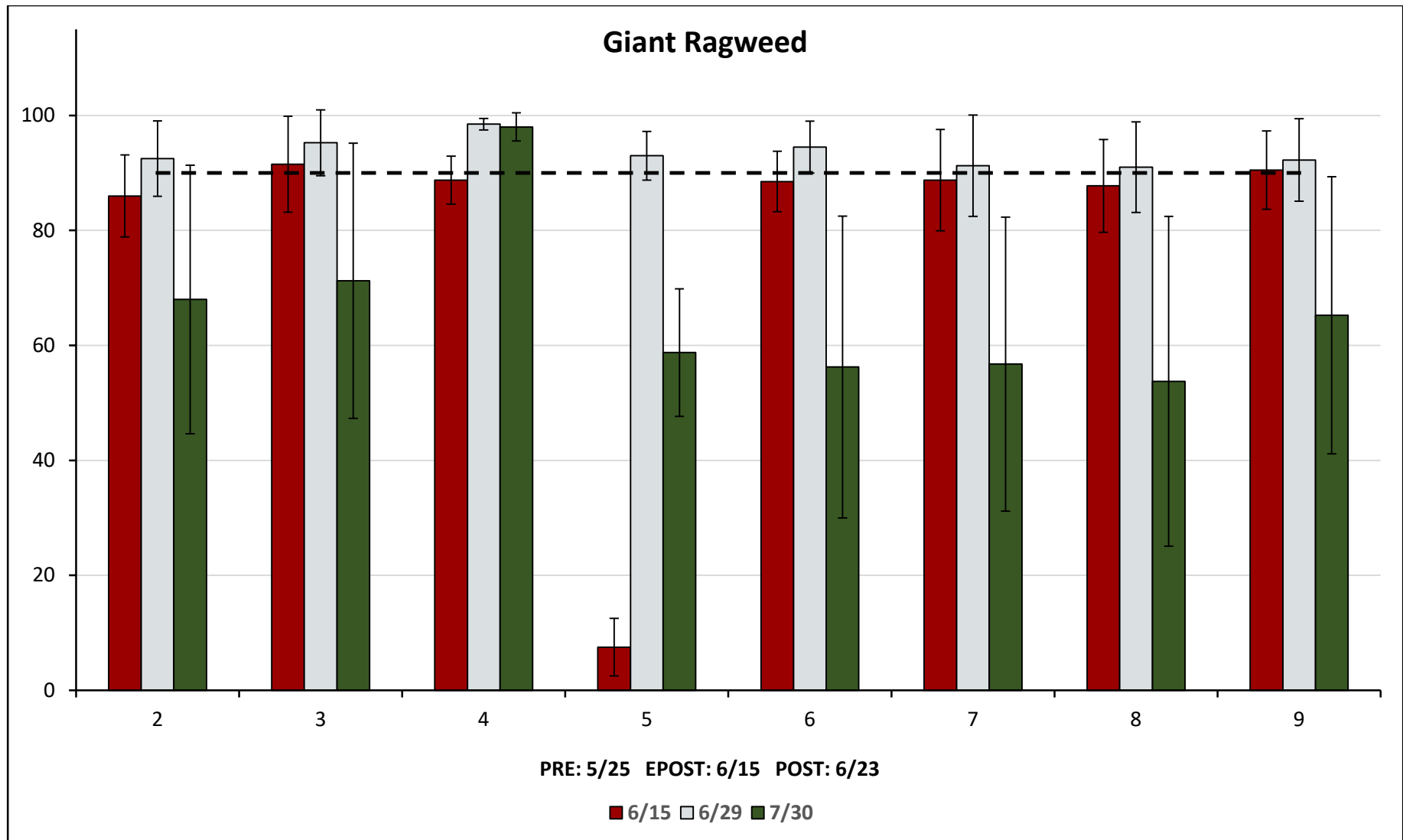


Figure 39. Giant ragweed efficacy ratings for trial #18-ROK-SB16. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

Project Goal: Compare efficacy of herbicide programs when Engenia/Engenia PRO is not used past V2/V3 soybean.

Site Description:

Location: Janesville, WI	Crop: Soybean
Field #: 5	Variety: P24A80X
Soil type: Plano silt loam	Planting Date: 5/25
% OM: 2.9	Emergence Date: 5/30
pH: 6.1	Population: 120,000 seeds/acre
Fertilization: none	Depth: 1.25 in
Previous crop: Corn	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 25 ft
Weed species: giant ragweed (AMBTR), common lambsquarters (CHEAL), redroot pigweed (AMARE), giant foxtail (SETFA), green foxtail (SETVI)	

Herbicide Application Information:

	Date:	5/25	6/1	6/23	7/2
Treatment:		PRE	VEPOST	MPOST	LPOST
Air Temp (°F):		92	71	90	83
2" Soil Temp (°F):		80	80	86	72
Soil moisture [surface]:		moist	moist	moist	moist
RH %:		42	73	51	83
Cloud cover %		90	5	25	0
Wind speed (mph)/direction		1-7/S	5-11/NNE	3-5/W	2-3/NE
Rainfall (in) 1 wk after APP:		0.45	0.37	0.96	0.05
GPA:		15	15	15	15
PSI:		19	21	21	21
Nozzle:		TTI 110015	TTI 110015	TTI 110015	TTI 110015
Nozzle spacing (in):		15	15	15	15
Boom Height (in):		20	23	23	26

Crop and Weed Information at Application:

	Date:	5/25	6/1*	6/23*	7/2
Soybean	Height (in):	-	1	-	9-10
	Stage:	-	VC	V3	V5/R1
AMBTR	Height (in):	-	-	4-8	-
	Density:	-	.25-2/m ²	1-4/m ²	-
CHEAL	Height (in):	-	-	1-2	-
	Density:	-	sparse	14-34/m ²	-
AMARE	Height (in):	-	-	1-4	-
	Density:	-	sparse	0-17/m ²	-
SETFA/SETVI	Height (in):	-	-	1-5	-
	Density:	-	sparse	1-13/m ²	-

