

2020 Wisconsin Weed Science Research Report



Cropping Systems Weed Science
UNIVERSITY OF WISCONSIN-MADISON

Ryan DeWerff, Nick Arneson, and Rodrigo Werle

Department of Agronomy
College of Agriculture and Life Sciences
University of Wisconsin-Madison | UW-Extension

www.wiscweeds.info

2020 Wisconsin Cropping Systems Weed Science Research Team

Dr. Rodrigo Werle

Assistant Professor, Extension Cropping Systems Weed Scientist

MSc. Ryan DeWerff

Weed Science Research Specialist, Wisconsin Herbicide Evaluation
Program Coordinator

MSc. Nick Arneson

Weed Science Outreach Specialist

MSc. Sarah Striegel

Weed Science Research Assistant

MSc. Dan Smith

UW-NPM Southwest Wisconsin Regional Agronomy Specialist

Weed Science Graduate Research Assistants:

Nikola Arsenijevic, Kolby Grint, Felipe Faleco, Haleigh Ortmeier-Clarke,
José Junior Nunes

Undergraduate Research Assistant:

Emily Glaeser, UW-Madison

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A3646, Pest Management in Wisconsin Field Crops
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MSc. Ryan DeWerff
Weed Science Research Specialist
Wisconsin Herbicide Evaluation Program Coordinator
Department of Agronomy
University of Wisconsin-Madison
dewerff@wisc.edu

or

Dr. Rodrigo Werle
Extension Weed Scientist
Department of Agronomy
University of Wisconsin-Madison
rwerle@wisc.edu
(608) 262-7130

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Predominant Weed Species in Trial: Color Coding		
 giant ragweed	 waterhemp	 lambsquarters

Project Goal: Gain exposure to Bayer corn herbicide product offerings to support potential recommendations.

Site Description:

Location:	Janesville, WI	Crop:	Corn
Field #:	1	Variety:	DKC54-38 RIB
Soil type:	Plano silt loam	Planting Date:	5/3
% OM:	3.5	Emergence Date:	5/21
pH:	6.4	Population:	32,000 seeds/acre
Fertilization:	180 lbs N/acre	Depth:	2 in
	70 lbs K/acre	Row spacing:	30 in
	80 lbs P/acre	Plot Size:	10 x 30 ft
Tillage:	conventional	Previous crop:	Soybean
Weed species:	giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), barnyardgrass (ECHCG), fall panicum (PANDI)		

Herbicide Application Information:

Date:	5/4	5/27	6/8
Treatment:	PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):	53	85	87
2" Soil Temp (°F):	51	80	80
Soil moisture [surface]:	moist	dry	dry
RH %:	55	28	37
Cloud cover %	25	30	10
Wind speed (mph)/direction	7-12/NE	1-6/SW	4-7/NNW
Rainfall (in) 1 wk after APP:	0.5	0.35	0.97
GPA:	15	15	15
PSI:	36	34	36
Nozzle:	TTI 110015	AIXR 110015	TTI 110015
Nozzle spacing (in):	20	20	20
Boom Height (in):	20	23	24

Crop and weed information at application:

	Date:	5/4	5/27	6/8
Corn	Height:	-	2-3"	7-9"
	Stage:	-	V1	V4/V5
Giant ragweed	Height:	-	1-2"	1-2"
	Density:	-	7-23 m ²	1-3 m ²
Lambsquarters	Height:	-	0.25-0.5"	-
	Density:	-	40-200 m ²	-
Velvetleaf	Height:	-	0.25-1"	-
	Density:	-	1-3 m ²	-
Annual grasses	Height:	-	0.5-1"	1-6"
	Density:	-	1-12 m ²	0-4 m ²

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	TripleFlex II	4.25 lb/gal	2, 4, 15	1 qt/a	A	PRE
	atrazine	4 lb/gal	5	2 pt/a	A	PRE
3	Harness MAX	3.85 lb/gal	15, 27	75 fl oz/a	A	PRE
	atrazine	4 lb/gal	5	2 pt/a	A	PRE
4	Acuron	3.44 lb/gal	5, 15, 27	2.75 qt/a	A	PRE
5	Degree XTRA	4.04 lb/gal	5, 15	3 qt/a	B	EPOST
	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	B	EPOST
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	B	EPOST
	AMS (liquid)			2.5% v/v	B	EPOST
6	Harness MAX	3.85 lb/gal	15, 27	64 fl oz	B	EPOST
	atrazine	4 lb/gal	5	2 pt/a	B	EPOST
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	B	EPOST
	AMS (liquid)			2.5% v/v	B	EPOST
7	Degree XTRA	4.04 lb/gal	5, 15	3 qt/a	B	EPOST
	DiFlexx	4 lbae/gal	4	8 fl oz/a	B	EPOST
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	B	EPOST
	Class Act Ridion			1% v/v	B	EPOST
8	Halex GT	4.39 lb/gal	9, 15, 27	3.6 pt/a	B	EPOST
	atrazine	4 lb/gal	5	2 pt/a	B	EPOST
	NIS			0.25% v/v	B	EPOST
	AMS (liquid)			2.5% v/v	B	EPOST
9	Harness MAX	3.85 lb/gal	15, 27	55 fl oz/a	A	PRE
	atrazine	4 lb/gal	5	2 pt/a	A	PRE
	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	C	POST
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	C	POST
	AMS (liquid)			2.5% v/v	C	POST
10	Harness Xtra 5.6L	5.6 lb/gal	5, 15	2 qt/a	A	PRE
	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	C	POST
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	C	POST
	AMS (liquid)			2.5% v/v	C	POST
11	Acuron	3.44 lb/gal	5, 15, 27	1.5 qt/a	A	PRE
	Halex GT	4.39 lb/gal	9, 15, 27	3.6 pt/a	C	POST
	atrazine	4 lb/gal	5	2 pt/a	C	POST
	NIS			0.25% v/v	C	POST
	AMS (liquid)			2.5% v/v	C	POST

Adjuvants: AMS = N-PAK; NIS = Prefer 90

Trial Summary:

This trial evaluated the weed control and crop safety of various corn herbicide programs from the Bayer portfolio and similar competitor programs. There was no visible corn injury from the PRE herbicides. There was minor leaf necrosis, ~ 5% injury, observed 12 days after the EPOST application of Harness MAX + atrazine + Roundup PowerMAX (data not shown). None of the other EPOST treatments had an average % necrosis >1%.

All treatments provided excellent control of common lambsquarters (>98%) at all rating timings. Control of annual grass weed species (giant foxtail, barnyardgrass, and fall panicum) was excellent, greater than 90%, for most herbicide programs 14 days after the POST application (6/22). Only treatments 4 (60%) and 8 (76%) had <90% control at this rating (data not shown).

Giant ragweed was the predominant species and in plots with heavy densities it largely outcompeted other species. Giant ragweed at this research location is a biotype with a prolonged emergence pattern as emergence typically starts in mid- to late-April and continues well into June. The average control of giant ragweed was impacted by herbicide program at all rating timings (Figure 1). All the PRE herbicides evaluated provided good control (79-88%) 23 days after application. In general, the PRE treatments containing mesotrione (group 27) had longer and more consistent residual control of giant ragweed control (Trts 2, 10). All 2-pass herbicide programs provided at least 92% control of giant ragweed at corn harvest. None of the 1-pass programs, except for treatment 6 (97%), provided >82% control at the end of the season. 1-pass PRE or EPOST herbicide programs are not recommended in fields with heavy population densities of giant ragweed and/or biotypes with the prolonged emergence pattern similar to this location

Corn yield was significantly impacted by herbicide program, $p < 0.001$ (Figure 2). Averaged across all treatments, yield of the 2-pass PRE + POST programs = 271 bu/acre, EPOST = 267 bu/acre and PRE = 225 bu/acre. The untreated check yield = 101 bu/acre.

Plot photos from throughout the growing season are available in the [Bayer Corn Herbicide Programs](#) visual report published on wiscweeds.info.

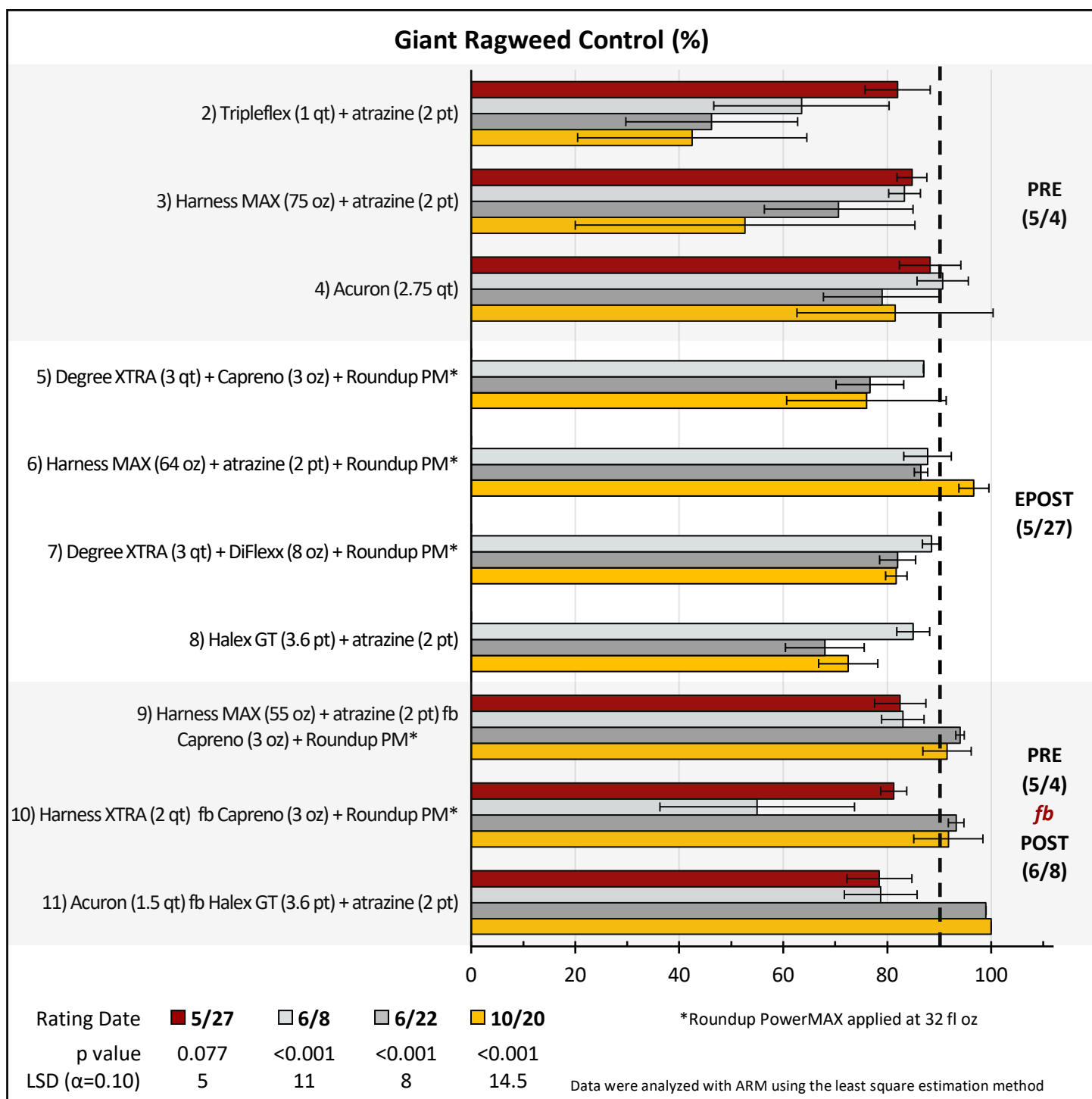


Figure 1: Giant ragweed efficacy ratings for trial #20-ROK-CN01. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