*Weed density recorded from check plots. Very few weeds had emerged by the 6/1 application even in the checks. AMBTR density was heavier in rep 4.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Engenia PRO		4, 15	16 fl oz/a	VEPOST	B
3	Engenia PRO		4, 15	16 fl oz/a	VEPOST	B
	Flexstar GT	3.5 lb/gal	9, 14	3.5 pts/a	LPOST	D
	COC			1.0 % v/v	LPOST	D
	AMS			12 lb/100 gal	LPOST	D
4	Engenia PRO		4, 15	16 fl oz/a	VEPOST	B
	Flexstar GT	3.5 lb/gal	9, 14	3.5 pts/a	LPOST	D
	Outlook	6 lb/gal	15	10 fl oz/a	LPOST	D
	COC			1.0% v/v	LPOST	D
	AMS			12lb/100 gal	LPOST	D
5	Engenia PRO		4, 15	16 fl oz/a	VEPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	LPOST	D
	AMS			12 lb/100 gal	LPOST	D
6	Engenia PRO		4, 15	16 fl oz/a	VEPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	LPOST	D
	Outlook	6 lb/gal	15	10 fl oz/a	LPOST	D
	AMS			12 lb/100 gal	LPOST	D
7	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Engenia PRO		4, 15	16 fl oz/a	MPOST	C
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	MPOST	C
	NIS			0.25% v/v	MPOST	C
8	Zidua PRO	4.09 lb/gal	2, 14, 15	6 fl oz/a	PRE	A
	Engenia	5 lbae/gal	4	12.8 fl oz/a	MPOST	C
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	MPOST	C
	NIS			0.25% v/v	MPOST	C
9	Zidua PRO	4.09 lb/gal	2, 14, 15	6 fl oz/a	PRE	A
	Engenia PRO		4, 15	16 fl oz/a	MPOST	C
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	MPOST	C
	NIS			0.25% v/v	MPOST	C
10	Zidua PRO	4.09 lb/gal	2, 14, 15	6 fl oz/a	PRE	A
	Engenia	5 lbae/gal	4	12.8 fl oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	MPOST	C
	Outlook	6 lb/gal	15	10 fl oz/a	MPOST	C
	AMS			12 lb/100 gal	MPOST	C
11	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Engenia	5 lbae/gal	4	12.8 fl oz/a	PRE	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	MPOST	C
	Outlook	6 lb/gal	15	10 fl oz/a	MPOST	C
	AMS			12 lb/100 gal	MPOST	C

Adjuvants: COC=Agri-Dex, NIS=Induce

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
12	Engenia	5 lbae/gal	4	12.8 fl oz/a	VEPOST	B
	Pursuit	2 lb/gal	2	3 fl oz/a	VEPOST	B
	Zidua SC	4.12 lb/gal	15	3.3 fl oz/a	VEPOST	B
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	LPOST	D
	Outlook	6 lb/gal	15	10 fl oz/a	LPOST	D
	AMS			12 lb/100 gal	LPOST	D
13	Engenia PRO		4, 15	16 fl oz/a	VEPOST	B
	Engenia PRO		4, 15	16 fl oz/a	MPOST	C
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	MPOST	C
	Induce			0.25% v/v	MPOST	C

Adjuvants: COC=Agri-Dex, NIS=Induce

Trial Summary:

Engenia PRO is a new premix formulation of two herbicide active ingredients, dicamba and pyroxasulfone, from BASF (pending EPA approval). All 2-pass herbicide programs were effective at controlling common lambsquarters, redroot pigweed, and the foxtail species throughout the entire season (>98% control at all ratings) (data not shown). In treatment 2, the only 1-pass program, control of these species decreased slightly at the 7/2 rating. Giant ragweed control differed among the various treatments and application timings (Figure 40). All POST herbicides were effective at controlling emerged giant ragweed; however, new flushes did emerge after the VEPOST and MPOST applications. In conclusion, it is possible to achieve good to excellent giant ragweed control by applying dicamba early in the growing season (before V4) as part of a 2-pass program. Soybean yield was not taken.