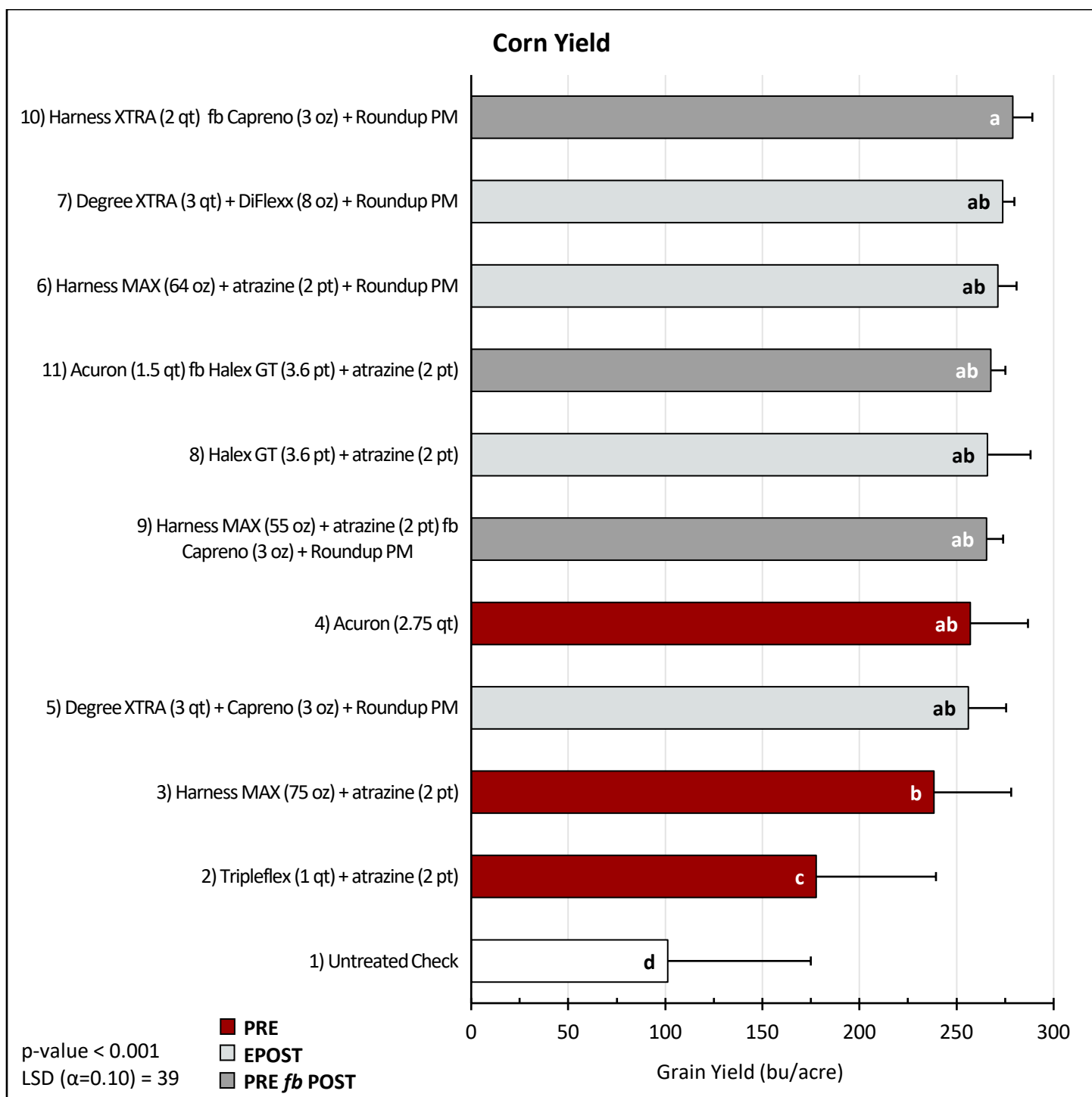


Figure 2. Grain yield for trial #20-ROK-CN01. Bars indicate the average yield in bushels per acre + the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. Bars with the same letter are not significantly different ($p < 0.001$).

Project Goal: Compare Shieldex applied POST to industry standards for weed control and crop safety.

Shieldex is a new HPPD, group 27, herbicide from Summit Agro for use in field and sweet corn. Contains the active ingredient tolpyralate.

Site Description:

Location:	Janesville, WI	Crop:	Corn
Field #:	2	Variety:	DKC 54-28 RIB
Soil type:	Plano silt loam	Planting Date:	4-27
% OM:	3.5	Emergence Date:	5/17
pH:	6.7	Population:	32,000 seeds/acre
Fertilization:	180 lbs N/acre	Depth:	2 in
	70 lbs K/acre	Row spacing:	30 in
	80 lbs P/acre	Plot Size:	10 x 30 ft
Tillage:	conventional	Previous crop:	Soybean
Weed species:	giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), green foxtail (SETVI), barnyardgrass (ECHCG)		

Herbicide Application Information:

Date:	4/28	5/27
Treatment:	PRE (A)	POST (B)
Air Temp (°F):	65	84
2" Soil Temp (°F):	52	78
Soil moisture [surface]:	wet	dry
RH %:	80	56
Cloud cover %	75	5
Wind speed (mph)/direction	0-5/ESE	2-5/SE
Rainfall (in) 1 wk after APP:	1.3	0.35
GPA:	15	15
PSI:	36	34
Nozzle:	TTI 110015	AIXR 110015
Nozzle spacing (in):	20	20
Boom Height (in):	20	23

Crop and weed information at application:

	Date:	4/28	5/27
Corn	Height:	-	2-3"
	Stage:	-	V2
giant ragweed	Height:	-	0.5-3"
	Density:	-	3-13/ft ²
lambsquarters	Height:	-	-
	Density:	-	-
velvetleaf	Height:	-	-
	Density:	-	-
annual grasses	Height:	-	-
	Density:	-	-

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Bicep II Magnum	5.5 lb/gal	5, 15	1.67 qt/a	PRE	A
2	Bicep II Magnum	5.5 lb/gal	5, 15	1.67 qt/a	PRE	A
	Shieldex	3.33 lb/gal	27	1 fl oz/a	POST	B
	atrazine	4 lb/gal	15	1 pt/a	POST	B
	COC			1% v/v	POST	B
3	Bicep II Magnum	5.5 lb/gal	5, 15	1.67 qt/a	PRE	A
	Impact	2.8 lb/gal	27	1 fl oz/a	POST	B
	atrazine	4 lb/gal	15	1 pt/a	POST	B
	COC			1% v/v	POST	B
4	Bicep II Magnum	5.5 lb/gal	5, 15	1.67 qt/a	PRE	A
	Laudis	3.5 lb/gal	27	3 fl oz/a	POST	B
	atrazine	4 lb/gal	15	1 pt/a	POST	B
	COC			1% v/v	POST	B
5	Untreated Check					

Adjuvants: COC = Crop Oil

Trial Summary:

This trial compared the efficacy and crop safety of a Shieldex plus atrazine tank mix applied POST to industry standards.

The Shieldex + atrazine tank mix resulted in more severe corn leaf necrosis or “leaf burn” than either of the Laudis or Impact tank mixes (Figure 3). Injury was not severe enough to affect normal growth and new leaves were unaffected. Shieldex generally has good crop safety and observed necrosis was likely contributed in part by the crop oil.

Control of common lambsquarters, velvetleaf, and annual grass species was excellent for all treatments throughout the growing season (data not shown). The PRE application of Bicep II Magnum largely controlled all three species as there were very few emerged when the POST application was made.

Giant ragweed was the predominant species and in plots with heavy densities it largely outcompeted other species. Giant ragweed at this research location is a biotype with a prolonged emergence pattern as emergence typically starts in mid- to late-April and continues well into June. Bicep II Magnum provided ~60% control of giant ragweed when the POST application was made. All POST treatments were effective at controlling emerged giant ragweed (Figure 4). However, numerous giant ragweed seedlings emerged after the POST application and control 14 days after application was only 78-83%. Shieldex, Impact, Laudis and the low rate of atrazine used have little residual activity on giant ragweed. Giant ragweed control fell below 50% for all herbicide programs 28 days after the POST application (data not shown).

Plot photos from throughout the growing season are available in the [Shieldex Weed Control and Crop Safety](#) visual report published on wiscweeds.info.

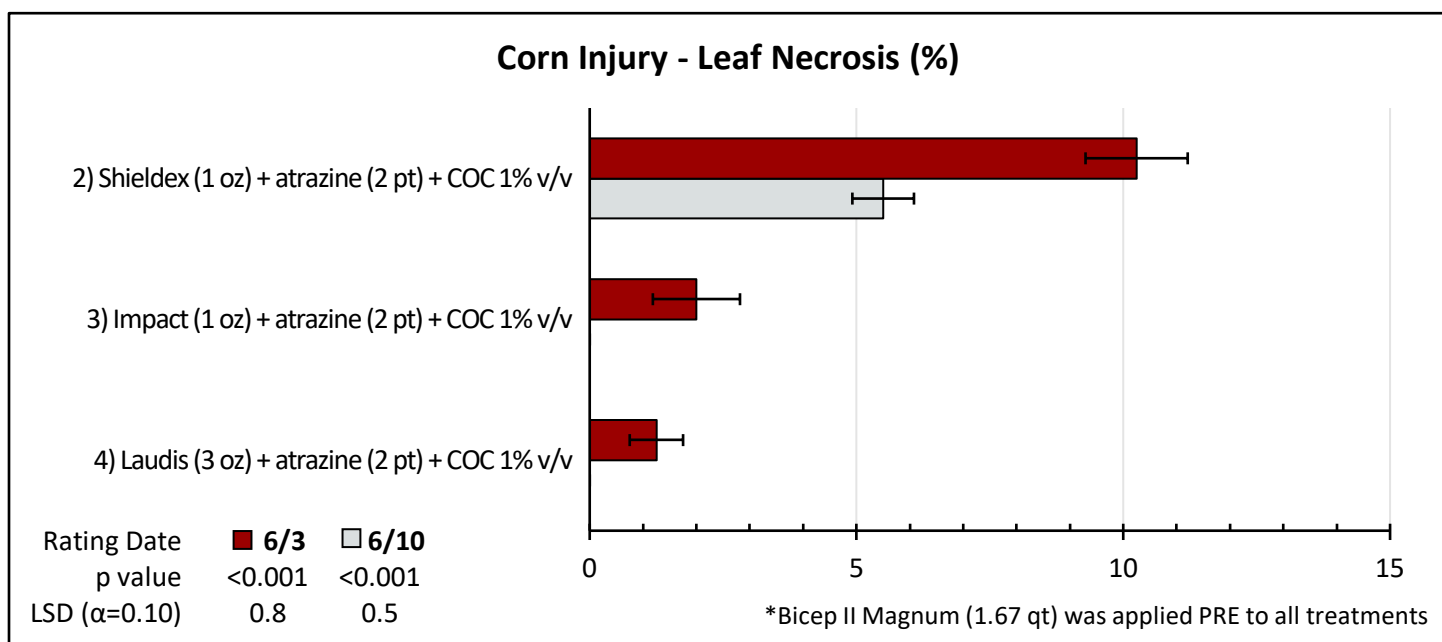


Figure 3: Corn injury ratings at 7 and 14 days after the POST application for trial #20-ROK-CN04. Bars indicate the average % leaf necrosis (burn) \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table.