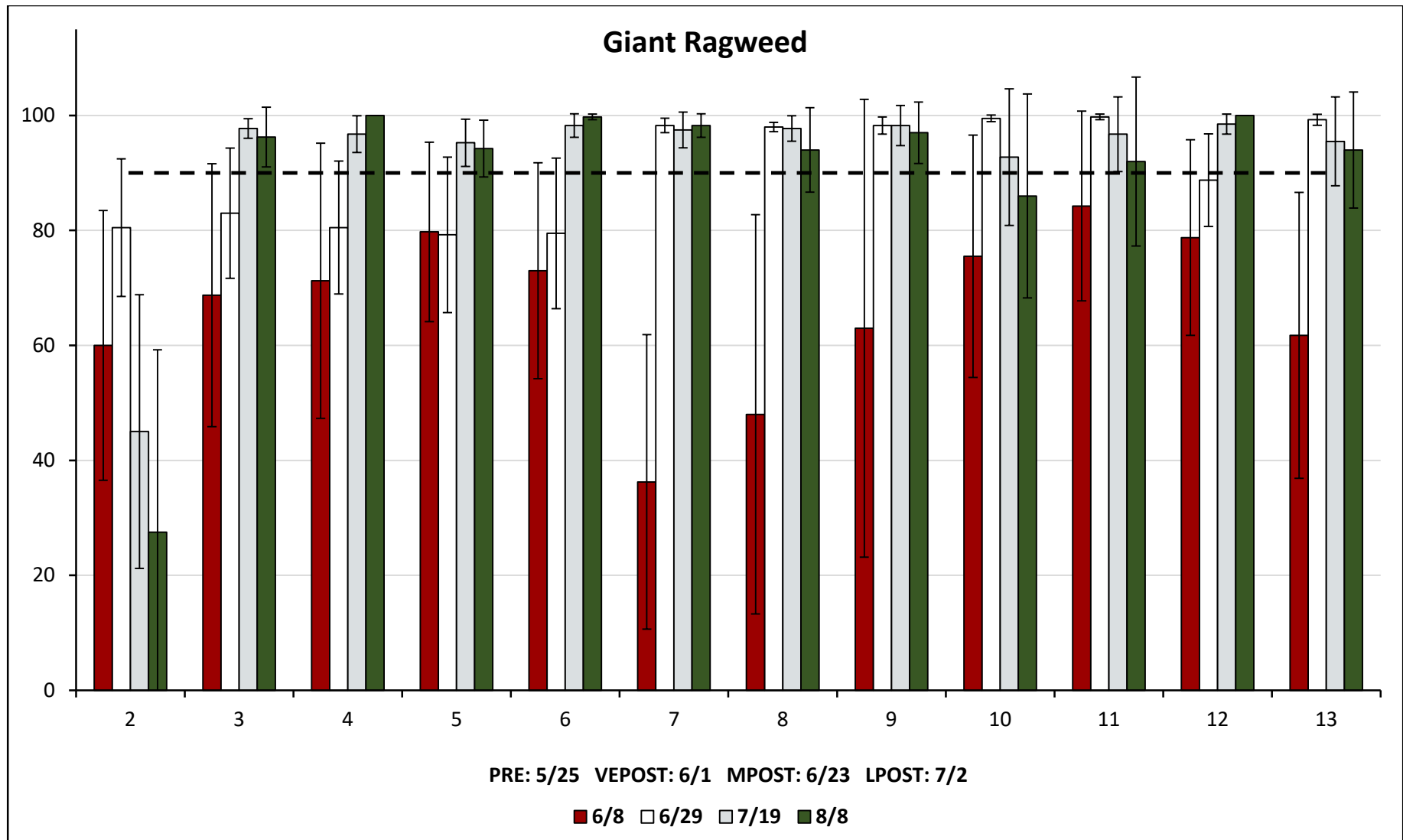


Figure 40. Giant ragweed efficacy ratings for trial #18-ROK-SB17. Bars indicate the average % control ± the standard deviation of four replications following herbicide applications. Numbers on the x-axis correspond to the herbicide treatment list for the respective trial number. The dashed line indicates 90% control.

Project Goal: Evaluate weed control and biomass reduction by single mode of action PRE-emergence soybean herbicides.

Site Description:

Location: Arlington, WI	Crop: Soybean
Field #: 370	Variety: AG17X7
Soil type: Saybrook silt loam	Planting Date: 6/11
% OM: 2.9	Emergence Date: ~6/16
pH: 6.5	Population: 140,000
Fertilization: none	Depth: 1.25 in
Previous crop: corn	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 25 ft
Weed species: common purslane (POROL), giant foxtail (SETFA), barnyardgrass (ECHCG)	

Herbicide Application Information:

Date:	6/12
Treatment:	PRE
Air Temp (°F):	73
2" Soil Temp (°F):	72
Soil moisture [surface]:	moist
RH %:	78
Cloud cover %	99
Wind speed (mph)/direction	2-4/SW
Rainfall (in) 1 wk after APP:	2.15
GPA:	15
PSI:	19
Nozzle:	XR 11002
Nozzle spacing (in):	15
Boom Height (in):	20

Trt #	Treatment	Trade Name	Formulation	SOA Group	Rate	App Timing
1	Untreated Check					
2	imazethapyr	Pursuit	2 lb/gal	2	4 fl oz/a	PRE
3	cholorimuron-ethyl	Classic	25% w/w	2	3 oz/a	PRE
4	cloransulam-methyl	FirstRate	84% w/w	2	0.6 oz/a	PRE
5	metribuzin	Tricor DF	75% w/w	5	0.67 lb/a	PRE
6	sulfentrazone	Spartan	4 lb/gal	14	8 fl oz/a	PRE
7	flumioxazin	Valor SX	51% w/w	14	3 oz/a	PRE
8	saflufenacil	Sharpen	2.85 lb/gal	14	1 fl oz/a	PRE
9	acetochlor	Warrant	3 lb/gal	15	1.5 qt/a	PRE
10	S-metolachlor	Dual II Magnum	7.64 lb/gal	15	1.67 pt/a	PRE
11	dimethenamid	Outlook	6 lb/gal	15	18 fl oz/a	PRE
12	pyroxasulfone	Zidua	85% w/w	15	3 oz/a	PRE

Trial Summary:

Most PRE-emergence herbicides tested herein significantly reduced early-season weed competition. Dimethenamid was the least effective treatment providing less than 50% of weed biomass reduction at the end of the season (Figure 41). Herbicide efficacy varied according to the species evaluated (Figure 42). Group 2 herbicides provided excellent level of common purslane and grasses control, which are the most predominant species at this site. Saflufenacil provided moderate level of common purslane control but good level of grass control.

Future Directions:

This study is a component of Victor Ribeiros's MS research. Soil samples were collected, and a bioassay was conducted in order to investigate the persistence of these herbicides in the soil using troublesome weed species and cover crops as bioindicators. Studies will be replicated in 2019. Results will allow us to model and further understand residual activity over time for the herbicides included in this study.

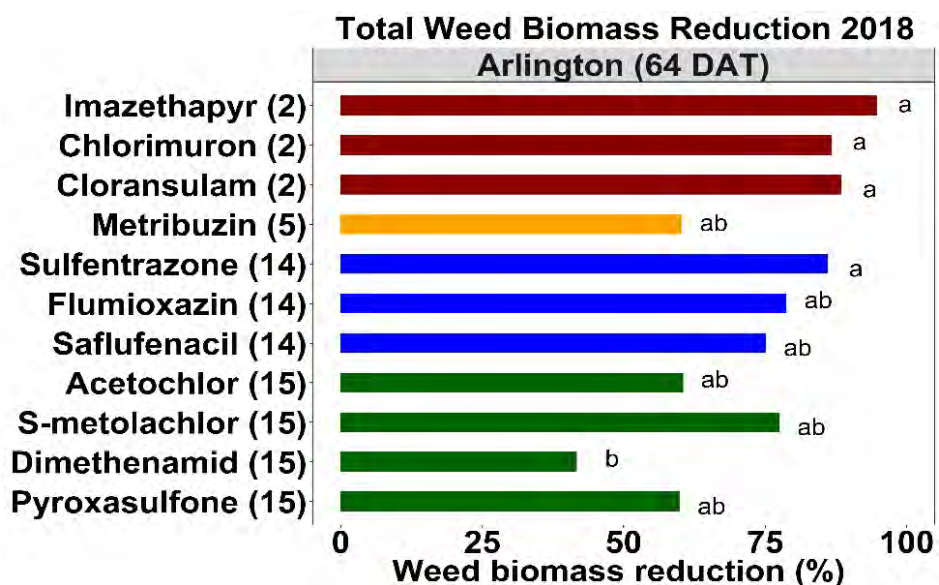


Figure 41. Total weed biomass reduction (%) at Arlington 64 DAT. Average \pm standard error biomass of Untreated check: $56 \pm 7 \text{ g m}^{-2}$ at Arlington.