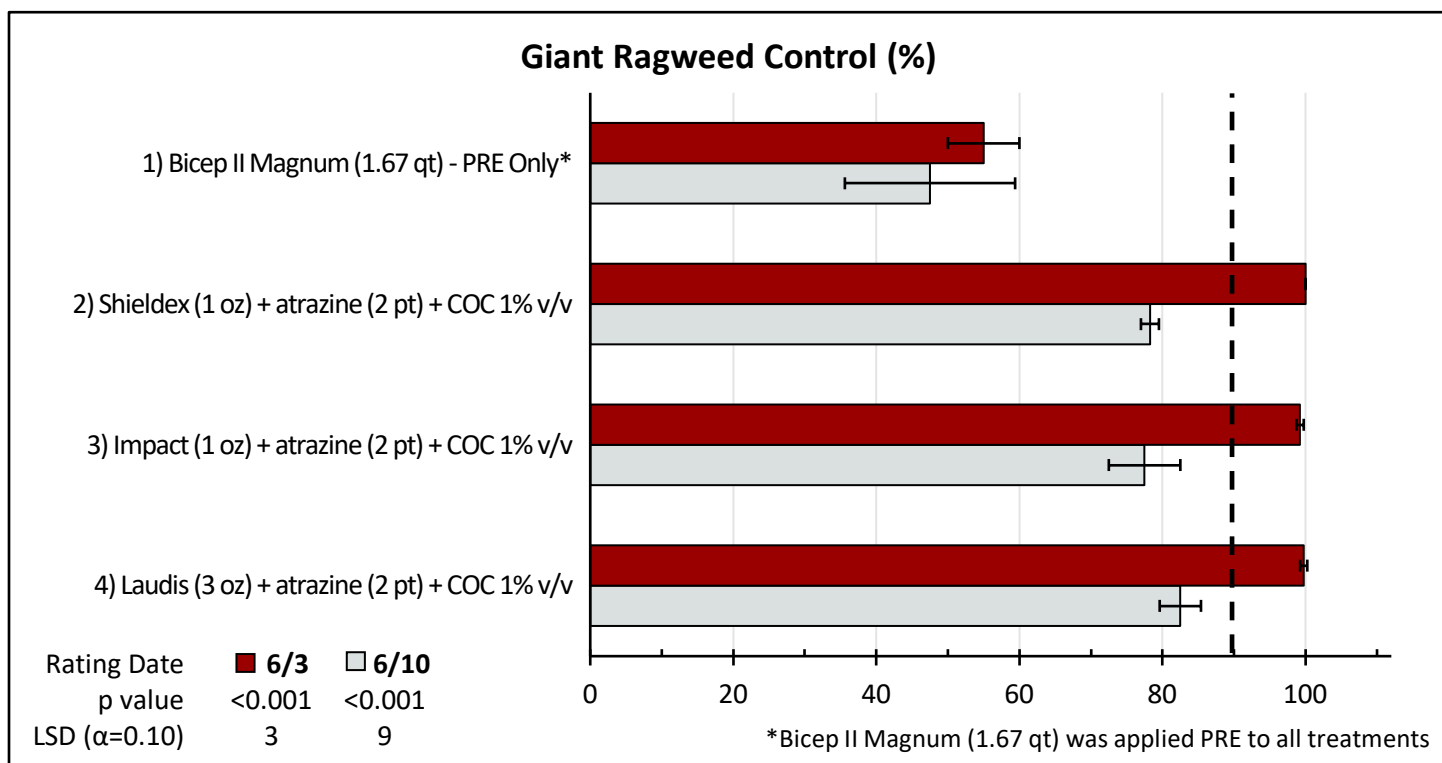


Figure 4: Giant ragweed efficacy ratings for trial #20-ROK-CN04. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Evaluate various corn herbicide programs containing atrazine for season long weed control.

Site Description:

Location:	Janesville, WI	Crop:	Corn
Field #:	1	Variety:	NK9535-3220-EZ1
Soil type:	Plano silt loam	Planting Date:	5/3
% OM:	3.5	Emergence Date:	5/21
pH:	6.4	Population:	32,000 seeds/acre
Fertilization:	180 lbs N/acre	Depth:	2 in
	70 lbs K/acre	Row spacing:	30 in
	80 lbs P/acre	Plot Size:	10 x 30 ft
Tillage:	conventional	Previous crop:	Soybean
Weed species:	giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), barnyardgrass (ECHCG), fall panicum (PANDI)		

Herbicide Application Information:

Date:	5/4	5/29	6/8
Treatment:	PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):	53	63	87
2" Soil Temp (°F):	51	62	80
Soil moisture [surface]:	moist	wet	dry
RH %:	55	73	37
Cloud cover %	25	0	10
Wind speed (mph)/direction	7-12/NE	3-6/NW	4-7/NNW
Rainfall (in) 1 wk after APP:	0.5	0.11	0.97
GPA:	15	15	15
PSI:	36	36	36
Nozzle:	TTI 110015	TTI 110015	TTI 110015
Nozzle spacing (in):	20	20	20
Boom Height (in):	20	24	24

Crop and weed information at application:

	Date:	5/4	5/29	6/8
Corn	Height:	-	3-4"	9-11"
	Stage:	-	V2	V4/V5
giant ragweed	Height:	-	1-4"	1-2"
	Density:	-	0.5-3/ft ²	0-3/ft ²
lambsquarters	Height:	-	0.25-1"	-
	Density:	-	5-40/ft ²	-
velvetleaf	Height:	-	0.5-1"	-
	Density:	-	0-0.1/ft ²	-
annual grasses	Height:	-	0.25-1"	-
	Density:	-	0.5-2/ft ²	-

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Lumax EZ	3.67 lb/gal	5, 15, 27	3 qt/a	PRE	A
3	Resicore	3.29 lb/gal	4, 15, 27	2.5 qt/a	PRE	A
4	Halex GT	4.39 lb/gal	9, 15, 27	4 pt/a	EPOST	B
	AAtrex	4 lb/gal	5	1 pt/a	EPOST	B
	NIS			0.25% v/v	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
5	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	1 pt/a	EPOST	B
	Roundup PowerMAX	4.5 lbae/gal	9	28 fl oz/a	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
6	Bicep Lite II Magnum	6 lb/gal	5, 15	1 qt/a	PRE	A
	Halex GT	4.39 lb/gal	9, 15, 27	3.6 pt/a	POST	C
	AAtrex	4 lb/gal	5	0.5 pt/a	POST	C
	NIS			0.25% v/v	POST	C
	AMS			8.5 lb/100 gal	POST	C
7	Lumax EZ	3.67 lb/gal	5, 15, 27	1.5 qt/a	PRE	A
	Halex GT	4.39 lb/gal	9, 15, 27	3.6 pt/a	POST	C
	AAtrex	4 lb/gal	5	1 pt/a	POST	C
	NIS			0.25% v/v	POST	C
	AMS			8.5 lb/100 gal	POST	C
8	Surestart II	4.25 lb/gal	2, 4, 15	2 pt/a	PRE	A
	AAtrex	4 lb/gal	5	2 pt/a	PRE	A
	Resicore	3.29 lb/gal	4, 15, 27	1.5 qt/a	POST	C
	Durango DMA	4 lbae/gal	9	32 fl oz/a	POST	C
	AMS			8.5 lb/100 gal	POST	C
9	Surpass NXT	7 lb/gal	15	2.25 pt/a	PRE	A
	AAtrex	4 lb/gal	5	2 pt/a	PRE	A
	Realm Q	38.75% w/w	2, 27	4 oz/a	POST	C
	Durango DMA	4 lbae/gal	9	32 fl oz/a	POST	C
	AMS			8.5 lb/100 gal	POST	C

Adjuvants: AMS = BlueAg spray grade ammonium sulfate; NIS = Prefer 90

Trial Summary:

This trial evaluated the weed control and crop safety of various corn herbicide programs containing atrazine from the Syngenta and Corteva portfolios. There was not any significant corn injury from the PRE herbicides. Some leaf necrosis was observed 5 days after the EPOST application. Halex GT + atrazine had 2% average leaf necrosis and Capreno + atrazine + Roundup had 6% leaf necrosis (data not shown).

Control of common lambsquarters was excellent for all treatments throughout the growing season (data not shown). Velvetleaf control was excellent for all treatments except for the PRE Bicep Lite II Magnum treatment (Trt 6), as control was only 64% at the 6/8 rating. Both EPOST herbicide programs did not provide adequate season long grass control. Grass control fell to 73 and 65% for treatments 4 and 5, respectively at the 7/22 late season rating. All other herbicide programs had excellent grass control.

Giant ragweed was the predominant species and in plots with heavy densities it largely outcompeted other species. Giant ragweed at this research location is a biotype with a prolonged emergence pattern as emergence typically starts in mid- to late-April and continues well into June. The average control of giant ragweed was impacted by herbicide program at all rating timings (Figure 5). All the PRE herbicides evaluated provided fair to excellent early season control (75-97%) 25 days after application. All 2-pass herbicide programs provided at least 90% control of giant ragweed at corn harvest. None of the 1-pass programs, except for Resicore, trt 3, (93%), provided <90% control at the end of the season. 1-pass PRE or EPOST herbicide programs are not recommended in fields with heavy population densities of giant ragweed and/or biotypes with the prolonged emergence pattern similar to this location

Corn yield was significantly impacted by herbicide program, $p < 0.001$ (Figure 6). Although this was largely driven by the untreated check as yields of most of the herbicide programs were similar. Averaged across all treatments, yield of the 2-pass PRE + POST programs = 239 bu/acre, EPOST = 226 bu/acre and PRE = 238 bu/acre. The untreated check yield = 112 bu/acre. Although not significantly different, there was a small yield reduction of the EPOST programs. This suggests that there may have been some yield potential lost by allowing weeds to compete with the corn early in the growing season.

Plot photos from throughout the growing season are available in the [Corn Herbicide Evaluation: 1 and 2-Pass Programs with Atrazine](#) visual report published on wiscweeds.info.

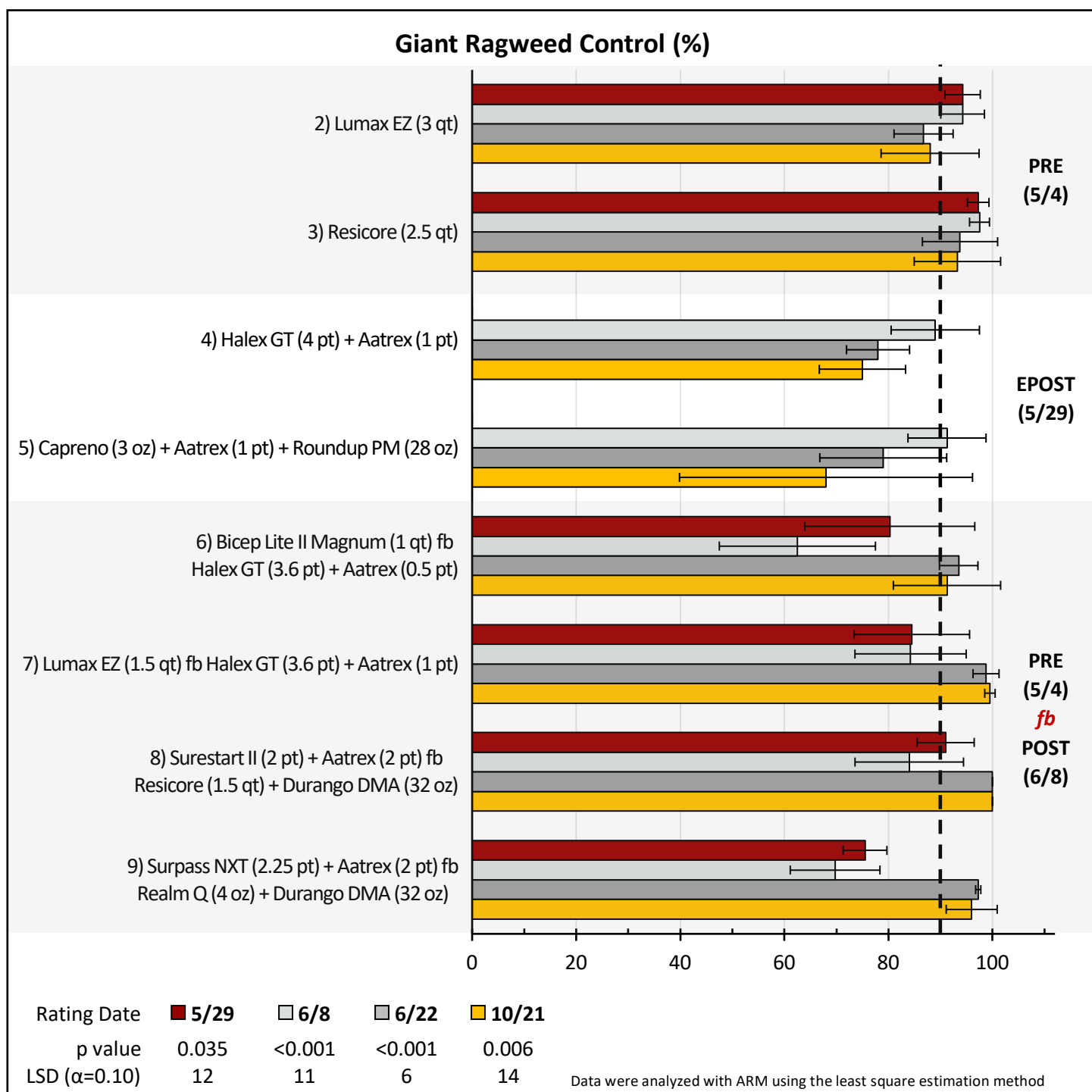


Figure 5: Giant ragweed efficacy ratings for trial #20-ROK-CN05. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

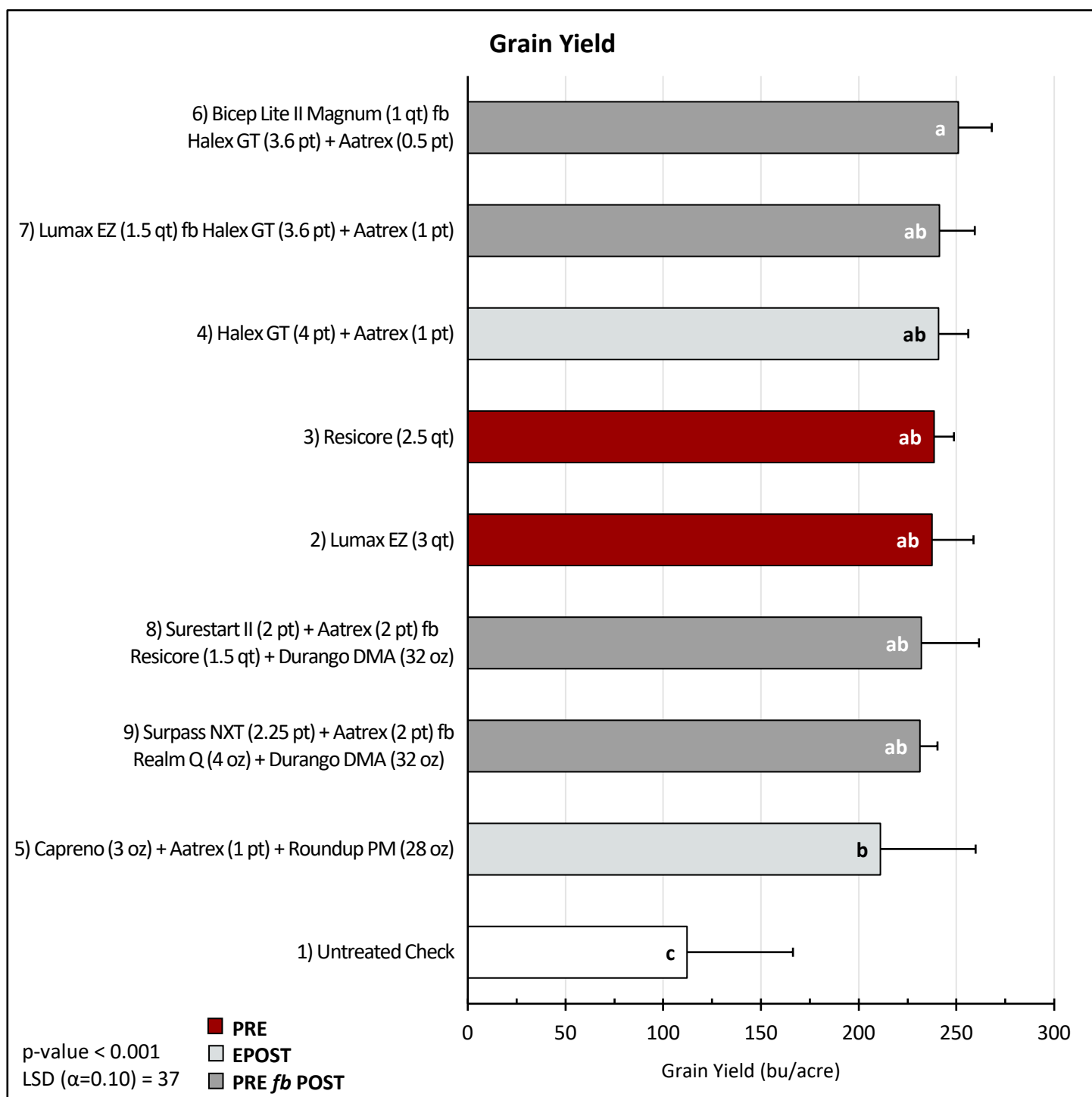


Figure 6. Grain yield for trial #20-ROK-CN05. Bars indicate the average yield in bushels per acre + the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. Bars with the same letter are not significantly different ($p < 0.001$).

Project Goal: Compare Anthem Maxx herbicide programs in 1- and 2-pass systems to competitor programs.

Site Description:

Location:	Janesville, WI	Crop:	Corn
Field #:	1	Variety:	NK9535-3220-EZ1
Soil type:	Plano silt loam	Planting Date:	5/3
% OM:	3.5	Emergence Date:	5/21
pH:	6.4	Population:	32,000 seeds/acre
Fertilization:	180 lbs N/acre	Depth:	2 in
	70 lbs K/acre	Row spacing:	30 in
	80 lbs P/acre	Plot Size:	10 x 30 ft
Tillage:	conventional	Previous crop:	Soybean
Weed species:	giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), barnyardgrass (ECHCG), fall panicum (PANDI)		

Herbicide Application Information:

Date:	5/4	5/29	6/5
Treatment:	PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):	53	63	78
2" Soil Temp (°F):	51	62	80
Soil moisture [surface]:	moist	wet	dry
RH %:	55	73	52
Cloud cover %	25	0	90
Wind speed (mph)/direction	7-12/NE	3-6/NW	1-3/SSE
Rainfall (in) 1 wk after APP:	0.5	0.11	0.97
GPA:	15	15	15
PSI:	36	36	36
Nozzle:	TTI 110015	TTI 110015	TTI 110015
Nozzle spacing (in):	20	20	20
Boom Height (in):	20	24	24

Crop and weed information at application:

	Date:	5/4	5/29	6/5
Corn	Height:	-	3-4"	5-8"
	Stage:	-	V2	V4
giant ragweed	Height:	-	1-4"	1-5"
	Density:	-	1-8/ft ²	1-9/ft ²
lambsquarters	Height:	-	0.25-0.5"	
	Density:	-	15-30/ft ²	
velvetleaf	Height:	-	0.5-1"	
	Density:	-	0-1/m ²	
annual grasses	Height:	-	0.25-1"	
	Density:	-	1-5/ft ²	

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Anthem Maxx	4.3 lb/gal	14, 15	4 fl oz/a	PRE	A
	Callisto	4 lb/gal	27	6 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	3 pt/a	PRE	A
3	Corvus	2.63 lb/gal	2, 27	5.6 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	3 pt/a	PRE	A
4	Acuron	3.44 lb/gal	5, 15, 27	3 qt/a	PRE	A
5	Resicore	3.29 lb/gal	4, 15, 27	2.5 qt/a	PRE	A
	AAtrex	4 lb/gal	5	3 pt/a	PRE	A
6	Verdict	5.57 lb/gal	14, 15	16 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	3 pt/a	PRE	A
7	Anthem Maxx	4.3 lb/gal	14, 15	4 fl oz/a	EPOST	B
	Callisto	4 lb/gal	27	3 fl oz/a	EPOST	B
	AAtrex	4 lb/gal	5	3 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
8	Halex GT	4.39 lb/gal	9, 15, 27	3.6 pt/a	EPOST	B
	AAtrex	4 lb/gal	5	2 pt/a	EPOST	B
	NIS			0.25% v/v	EPOST	B
	AMS			8.5 lb/100 gal	EPOST	B
9	Acuron Flexi	4.3 lb/gal	15, 27	2 qt/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
10	Anthem Maxx	4.3 lb/gal	14, 15	4 fl oz/a	PRE	A
	AAtrex	4 lb/gal	5	2 pt/a	PRE	A
	Roundup PowerMAX	4.5 lbae/gal	9	22 fl oz/a	POST	C
	Callisto	4 lb/gal	27	3 fl oz/a	POST	C
	AAtrex	4 lb/gal	5	1 pt/a	POST	C
	NIS			0.25% v/v	POST	C
	AMS			8.5 lb/100 gal	POST	C

Adjuvants: AMS = BlueAg spray grade ammonium sulfate; NIS = Prefer 90

Trial Summary:

This trial compared Anthem Maxx herbicide programs in 1- and 2-pass systems to competitor programs. There was not any significant corn injury from the PRE herbicides. Some leaf necrosis was observed 5 days after the EPOST application. Treatments 7, 8, and 9 had 10%, 3%, and 1% leaf necrosis, respectively. Injury was not severe enough to affect normal growth and new leaves were unaffected.

Control of common lambsquarters was excellent for all treatments throughout the growing season (data not shown). Early season annual grass control (giant foxtail, barnyardgrass, fall panicum) was excellent for all herbicide programs. However, some programs did not provide adequate season long grass control (Figure 8). Grass control fell below 90% for treatments 3, 6, 7, 8 and 9 at the 7/2 rating.

Giant ragweed was the predominant species and in plots with heavy densities it largely outcompeted other species. Giant ragweed at this research location is a biotype with a prolonged emergence pattern as emergence typically starts in mid- to late-April and continues well into June. The average control of giant ragweed was impacted by herbicide program at all rating timings (Figure 7). Most of the PRE herbicides evaluated provided fair to excellent early season control (75-92%) 22 days after application except the Anthem Maxx + atrazine program (45%). None of the herbicide programs evaluated provided >90% control at corn harvest. In general, adding a group 27 herbicide (mesotrione, isoxaflutole) to the tank at the PRE application improved the consistency and length of residual control. Using the full rate of atrazine also seemed to improve control. 1-pass PRE or EPOST herbicide programs are not recommended in fields with heavy population densities of giant ragweed and/or biotypes with the prolonged emergence pattern similar to this location.

Corn yield was significantly impacted by herbicide program, $p < 0.001$ (Figure 9). Averaged across all treatments, yield of the 2-pass PRE + POST program = 248 bu/acre, EPOST = 229 bu/acre and PRE = 188 bu/acre. The untreated check only yielded 30 bu/acre indicating the very heavy giant ragweed density in this trial.

Plot photos from throughout the growing season are available in the [Anthem Maxx Corn Herbicide Programs](#) visual report published on wiscweeds.info.

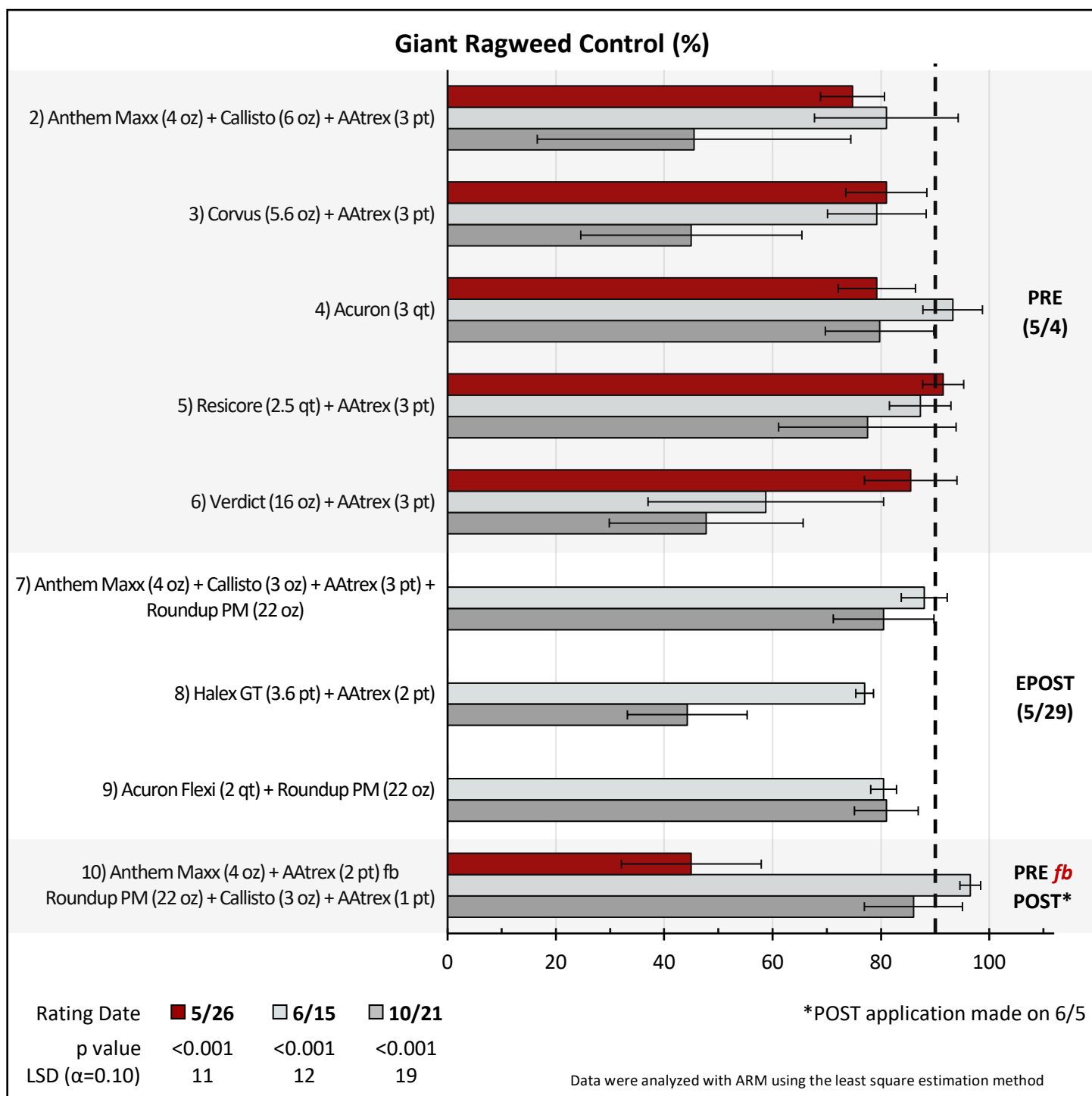


Figure 7: Giant ragweed efficacy ratings for trial #20-ROK-CN06. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