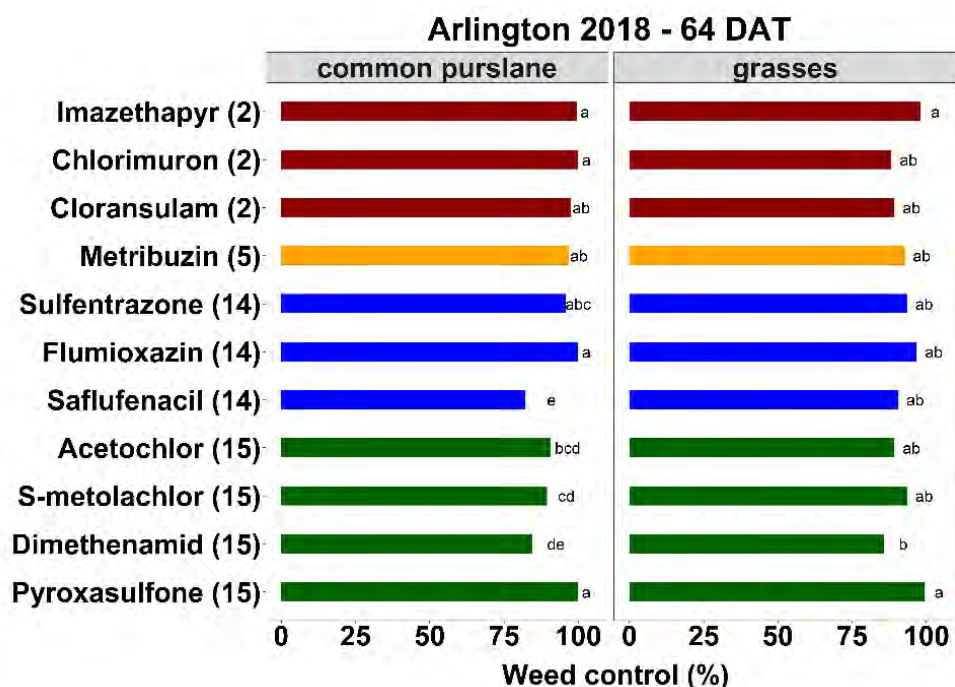


Figure 42. Efficacy (%) of PRE-emergence soybean herbicides on control of common purslane and grasses at Arlington 64 days after treatment. The number in parenthesis following the herbicide active ingredient indicates the site of action group number.

Project Goal: Evaluate and demonstrate the effectiveness of multiple PRE-emergence soybean herbicides.

Site Description:

Location: Lancaster, WI	Crop: Soybean
Field #: -	Variety: AG21X7
Soil type: Fayette silt loam	Planting Date: 5/24
% OM: 2.4	Emergence Date: 5/29
pH: 7.3	Population: 145,000
Fertilization: none	Depth: 1.25 in
Previous crop: Corn	Row spacing: 30 in
Tillage: conventional	Plot Size: 10 x 25 ft
Weed species: common waterhemp (AMATU), common lambsquarters (CHEAL)	

Herbicide Application Information:

Date:	5/25
Treatment:	PRE
Air Temp (°F):	78
2" Soil Temp (°F):	70
Soil moisture [surface]:	dry
RH %:	67
Cloud cover %	40
Wind speed (mph)/direction	1-3/NW
Rainfall (in) 1 wk after APP:	0.83
GPA:	15
PSI:	26
Nozzle:	XR 11002
Nozzle spacing (in):	20
Boom Height (in):	20

Lancaster Agricultural Research Station Field History:

Waterhemp was first observed in 2008 at the trial site. According to station records, waterhemp was first seen in a grass waterway approaching from a neighboring CRP field. Waterhemp remained mostly unnoticed until soybeans were planted in 2013. At this point, the population had intensified and has since been an issue; research trials have severely limited management options.

Crop Rotation and Herbicide Use			
Year	Crop	Herbicide Program	Tillage
2013	Soybean	PPI: Prowl (1.75 pt/a) + Pursuit Plus (1.25 qt/a) POST: managed for research	field cultivation
2014	Corn	PRE: Lumax EX (3 qt/a) POST: none	verticle tillage
2015	Corn	POST: Roundup PowerMax (29 fl oz/a)	no-till, cover crop research
2016	Corn	POST: Roundup PowerMax (29 fl oz/a)	
2017	Corn	PRE: Lumax EZ (3 qt/a) POST: Roundup PowerMax (29 oz/a)	

Trt #	Treatment	Active Ingredient(s)	Formulation	SOA Group	Rate
1	Untreated Check				
2	Pursuit	imazethapyr	2 lb/gal	2	4 fl oz/a
3	Classic	chlorimuron	25% w/w	2	3 oz/a
4	FirstRate	cloransulam	84% w/w	2	0.6 oz/a
5	Tricor DF	metribuzin	75% w/w	5	10.7 oz/a
6	Spartan	sulfentrazone	4 lb/gal	14	8 fl oz/a
7	Valor SX	flumioxazin	51% w/w	14	3 oz/a
8	Sharpen	saflufenacil	2.85 lb/gal	14	1 fl oz/a
9	Warrant	acetochlor	3 lb/gal	15	24 fl oz/a
10	Warrant	acetochlor	3 lb/gal	15	48 fl oz/a
11	Dual II Magnum	S-metolachlor	7.64 lb/gal	15	13.4 fl oz/a
12	Dual II Magnum	S-metolachlor	7.64 lb/gal	15	26.7 fl oz/a
13	Outlook	dimethenamid-P	6 lb/gal	15	9 fl oz/a
14	Outlook	dimethenamid-P	6 lb/gal	15	18 fl oz/a
15	Zidua	pyroxasulfone	85% w/w	15	1.5 oz/a
16	Zidua	pyroxasulfone	85% w/w	15	3 oz/a
17	Authority Assist	imazethapyr + sulfentrazone	4 lb/gal	2, 14	10 fl oz/a
18	Sonic	cloransulam + sulfentrazone	70% w/w	2, 14	6.45 oz/a
19	Surveil	cloransulam + flumioxazin	48% w/w	2, 14	3.5 oz/a
20	Valor XLT	chlorimuron + flumioxazin	40.3% w/w	2, 14	3 oz/a
21	Broadaxe XC	sulfentrazone +S-metolachlor	7 lb/gal	14, 15	25 fl oz/a
22	Authority MTZ	metribuzin + sulfentrazone	45% w/w	5, 14	12 oz/a
23	Authority Supreme	sulfentrazone+ pyroxasulfone	4.16 lb/gal	14, 15	8 fl oz/a
24	Verdict	saflufenacil + dimethenamid	5.57 lb/gal	14, 15	5 fl oz/a
25	Prefix	fomesafen + S-metolachlor	5.29 lb/gal	14, 15	32 fl oz/a
26	Fierce	flumioxazin + pyroxasulfone	76% w/w	14, 15	3.75 oz/a
27	Boundary	metribuzin + S-metolachlor	6.5 lb/gal	5, 15	28.8 fl oz/a
28	Canopy DF	chlorimuron + metribuzin	75% w/w	2, 5	2.25 oz/a
29	Enlite	chlorimuron + thifensulfuron + flumioxazin	47.9% w/w	2, 14	2.8 oz/a
30	Afforia	thifensulfuron + tribenuron + flumioxazin	50.8% w/w	2, 14	2.5 oz/a
31	Trivence	chlorimuron + metribuzin + flumioxazin	61.3% w/w	2, 5, 14	6 oz/a
32	Zidua PRO	imazethapyr + saflufenacil + pyroxasulfone	4.09 lb/gal	2, 14, 15	6 fl oz/a
33	Fierce XLT	chlorimuron + flumioxazin + pyroxasulfone	62.4% w/w	2, 14, 15	4 oz/a
34	Fierce MTZ (Fierce + metribuzin co-pack)	flumioxazin + pyroxasulfone + metribuzin	76% w/w + 4 lb/gal	14, 15 5	3 oz/a + 6 fl oz/a