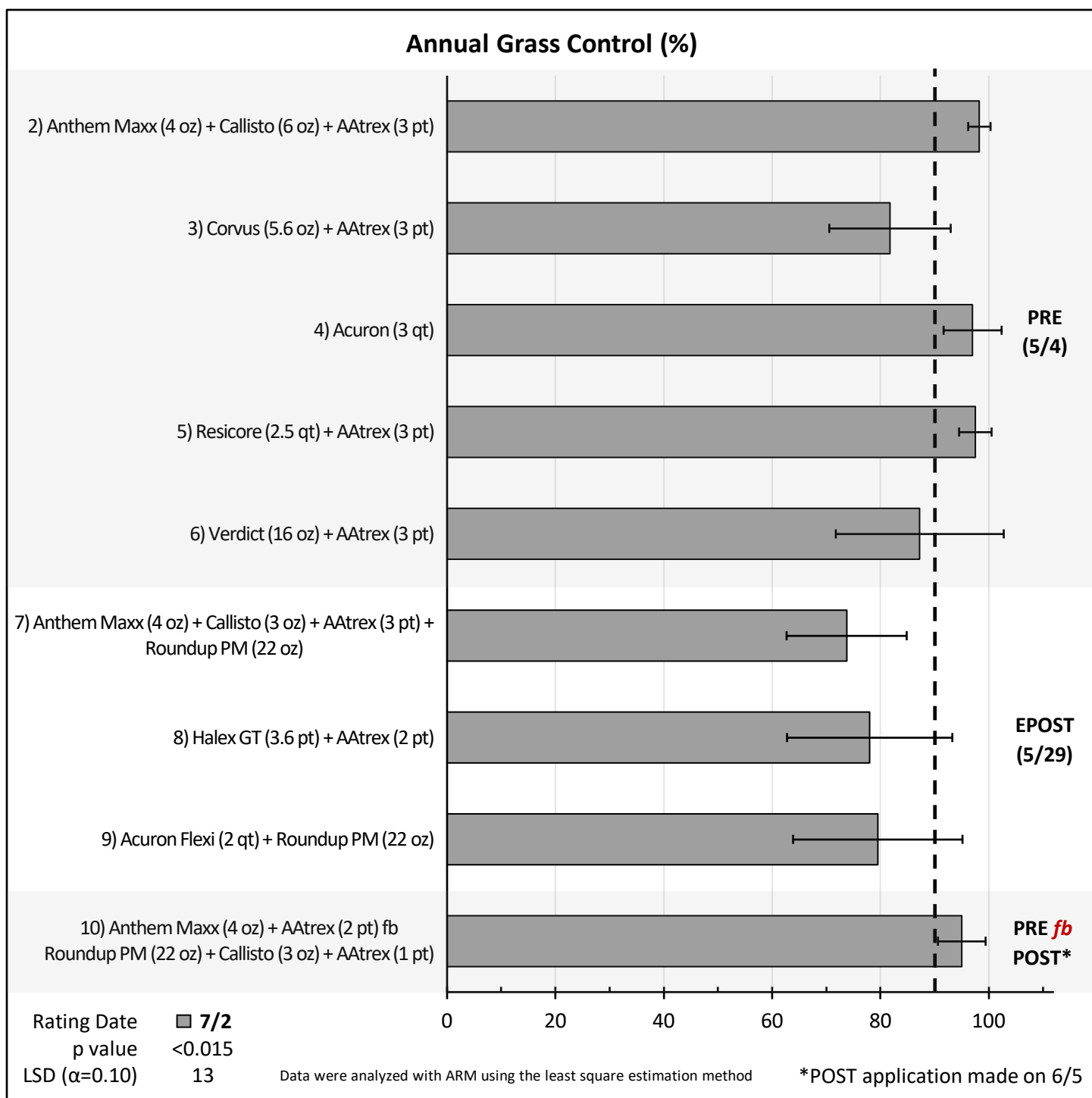


Figure 8: Annual grass (giant foxtail, barnyardgrass, fall panicum) efficacy ratings for trial #20-ROK-CN06. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

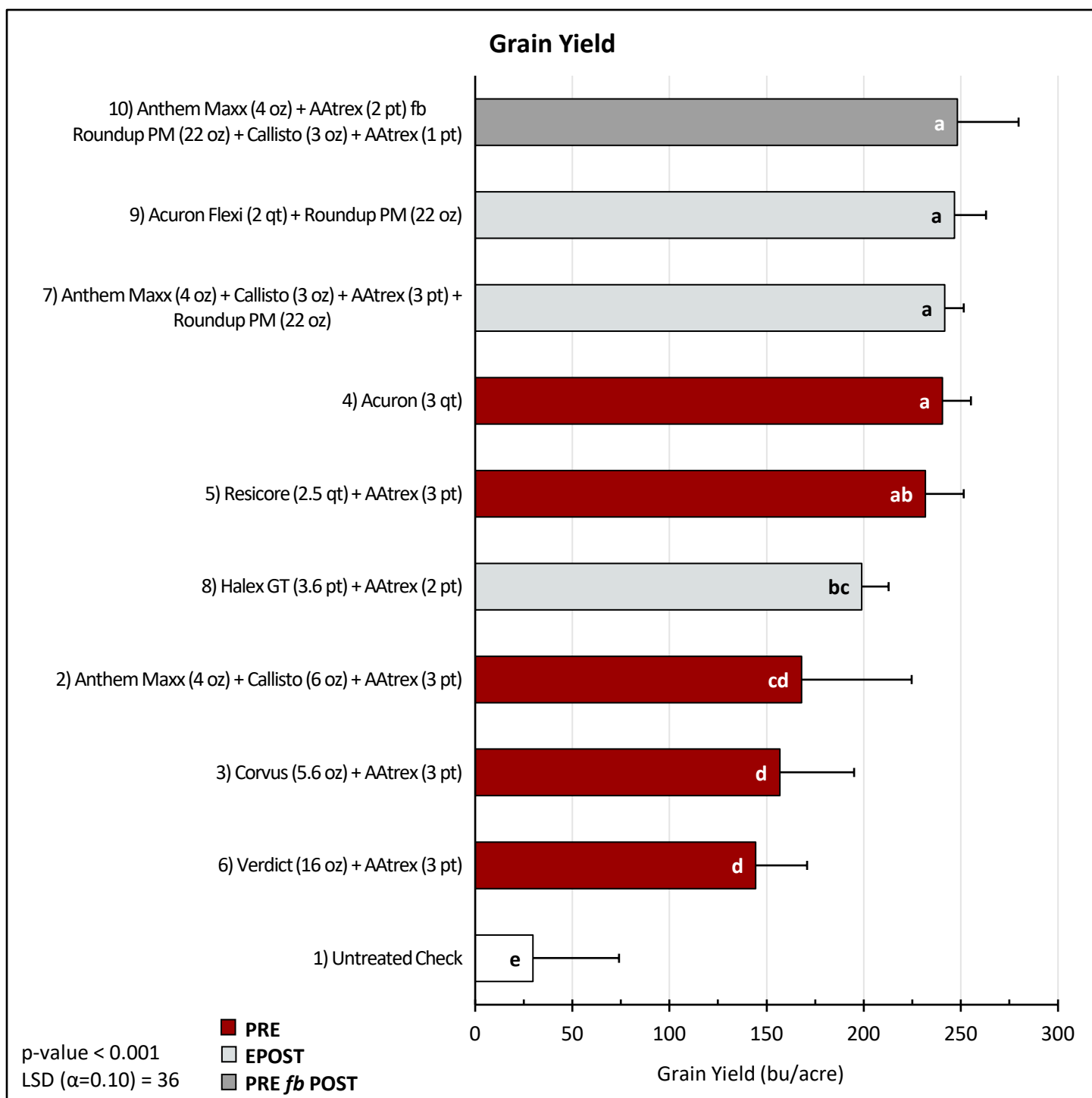


Figure 9. Grain yield for trial #20-ROK-CN06. Bars indicate the average yield in bushels per acre + the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. Bars with the same letter are not significantly different ($p < 0.001$).

Project Goal: Evaluate differences in weed control and crop safety among POST applications of Acuron GT, Halex GT, and competitor programs.

***Acuron GT** is an experimental herbicide premix for corn containing bicyclopyrone (27), mesotrione (27), s-metolachlor (15), and glyphosate (9). Does NOT contain atrazine. Will have a similar utility as Halex GT. Anticipated launch in spring 2021.

Site Description:

Location:	Arlington, WI	Crop:	Corn
Field #:	454	Variety:	NK9535-3220-EZ1
Soil type:	Plano silt loam	Planting Date:	4/28
% OM:	3.5	Emergence Date:	5/17
pH:	6.7	Population:	32,500 seeds/acre
Fertilization:	40 gal/a 32% UAN	Depth:	2 in
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	conventional	Plot Size:	10 x 25 ft
Weed species:	common ragweed (AMBEL), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), yellow foxtail (SETPU)		

Herbicide Application Information:

Date:	6/2
Treatment:	EPOST (A)
Air Temp (°F):	93
2" Soil Temp (°F):	85
Soil moisture [surface]:	dry
RH %:	50
Cloud cover %	0
Wind speed (mph)/direction	2-13/S
Rainfall (in) 1 wk after APP:	1.42
GPA:	15
PSI:	36
Nozzle:	TTI 110015
Nozzle spacing (in):	20
Boom Height (in):	23

Crop and weed information at application:

	Date:	6/2
Corn	Height:	6-8"
	Stage:	V2
common ragweed	Height:	0.25-1"
	Density:	0-2/ft ²
lambsquarters	Height:	0.25-0.5"
	Density:	1-6/ft ²
velvetleaf	Height:	1-1.5"
	Density:	1-2/ft ²
foxtails	Height:	1-2"
	Density:	1-2/ft ²

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Acuron GT	4.3 lb/gal	9, 15, 27	3.75 pt/a	A	EPOST
	NIS			0.25% v/v	A	EPOST
	AMS			2.5% v/v	A	EPOST
3	Halex GT	4.39 lb/gal	9, 15, 27	3.6 pt /a	A	EPOST
	NIS			0.25% v/v	A	EPOST
	AMS			2.5% v/v	A	EPOST
4	Resicore	3.29 lb/gal	4, 15, 27	1.25 qt/a	A	EPOST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	A	EPOST
	AMS			2.5% v/v	A	EPOST
5	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	A	EPOST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	A	EPOST
	Superb HC			0.5% v/v	A	EPOST
	AMS			2.5% v/v	A	EPOST
6	Harness MAX	3.85 lb/gal	15, 27	40 fl oz/a	A	EPOST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	A	EPOST
	AMS			2.5% v/v	A	EPOST
7	Armezon PRO	5.35 lb/gal	15, 27	20 fl oz/a	A	EPOST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	A	EPOST
	AMS			2.5% v/v	A	EPOST
8	Laudis	3.5 lb/gal	27	3 fl oz/a	A	EPOST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	A	EPOST
	Superb HC			0.5% v/v	A	EPOST
	AMS			2.5% v/v	A	EPOST
9	Laudis	3.5 lb/gal	27	3 fl oz/a	A	EPOST
	XtendiMax*	2.9 lbae/gal	4	17 fl oz/a	A	EPOST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	A	EPOST
	Intact			0.5% v/v	A	EPOST
	Class Act Ridion			1% v/v	A	EPOST
10	Realm Q	38.75% w/w	2, 27	4 oz/a	A	EPOST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	A	EPOST
	AMS			2.5% v/v	A	EPOST
11	Impact	2.8 lb/gal	27	1 fl oz/a	A	EPOST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	A	EPOST
	MSO			0.5% v/v	A	EPOST
	AMS			2.5% v/v	A	EPOST

Adjuvants: AMS = Amsol (liquid AMS); NIS = Prefer 90; MSO = Emulate; Superb HC = high surfactant oil concentrate MSO; Intact = drift reduction agent; Class Act Ridon = non-AMS water conditioner

*Xtendimax is no longer registered for POST applications in field corn.