Trial Summary:

This study was a joint effort between the [UW-Madison Nutrient and Pest Management Program](#) (NPM; Dan Smith and Richard Proost) and the WiscWeed team. The study was conducted at [UW Lancaster Ag Research Station](#), in Lancaster, Grant County, southwest WI in a field with natural and significant waterhemp and common lambsquarters infestation. Treatments consisted of PRE-emergence soybean herbicides containing one, two and three different active ingredients and/or sites of action. Since we wanted to evaluate the residual activity of the PRE-emergence herbicide treatments throughout the season, no POST-emergence herbicides were sprayed to the research plots. Our intent was not to promote one product versus another, instead, demonstrate the value of using an effective PRE-emergence herbicide program.

While these results should be taken with a grain of salt (only one year of data), they clearly indicate the value of PRE-emergence herbicides and the programs that don't work. Moreover, the herbicide rates used in the study are the ones recommended by our industry colleagues and supported by us for a typical Wisconsin Silt Loam soil, thus, valuable information for decision-makers.

Key Take Home Points from 2018 Data:

- Several PRE-emergence soybean herbicides evaluated provided good levels of waterhemp and lambsquarters control. The onset of waterhemp emergence in the research site was noticed in the first week of June. Because of excessive rainfall in the spring, soybean planting was delayed and happened on 05/24/2018 at the research site; thus, the application of our PRE-emergence treatments (05/25/2018) matched the time waterhemp started to emerge, explaining the overall satisfactory level of weed control observed in most treatments (perfect timing!).
- Group 2 herbicides (e.g., Pursuit, Classic, First Rate) applied alone were effective on lambsquarters but NOT on waterhemp. The use of imazethapyr (e.g., Pursuit, Extreme, Thundermaster), which is a common practice in Wisconsin, did not provide satisfactory control of waterhemp. When using imazethapyr (which is an effective herbicide for control of several weed species) as part of the PRE-emergence herbicide program for waterhemp control, the tank mixture with or selection of herbicides that contain other effective active ingredient(s) is recommended.
- PRE-emergence herbicide programs containing multiple effective sites of action are recommended to broaden weed control spectrum and to lower selection for additional herbicide resistance.

For the complete publication of the [2018 Preliminary Report of the "UW Waterhemp Challenge: Comparison of Soil Residual Herbicides" \(PDF file\) click HERE](#) or visit wiscweeds.info for the accompanying blog post and pdf link.

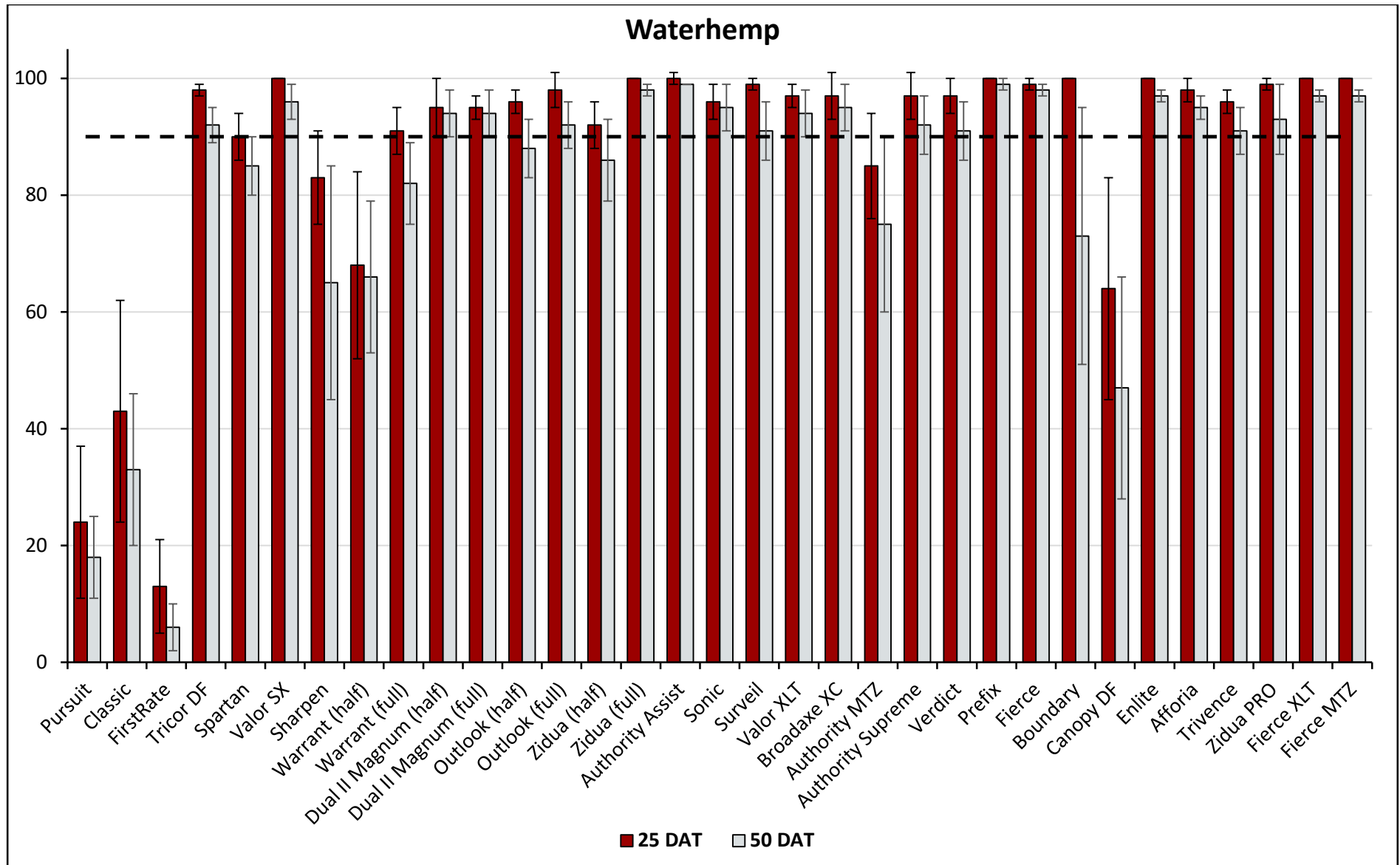


Figure 43. Waterhemp efficacy ratings for trial #18-LAN-WC02. Bars indicate the average % control ± the standard error of four replications following herbicide applications. The herbicides evaluated are listed along the x-axis. For rates used, refer to the treatment table on page 103. The dashed line indicates 90% control.

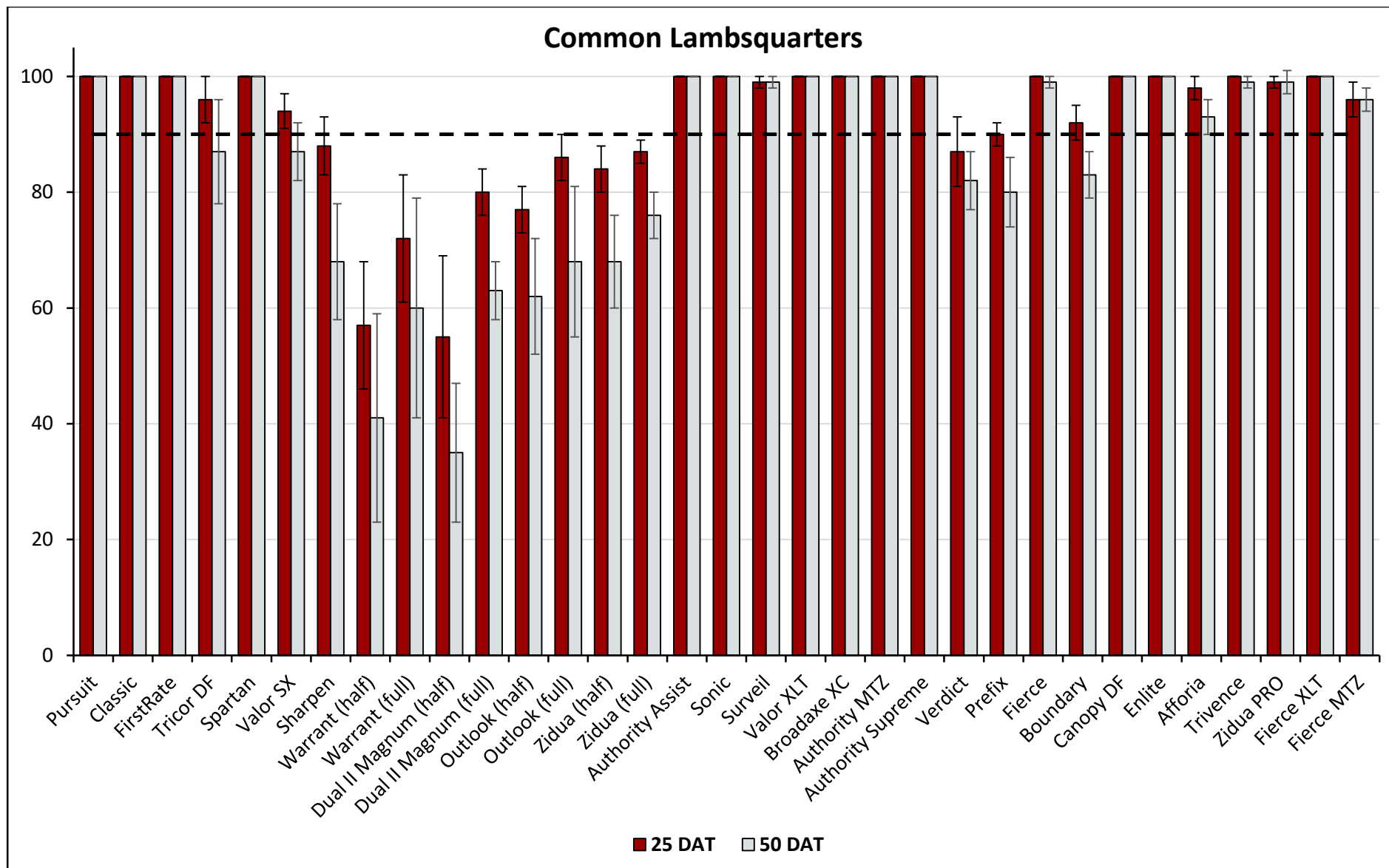


Figure 44. Common lambsquarters efficacy ratings for trial #18-LAN-WC02. Bars indicate the average % control ± the standard error of four replications following herbicide applications. The herbicides evaluated are listed along the x-axis. For rates used, refer to the treatment table on page 103. The dashed line indicates 90% control.

Table 3. 2018 Temperature and Precipitation Summary

Location	Month	Precipitation (in)			Average Temperature (F)		
		2018*	30-year norm**	2018 departure	2018*	30-year norm**	2018 departure
Arlington	May	7.11	3.69	3.42	64.5	55.7	8.8
	June	4.84	4.68	0.16	68.6	65.6	3.0
	July	2.08	4.16	-2.08	71.6	69.4	2.1
	August	8.76	3.90	4.86	70.4	67.3	3.1
	September	4.65	3.54	1.11	63.0	59.3	3.7
	Total		27.44	19.97	+7.47	-	-
Janesville (Beloit)	May	5.76	3.80	1.96	65.3	58.7	6.6
	June	7.15	4.73	2.42	69.6	68.6	1.0
	July	3.33	3.85	-0.52	72.0	72.5	-0.5
	August	10.2	4.27	5.93	71.3	70.8	0.5
	September	8.69	3.65	5.04	64.7	62.9	1.5
	Total		35.14	20.30	+14.84	-	-
Lancaster	May	6.41	4.13	2.28	64.7	57.3	7.4
	June	6.37	5.26	1.11	69.6	66.9	2.7
	July	5.38	4.32	1.06	71.7	70.8	0.9
	August	9.09	4.20	4.89	70.8	69.0	1.8
	September	12.13	3.14	8.99	64.0	60.8	3.2
	Total		39.38	21.05	+18.33	-	-

*2018 data recorded from on-site weather stations.