Trial Summary:

This trial evaluated differences in weed control and crop safety among POST applications of Acuron GT, Halex GT, and competitor programs. Acuron GT is an experimental herbicide premix for corn containing bicyclopyrone (27), mesotrione (27), s-metolachlor (15), and glyphosate (9). Does NOT contain atrazine. Acuron GT will have a similar utility as Halex GT with an anticipated launch in spring 2021. Corn injury was observed 7 days after the EPOST application (Figure 10). Symptoms were either necrotic leaf spots/leaf burn (trs 4, 6, 7) or onion leafing/leaf curl (trt 9). Injury was not severe enough to affect normal growth and all treatments had <1% injury 30 days after application.

Control of common ragweed, common lambsquarters, and velveleaf was excellent (>90%) for all treatments throughout the growing season (data not shown). All herbicide programs provided excellent giant and yellow foxtail control 30 days after application (Figure 11). However, control of some programs fell below 90% later in the growing season 58 days after application. Acuron GT had 7% greater foxtail control than Halex GT at 58 DAT. In general, the programs that did not have a group 15 herbicide had lower foxtail control later in the season.

Corn yield did not differ significantly among herbicide treatments (data not shown). Yield across all herbicide programs was 207 bu/acre, while the untreated check was 165 bu/acre, a 20% reduction.

Plot photos from throughout the growing season are available in the [Evaluation of Acuron GT in a One Pass System](#) visual report published on wiscweeds.info.

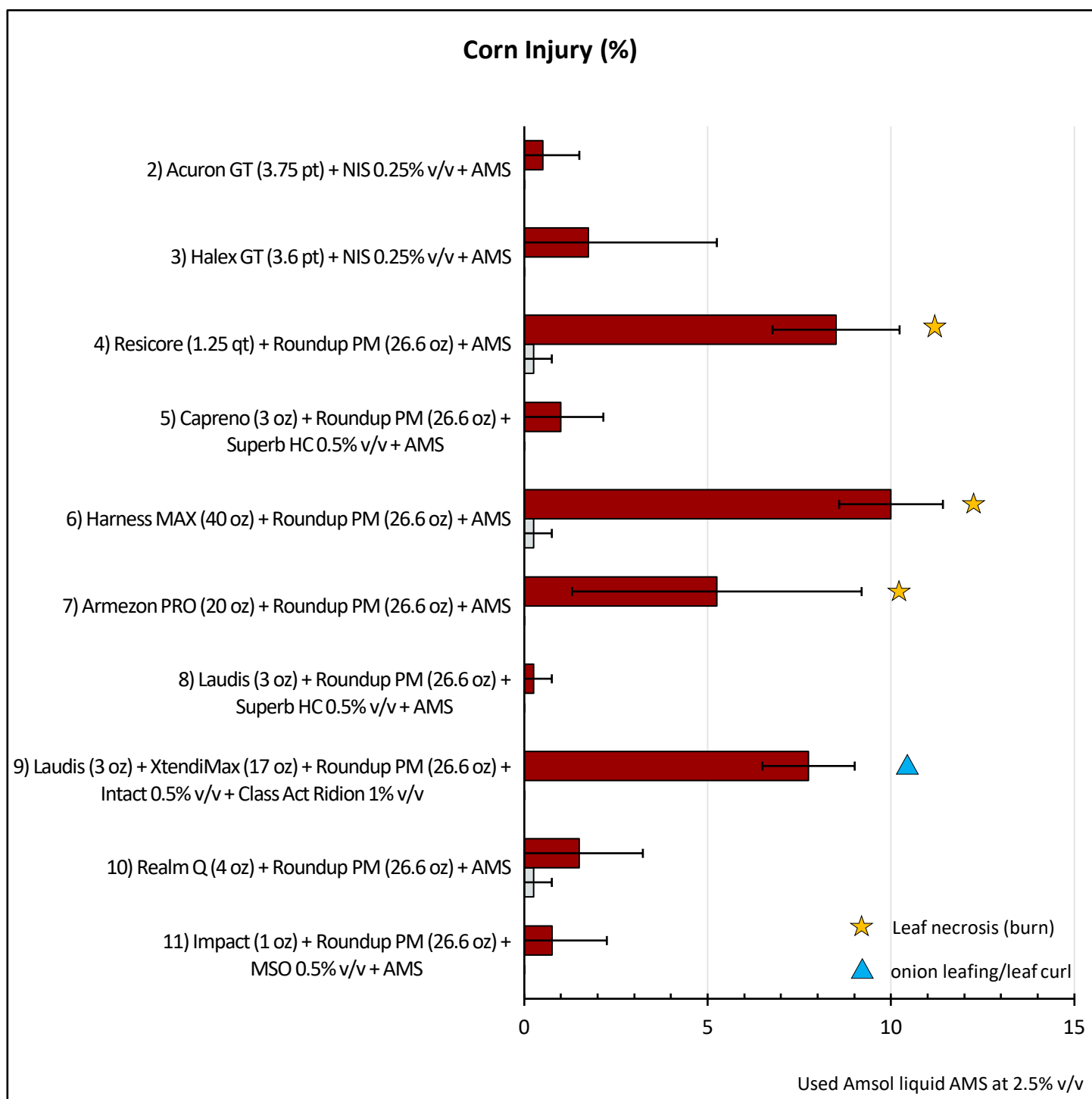


Figure 10: Corn injury ratings at 7 and 30 days after the EPOST application for trial #20-ARL-CN08. Bars indicate the average % corn injury \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table.

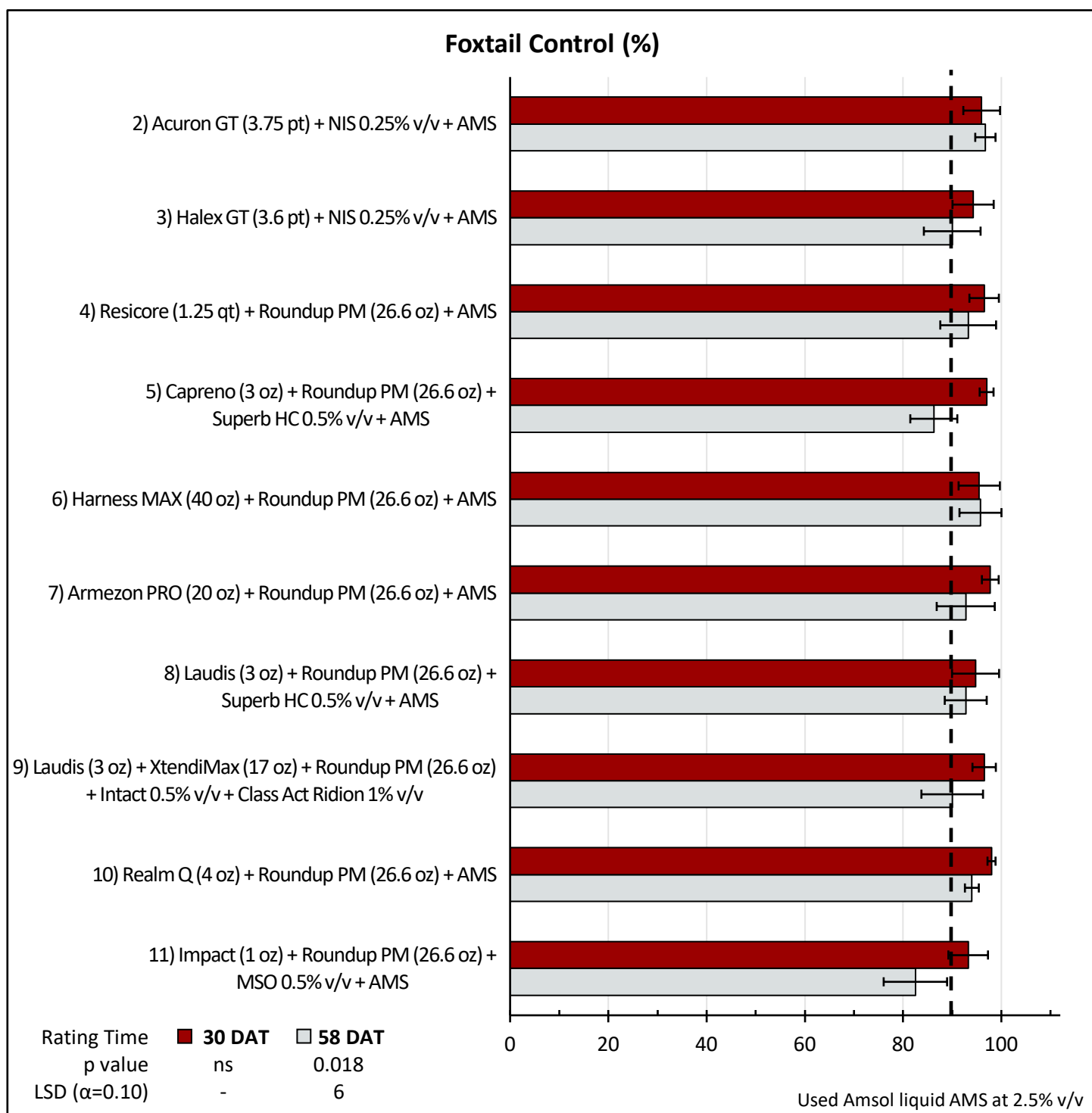


Figure 11: Foxtail (giant foxtail, yellow foxtail) efficacy ratings for trial #20-ARL-CN08. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Evaluate differences in weed control and crop safety among 2-pass programs containing Acuron GT and other competitor programs.

***Acuron GT** is an experimental herbicide premix for corn containing bicyclopyrone (27), mesotrione (27), s-metolachlor (15), and glyphosate (9). Does NOT contain atrazine. Will have a similar utility as Halex GT. Anticipated launch in spring 2021.

Site Description:

Location:	Janesville, WI	Crop:	Corn
Field #:	1	Variety:	NK9535-3220-EZ1
Soil type:	Plano silt loam	Planting Date:	5/3
% OM:	3.5	Emergence Date:	5/21
pH:	6.4	Population:	32,000 seeds/acre
Fertilization:	180 lbs N/acre	Depth:	2 in
	70 lbs K/acre	Row spacing:	30 in
	80 lbs P/acre	Plot Size:	10 x 30 ft
Tillage:	conventional	Previous crop:	Soybean
Weed species:	giant ragweed (AMBTR), common lambsquarters (CHEAL), giant foxtail (SETFA), barnyardgrass (ECHCG), fall panicum (PANDI)		

Herbicide Application Information:

Date:	5/4	6/5
Treatment:	PRE (A)	POST (B)
Air Temp (°F):	53	78
2" Soil Temp (°F):	51	80
Soil moisture [surface]:	dry/moist	dry
RH %:	55	52
Cloud cover %	25	90
Wind speed (mph)/direction	7-12/NE	1-3/SSE
Rainfall (in) 1 wk after APP:	0.5	0.97
GPA:	15	15
PSI:	36	36
Nozzle:	TTI 110015	TTI 110015
Nozzle spacing (in):	20	20
Boom Height (in):	20	24

Crop and weed information at application:

	Date:	5/4	6/5
Corn	Height:	-	6-8"
	Stage:	-	V4
giant ragweed	Height:	-	1-4"
	Density:	-	3-13/ft ²
lambsquarters	Height:	-	*
	Density:	-	*
annual grasses	Height:	-	*
	Density:	-	*

*There were no lambsquarters or grasses emerged at the time of the POST application as all PREs used provided 100% control of these species.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Bicep Lite II Magnum	6 lb/gal	5, 15	1 qt/a	A	PRE
	Acuron GT	4.3 lb/gal	9, 15, 27	3.75 pt/a	B	POST
	NIS			0.25% v/v	B	POST
	AMS			2.5% v/v	B	POST
3	Lumax EZ	3.67 lb/gal	5, 15, 27	1.5 qt/a	A	PRE
	Acuron GT	4.3 lb/gal	9, 15, 27	3.75 pt/a	B	POST
	NIS			0.25% v/v	B	POST
	AMS			2.5% v/v	B	POST
4	SureStart II	4.25 lb/gal	2, 4, 15	1.75 pt	A	PRE
	Acuron GT	4.3 lb/gal	9, 15, 27	3.75 pt/a	B	POST
	NIS			0.25% v/v	B	POST
	AMS			2.5% v/v	B	POST
5	Harness	7 lb/gal	15	1.5 pt/a	A	PRE
	Acuron GT	4.3 lb/gal	9, 15, 27	3.75 pt/a	B	POST
	NIS			0.25% v/v	B	POST
	AMS			2.5% v/v	B	POST
6	Verdict	5.57 lb/gal	14, 15	14 fl oz/a	A	PRE
	Acuron GT	4.3 lb/gal	9, 15, 27	3.75 pt/a	B	POST
	NIS			0.25% v/v	B	POST
	AMS			2.5% v/v	B	POST
7	Surestart II	4.25 lb/gal	2, 4, 15	1.75 pt/a	A	PRE
	Resicore	3.29 lb/gal	4, 15, 27	1.25 qt/a	B	POST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	B	POST
	AMS			2.5% v/v	B	POST
8	Harness	7 lb/gal	15	1.5 pt/a	A	PRE
	Laudis	3.5 lb/gal	27	3 fl oz/a	B	POST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	B	POST
	Superb HC			0.5% v/v	B	POST
	AMS			2.5% v/v	B	POST
9	Verdict	5.57 lb/gal	2, 4, 15	14 fl oz/a	A	PRE
	Armezon PRO	5.35 lb/gal	15, 27	20 fl oz/a	B	POST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	B	POST
	AMS			2.5% v/v	B	POST
10	Verdict	5.57 lb/gal	2, 4, 15	14 fl oz/a	A	PRE
	Status	56% w/w	2, 4	5 oz/a	B	POST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	B	POST
	AMS			2.5% v/v	B	POST
11	Harness	7 lb/gal	15	1.5 pt/a	A	PRE
	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	B	POST
	Roundup PowerMAX	4.5 lbae/gal	9	26.6 fl oz/a	B	POST
	AMS			2.5% v/v	B	POST

Adjuvants: AMS = Amsol (liquid AMS); NIS = Prefer 90; Superb HC = high surfactant oil concentrate MSO

Trial Summary:

This trial evaluated differences in weed control and crop safety among 2-pass programs containing Acuron GT and other competitor programs. Acuron GT is an experimental herbicide premix for corn containing bicyclopyrone (27), mesotrione (27), s-metolachlor (15), and glyphosate (9). Does NOT contain atrazine. Acuron GT will have a similar utility as Halex GT with an anticipated launch in spring 2021. There was not any significant corn injury from the PRE herbicides. There was minimal corn injury observed 27 days after the POST application (data not shown).

All of the PRE herbicides provided excellent early season control of common lambsquarters and annual grasses (giant foxtail, barnyardgrass, fall panicum). However, lambsquarters control fell below 90% in treatments 8 (88%) and 11 (87%) 54 days after the POST application (data not shown).

Giant ragweed was the predominant species and in plots with heavy densities it largely outcompeted other species. Giant ragweed at this research location is a biotype with a prolonged emergence pattern as emergence typically starts in mid- to late-April and continues well into June. The average control of giant ragweed was impacted by herbicide program at all rating timings (Figure 12). Most of the PRE herbicides evaluated did not provide adequate control. Verdict and Lumax EZ did suppress early season giant ragweed growth ~66-76% control. However, the POST herbicide programs were effective as most of the treatments provided >90% control at corn harvest.

Corn yield did not differ significantly among herbicide treatments (data not shown). Yield across all herbicide programs was 238 bu/acre. The untreated check only yielded 21 bu/acre, a 91% reduction, indicating the very heavy giant ragweed density in this trial.

Plot photos from throughout the growing season are available in the [Evaluation of Acuron GT in a Two Pass System](#) visual report published on wiscweeds.info

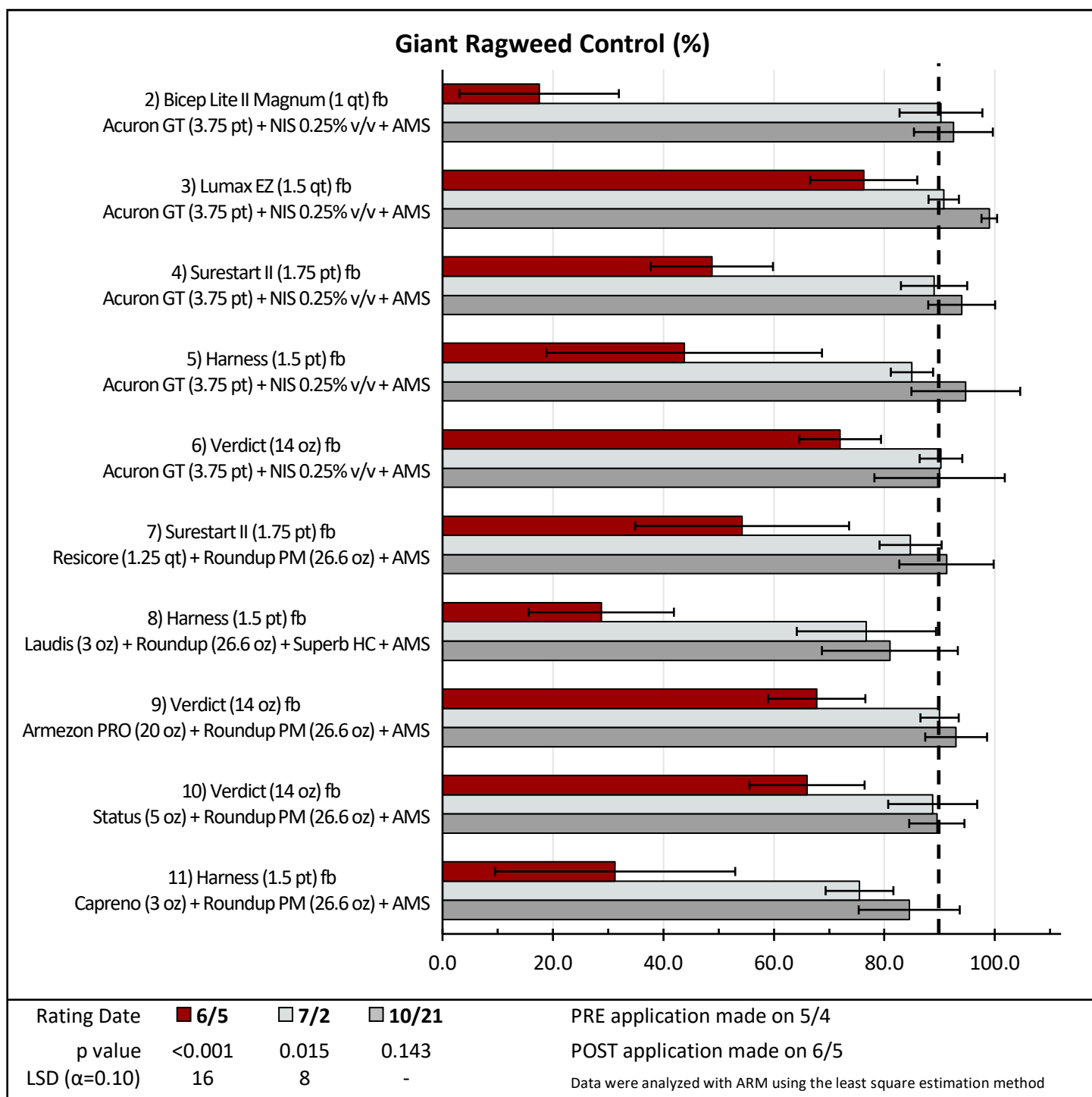


Figure 12: Giant ragweed efficacy ratings for trial #20-ROK-CN09. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Evaluate differences in weed control and crop safety among 1- and 2-pass Acuron XR, Acuron Flexi XR, and competitor herbicide programs.

***Acuron XR and Acuron Flexi XR** are new formulations of Acuron and Acuron Flexi that contain higher concentrations of S-metolachlor. Both products are not yet registered for use as of 2020.

Site Description:

Location:	Brooklyn, WI	Crop:	Corn
Field #:	K-3	Variety:	DKC 47-47 RIB
Soil type:	silt loam	Planting Date:	5/9
% OM:	4.7	Emergence Date:	5/20
pH:	5.9	Population:	36,000 seeds/acre
Fertilization:	40 gal/a 32% UAN	Depth:	2 in
Previous crop:	Hemp	Row spacing:	30 in
Tillage:	conventional	Plot Size:	10 x 25 ft
Weed species:	common lambsquarters (CHEAL), common purslane (POROL), velvetleaf (ABUTH)		

Herbicide Application Information:

Date:	5/9	6/15
Treatment:	PRE (A)	POST (B)
Air Temp (°F):	49	80
2" Soil Temp (°F):	45	75
Soil moisture [surface]:	dry	dry
RH %:	26	32
Cloud cover %	0	30
Wind speed (mph)/direction	5-12/NW	2-8/SE
Rainfall (in) 1 wk after APP:	1.15	0.82
GPA:	15	15
PSI:	36	36
Nozzle:	TTI 110015	TTI 110015
Nozzle spacing (in):	20	20
Boom Height (in):	20	24

Crop and weed information at application:

	Date:	5/9	6/15
Corn	Height:	-	9-11"
	Stage:	-	V4/V5
lambsquarters	Height:	-	-
	*Density:	-	10-90/ft ²
common purslane	Height:	-	-
	*Density:	-	4-10/ft ²
velvetleaf	Height:	-	-
	*Density:	-	0-0.25/ft ²

***Density values from untreated check as there were very few weeds in plots with a PRE herbicide**

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Acuron XR	3.54 lb/gal	5, 15, 27	3.5 qt/a	PRE	A
3	Acuron Flexi XR	3.13 lb/gal	15, 27	3 qt/a	PRE	A
4	Resicore	3.29 lb/gal	4, 15, 27	2.75 qt/a	PRE	A
5	Harness MAX	3.85 lb/gal	15, 27	75 fl oz/a	PRE	A
6	SureStart II	4.25 lb/gal	2, 4, 15	3 pt/a	PRE	A
7	Corvus	2.63 lb/gal	2, 27	5.6 fl oz/a	PRE	A
8	Verdict	5.57 lb/gal	14, 15	16 fl oz/a	PRE	A
9	Acuron XR	3.54 lb/gal	5, 15, 27	1.75 qt/a	PRE	A
	Acuron XR	3.54 lb/gal	5, 15, 27	1.75 qt/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	22 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
10	Acuron Flexi XR	3.13 lb/gal	15, 27	1.5 qt/a	PRE	A
	Acuron Flexi XR	3.13 lb/gal	15, 27	1.5 qt/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	22 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
11	Resicore	3.29 lb/gal	4, 15, 27	1.38 qt/a	PRE	A
	Resicore	3.29 lb/gal	4, 15, 27	1.38 qt/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	22 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
12	Harness MAX	3.85 lb/gal	15, 27	35 fl oz/a	PRE	A
	Harness MAX	3.85 lb/gal	15, 27	40 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal		22 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
13	Verdict	5.57 lb/gal	14, 15	16 fl oz/a	PRE	A
	Status	56% w/w	2, 4	3 oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	22 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
14	Corvus	2.63 lb/gal	2, 27	3.3 fl oz/a	PRE	A
	Capreno	3.45 lb/gal	2, 27	3 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	22 fl oz/a	POST	B
	Superb HC			0.5% v/v	POST	B
	AMS			2.5% v/v	POST	B

Adjuvants: AMS = Amsol (liquid AMS; Superb HC = high surfactant oil concentrate MSO

Trial Summary:

This trial evaluated differences in weed control and crop safety among 1- and 2-pass programs containing Acuron XR, Acuron Flexi XR, and other competitor programs. **Acuron XR** and **Acuron Flexi XR** are new formulations of Acuron and Acuron Flexi that contain higher concentrations of S-metolachlor. Both products are not yet registered for use as of 2020.

Corn growth was stunted 15-20% by the PRE application of SureStart II (3 pt/a) at 37 days after application. Corn recovered but remained 6-10% stunted at 44 days after application. No significant injury was observed from the other PRE herbicides. The POST application of Acuron XR (1.75 qt) caused 5-7% leaf chlorosis (yellowing) 7 days after application. There was no visible injury in any treatment 29 days after the POST application.