**Source: Wisconsin State Climatology Office; 30-year normals from 1981 to 2010.

List of Tables and Figures

Table/Figure #	Description	Trial #	Page #
Figure 1	Giant ragweed control with PRE herbicides	CN01	1
Figure 2	Giant ragweed Control with EPOST herbicides	CN02	7
Figure 3	Annual grass control with EPOST herbicides	CN02	8
Figure 4	Corn injury from EPOST herbicide applications	CN02	9
Figure 5	Giant ragweed control with a 2-pass herbicide program	CN03	13
Figure 6	Corn injury from POST applied herbicides	CN03	14
Figure 7	Giant ragweed control with 1 and 2-pass programs	CN04	18
Figure 8	Lambsquarters control with 1 and 2-pass programs	CN04	19
Figure 9	Corn injury from EPOST applied herbicides	CN04	20
Figure 10	Velvetleaf control with EPOST herbicides	CN06	24
Figure 11	Corn injury from EPOST applied herbicides	CN06	25
Figure 12	Giant ragweed control with 1 and 2-pass programs	CN07	29
Figure 13	Annual grass control with 1 and 2-pass programs	CN07	30
Figure 14	Corn yield in 1 and 2-pass herbicide programs	CN07	31
Figure 15	Giant ragweed control with PRE herbicides	CN09	34
Figure 16	Giant ragweed control: Liberty Link system comparison	CN10	38
Figure 17	Giant foxtail control with 1 and 2-pass programs	CN11	41
Figure 18	Giant ragweed control with 1 and 2-pass programs	CN12	44
Figure 19	Giant foxtail control with 1 and 2-pass programs	CN13	48
Figure 20	Corn Injury from POST applied herbicides	CN13	49
Figure 21	Common ragweed control with PRE herbicides	SB06	57
Figure 22	Velvetleaf control with PRE herbicides	SB06	58
Figure 23	Giant foxtail control with PRE herbicides	SB06	59
Figure 24	Broadleaf and grass weed density at POST application	SB06	60
Figure 25	Waterhemp control with PRE herbicides	SB07	63
Figure 26	Common lambsquarters control with PRE herbicides	SB07	64
Figure 27	Velvetleaf control with PRE herbicides	SB08	68
Figure 28	Giant foxtail control with PRE herbicides	SB08	69
Figure 29	Broadleaf weed control with PRE herbicides	SB09	72
Figure 30	Annual grass control with PRE herbicides.	SB09	73

List of Tables and Figures (cont.)

Table/Figure #	Description	Trial #	Page #
Figure 31	Soybean injury from PRE applied herbicides	SB09	74
Figure 32	Velvetleaf control with PRE herbicides: Corteva	SB12	78
Figure 33	Common ragweed control with PRE herbicides: Corteva	SB12	79
Figure 34	Giant foxtail control with PRE herbicides: Corteva	SB12	80
Figure 35	Velvetleaf control with a 2-pass program: Syngenta	SB14	87
Figure 36	Common ragweed with a 2-pass program: Syngenta	SB14	88
Figure 37	Giant foxtail control with a 2-pass program: Syngenta	SB14	89
Figure 38	Soybean injury from PRE and POST applied herbicides	SB14	90
Figure 39	Giant ragweed control with dicamba in 2-pass programs	SB16	94
Figure 40	Giant ragweed control with dicamba in 2-pass programs	SB17	98
Figure 41	Weed biomass reduction from single MOA PRE herb.	SB19	101
Figure 42	Purslane and grass control from single MOA PRE herb.	SB19	101
Figure 43	Waterhemp control from soil applied residual herb.	WC02	105
Figure 44	Lambsquarters control from soil applied residual herb.	WC02	106
Table 1	Weed control and corn yield: herb. systems approach	CN14	53
Table 2	Weed control and soy yield: herb. systems approach	SB13	83
Table 3	Temperature and precipitation summary	-	107

Index of Weed Species Evaluated

Weed (common name)	Bayer Code	Page Number(s)
foxtail, giant	SETFA	41, 48, 59, 69, 73, 80, 89
foxtail, yellow	SETPU	73
grasses, annual	GGGGG	2, 8, 12, 17, 23, 30, 33, 37, 43, 93, 97, 101
lambsquarters, common	CHEAL	2, 6, 12, 19, 23, 28, 33, 37, 40, 43, 47, 56, 64, 67, 72, 77, 86, 93, 97, 105
nightshade, eastern black	SOLPT	56, 67, 77
pigweed, redroot	AMARE	6, 17, 28, 40, 43, 47, 72, 93, 97
purslane, common	POROL	101
ragweed, common	AMBEL	40, 47, 57, 72, 79, 88
ragweed, giant	AMBTR	3, 7, 13, 18, 23, 29, 34, 38, 44, 53, 83, 94, 98
velvetleaf	ABUTH	6, 24, 28, 33, 37, 40, 47, 58, 68, 72, 78, 87
waterhemp, common	AMATA	63, 105

Index of Adjuvants

Adjuvant Brand	Adjuvant Type	Page Number(s)
Agri-Dex	crop oil concentrate	16, 96
Amsol	ammonium sulfate (liquid)	5, 11, 43, 76, 85
Bronc	ammonium sulfate (liquid)	46
ChemSurf 90	nonionic surfactant	17
Class Act Ridion	water conditioner (non-AMS)	82, 85
Destiny HC	high surfactant methylated seed oil	5
FS COC Supreme	high load crop oil concentrate	52
Induce	nonionic surfactant	5, 11, 22, 27, 40, 43, 52, 66, 92, 96
Intact	drift reduction and deposition aid	11, 76, 82, 85
Premium MSO	methylated seed oil	27, 43, 85
S-Sul	ammonium sulfate (dry)	16, 22, 27, 36, 40, 52, 55, 62, 66, 71, 96

Index of Herbicides Evaluated

Herbicide	Active Ingredient(s)	Page Number(s)
AAtrex	atrazine	2, 5, 11, 16, 22, 27, 33, 36, 43
Abundit Edge	glyphosate (potassium salt)	76
Acuron	bicyclopyrone+mesotrione+atrazine+S-metolachlor	2, 11, 16, 27, 33
Acuron Flexi	bicyclopyrone + mesotrione + S-metolachlor	17, 40, 52
Afforia	thifensulfuron + tribenuron + flumioxazin	76, 103
Anthem Maxx	pyroxasulfone + fluthiacet	16, 22, 55, 62, 71
Armezon	topramezone	22
Armezon PRO	topramezone + dimethenamid	11, 22
Authority Assist	sulfentrazone + imazethapyr	55, 103
Authority Elite	sulfentrazone + S-metolachlor	55, 66
Authority First	sulfentrazone + cloransulam	55, 62, 71, 85
Authority MTZ	sulfentrazone + metribuzin	55, 103
Authority Supreme	sulfentrazone + pyroxasulfone	55, 66, 103
Balance Bean	isoxaflutole	71
Balance Flexx	isoxaflutole	11, 16, 27, 36
Bicep II Magnum	S-metolachlor + atrazine	11
Boundary	S-metolachlor + metribuzin	55, 62, 66, 71, 85, 103
Broadaxe XC	S-metolachlor + sulfentrazone	85, 103
Callisto Xtra	mesotrione + atrazine	27
Callisto	mesotrione	16, 22, 40
Canopy DF	chlorimuron + metribuzin	103
Capreno	tembotrione + thien carbazone	5, 22, 27, 36
Clarity	dicamba (DGA salt)	40, 46, 52
Classic	chlorimuron-ethyl	99, 103
Corvus	isoxaflutole + thien carbazone	11, 16, 22, 27, 33, 36, 40
Degree Xtra	acetochlor + atrazine	11
Diflexx	dicamba (DGA salt)	5, 11, 52
Diflexx Duo	dicamba + tembotrione	22, 27, 36, 52
Dual II Magnum	S-metolachlor	92, 99, 103
Durango DMA	glyphosate (DMA salt)	11, 36, 46, 76
Engenia	dicamba (BAPMA salt)	85, 92, 96
Engenia PRO	dicamba + pyroxasulfone	92, 96
Enlist Duo	2,4-D (choline salt) + glyphosate (DMA salt)	46
Enlite	chlorimuron + thifensulfuron + flumioxazin	76, 103
EverpreX	S-metolachlor	76
FeXapan	dicamba (DGA salt) with VaporGrip® Technology	76
Fierce	flumioxazin + pyroxasulfone	55, 66, 103
Fierce MTZ	flumioxazin + pyroxasulfone + metribuzin	66, 103
Fierce XLT	flumioxazin + pyroxasulfone + chlorimuron	103
FirstRate	cloransulam-methyl	99, 103

Herbicide	Active Ingredient(s)	Page Number(s)
Flexstar	fomesafen	76
Flexstar GT	fomesafen + glyphosate	85, 96
Halex GT	S-metolachlor + mesotrione + glyphosate	5, 11, 16, 22, 27, 40, 43, 52
Harness	acetochlor	43
Harness Max	acetochlor + mesotrione	2, 5, 11, 27, 33, 36, 40, 52
Harness Xtra	acetochlor + atrazine	2, 5, 11
Harness Xtra 5.6L	acetochlor + atrazine	11
Impact	topramezone	43
ImpactZ	topramezone + atrazine	43
Keystone NXT	acetochlor + atrazine	11
Lexar EZ	mesotrione + S-metolachlor + atrazine	11
Liberty 280	glufosinate	22, 33, 36, 43, 66
Lumax	mesotrione + S-metolachlor + atrazine	33
Outlook	dimethenamid-P	62, 71, 96, 99, 103
Prefix	S-metolachlor + fomesafen	62, 85, 103
Princep 4L	simazine	40
Pursuit	imazethapyr	97, 99, 103
Realm Q	rimsulfuron + mesotrione	46, 52
Resicore	clopyralid + acetochlor + mesotrione	2, 5, 11, 16, 22, 33, 40, 46
Roundup	glyphosate (potassium salt)	5, 11, 16, 22, 27, 36, 40, 43,
PowerMax		52, 55, 62, 71, 82, 85, 92, 96
Select Max	clethodim	66
Sharpen	saflufenacil	99, 103
Solstice	fluthiacet-methyl	16
Sonic	sulfentrazone + cloransulam	71, 76, 103
Spartan	sulfentrazone	99, 103
Status	diflufenzopyr + dicamba (sodium salt)	5, 11, 16, 22
Surestart II	acetochlor + clopyralid + flumetsulam	11, 46, 52
Surveil	flumioxazin + cloransulam	76, 103
Tavium	dicamba (DGA salt) w/VaporGrip® + S-metolachlor	85
Tricor DF	metribuzin	55, 62, 71, 92, 99, 103
Tripleflex II	acetochlor + clopyralid + flumetsulam	11, 27
Trivence	chlorimuron + flumioxazin + metribuzin	103
Valor SX	flumioxazin	71, 82, 99, 103
Valor XLT	flumioxazin + chlorimuron	85, 103
Verdict	saflufenacil + dimethenamid	16, 36, 103
Warrant	acetochlor	62, 82, 92, 99, 103
Xtendimax	dicamba (DGA salt) with VaporGrip® Technology	82, 85, 92
Zidua	pyroxasulfone	71, 99, 103
Zidua PRO	pyroxasulfone + saflufenacil + imazethapyr	55, 62, 66, 85, 96, 103
Zidua SC	pyroxasulfone	92, 97

Index of Trial Sponsors

Company	Trial Number (s)*
AMVAC	CN12
BASF	SB16 , SB17
Bayer Crop Science	CN06 , CN07 , CN08 , CN09 , CN10 , SB09 , SB10
Corteva Agriscience	CN13 , SB11 , SB12
FMC	CN04 , SB06 , SB07
Monsanto	CN01 , CN02 , CN03 , SB01 , SB02 , SB03 , SB04 , SB05 , BG01
Sipcam Agro	CN05
Syngenta	CN07 , CN11 , SB14 , SB15
Valent	SB08
WiscWeeds	CN14 , CN15 , SB13 , SB18 , SB19 , WC02

*Not all trials listed were presented in this research report.