Common lambsquarters was the predominant weed species in the trial area with heavy densities up to 90 plants/ft². All of the PRE herbicide treatments provided excellent early season control (>90%) of common lambsquarters, common purslane, and velvetleaf (data not shown). However, lambsquarters control fell below 90% in treatment 8 later in the growing season (Figure 13). Common purslane and velvetleaf control was >90% for all treatments at corn harvest (data not shown).

Corn yield did not differ significantly among herbicide treatments (data not shown). Yield across all herbicide programs was 256 bu/acre while the untreated check yielded 129 bu/acre, a 50% reduction.

Plot photos from throughout the growing season are available in the [Evaluation of Acuron XR and Acuron Flexi XR](#) visual report published on wiscweeds.info.

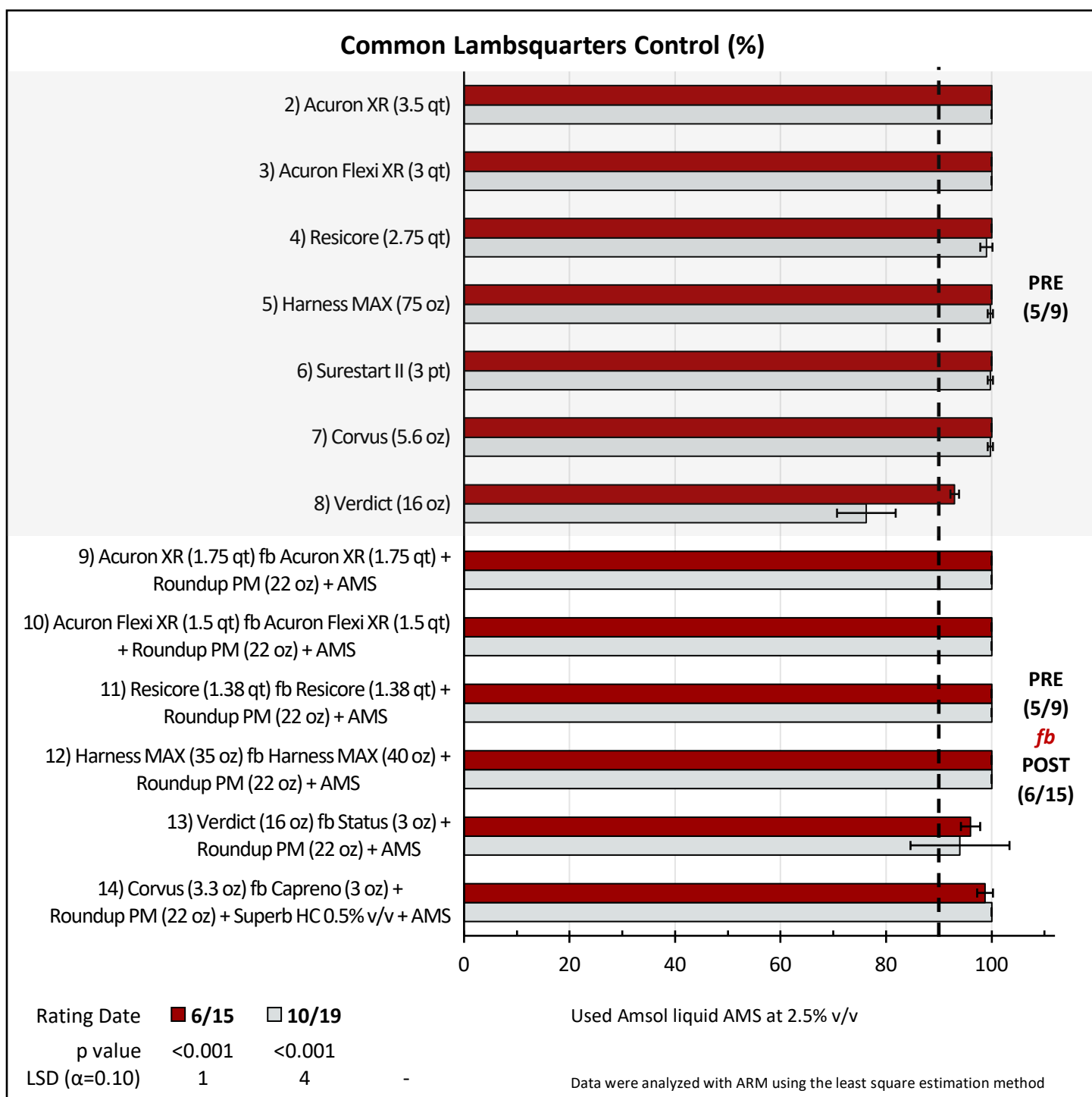


Figure 13: Common lambsquarters efficacy ratings for trial #20-BRO-CN10. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Evaluate Sinate herbicide programs for weed control and crop safety.

Sinate is a new premix of topramezone (Impact) + glufosinate (Liberty) from AMVAC available for use in corn.

Site Description:

Location:	Janesville, WI	Crop:	Corn
Field #:	1	Variety:	NK9535-3220-EZ1
Soil type:	Plano silt loam	Planting Date:	5/3
% OM:	3.5	Emergence Date:	5/21
pH:	6.4	Population:	32,000 seeds/acre
Fertilization:	180 lbs N/acre	Depth:	2 in
	70 lbs K/acre	Row spacing:	30 in
	80 lbs P/acre	Plot Size:	10 x 30 ft
Tillage:	conventional	Previous crop:	Soybean
Weed species:	giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), barnyardgrass (ECHCG), fall panicum (PANDI)		

Herbicide Application Information:

Date:	6/5
Treatment:	POST (A)
Air Temp (°F):	78
2" Soil Temp (°F):	80
Soil moisture [surface]:	dry
RH %:	52
Cloud cover %	90
Wind speed (mph)/direction	1-3/SSE
Rainfall (in) 1 wk after APP:	0.97
GPA:	15
PSI:	36
Nozzle:	TT 110015
Nozzle spacing (in):	20
Boom Height (in):	27

Crop and weed information at application:

	Date:	6/5
Corn	Height:	8"
	Stage:	V4
giant ragweed	Height:	3-5"
	Density:	0.5-3/ft ²
lambsquarters	Height:	0.25-1"
	Density:	4-23/ft ²
velvetleaf	Height:	1-2"
	Density:	0-2/ft ²
annual grasses	Height:	0.25-2"
	Density:	0-5/ft ²

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Sinate	2.57 lb/gal	10, 27	21 fl oz/a	POST	A
	MSO			1% v/v	POST	A
	AMS			3 lb/a	POST	A
3	Sinate	2.57 lb/gal	10, 27	21 fl oz/a	POST	A
	atrazine	4 lb/gal	5	1 pt/a	POST	A
	MSO			1% v/v	POST	A
	AMS			3 lb/a	POST	A
4	Sinate	2.57 lb/gal	10, 27	28 fl oz/a	POST	A
	MSO			1% v/v	POST	A
	AMS			3 lb/a	POST	A
5	Impact	2.8 lb/gal	27	1 fl oz/a	POST	A
	MSO			1% v/v	POST	A
	AMS			3 lb/a	POST	A
6	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	A
	AMS			3 lb/a	POST	A
7	Impact	2.8 lb/gal	27	1 fl oz/a	POST	A
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	A
	atrazine	4 lb/gal	5	1 pt/a	POST	A
	MSO			0.5% v/v	POST	A
	AMS			3 lb/a	POST	A

Adjuvants: AMS = BlueAg spray grade ammonium sulfate; MSO = Emulate

Trial Summary:

This trial evaluated Sinate herbicide programs for weed control and crop safety. **Sinate** is a new premix of topramezone (Impact) + glufosinate (Liberty) from AMVAC available for use in corn. 21 fl oz/a of Sinate is equivalent to 0.75 fl oz/a Impact and 22 fl oz/a Liberty. 28 fl oz Sinate = 1 fl oz/a Impact and 29.5 fl oz/a Liberty. There was no observable corn injury from any of the treatments 17 days after the POST application.

Giant ragweed control was similar for all treatments (Figure 14). Common lambsquarters control differed among herbicide programs (Figure 15). Adding 1 pt/a of atrazine to Sinate was more effective at improving lambsquarters control than increasing the Sinate rate from 21 to 28 fl oz/a. All Sinate treatments had better lambsquarters control than the Liberty alone treatment. Sinate + atrazine had similar lambsquarters control as the Impact alone and Impact + Roundup + atrazine treatments. Annual grass and velvetleaf pressure was not consistent throughout the trial area, so data from these ratings are not presented. Corn yield was not taken.

Plot photos from throughout the growing season are available in the [Sinate Corn Herbicide Comparison](#) visual report published on wiscweeds.info.

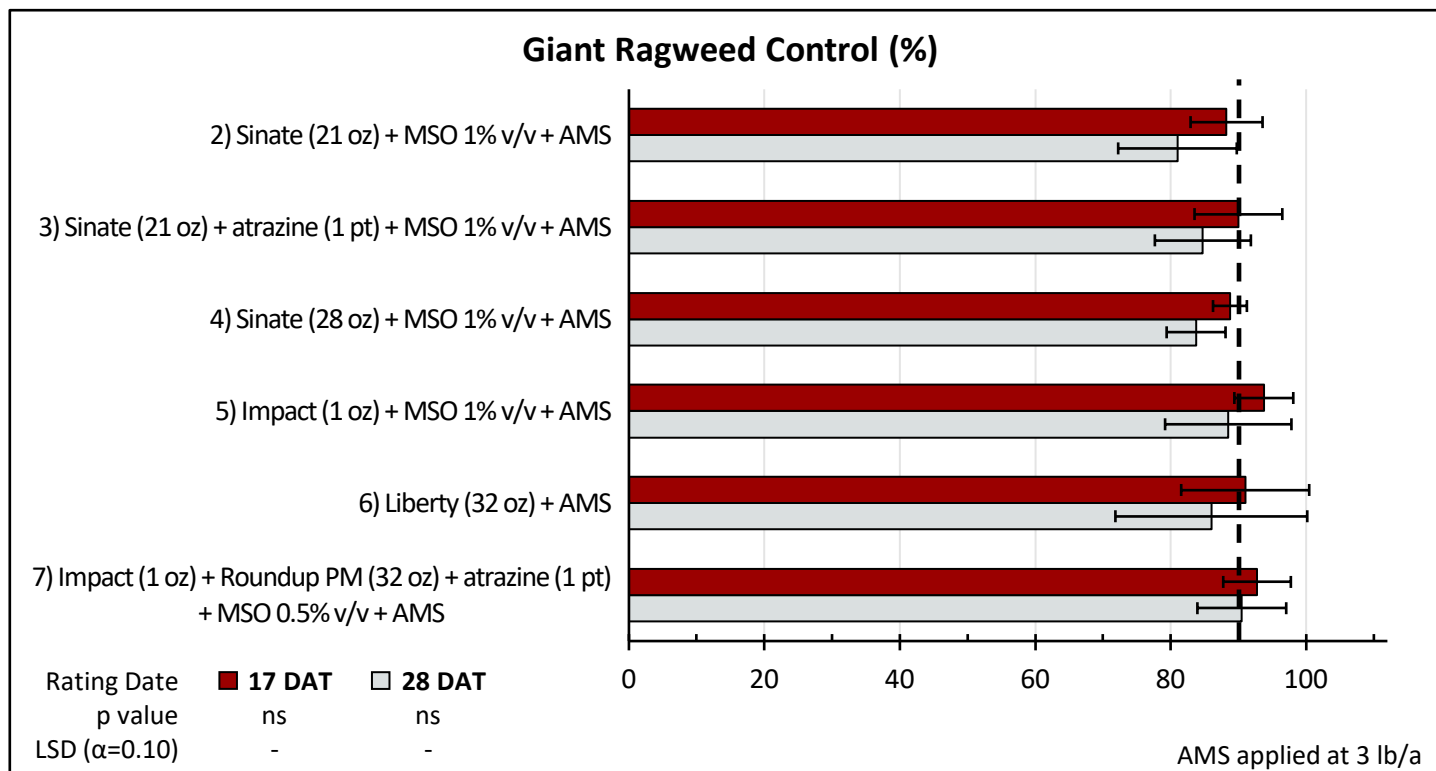


Figure 14: Giant ragweed efficacy ratings for trial #20-ROK-CN12. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. The dashed line indicates 90% control

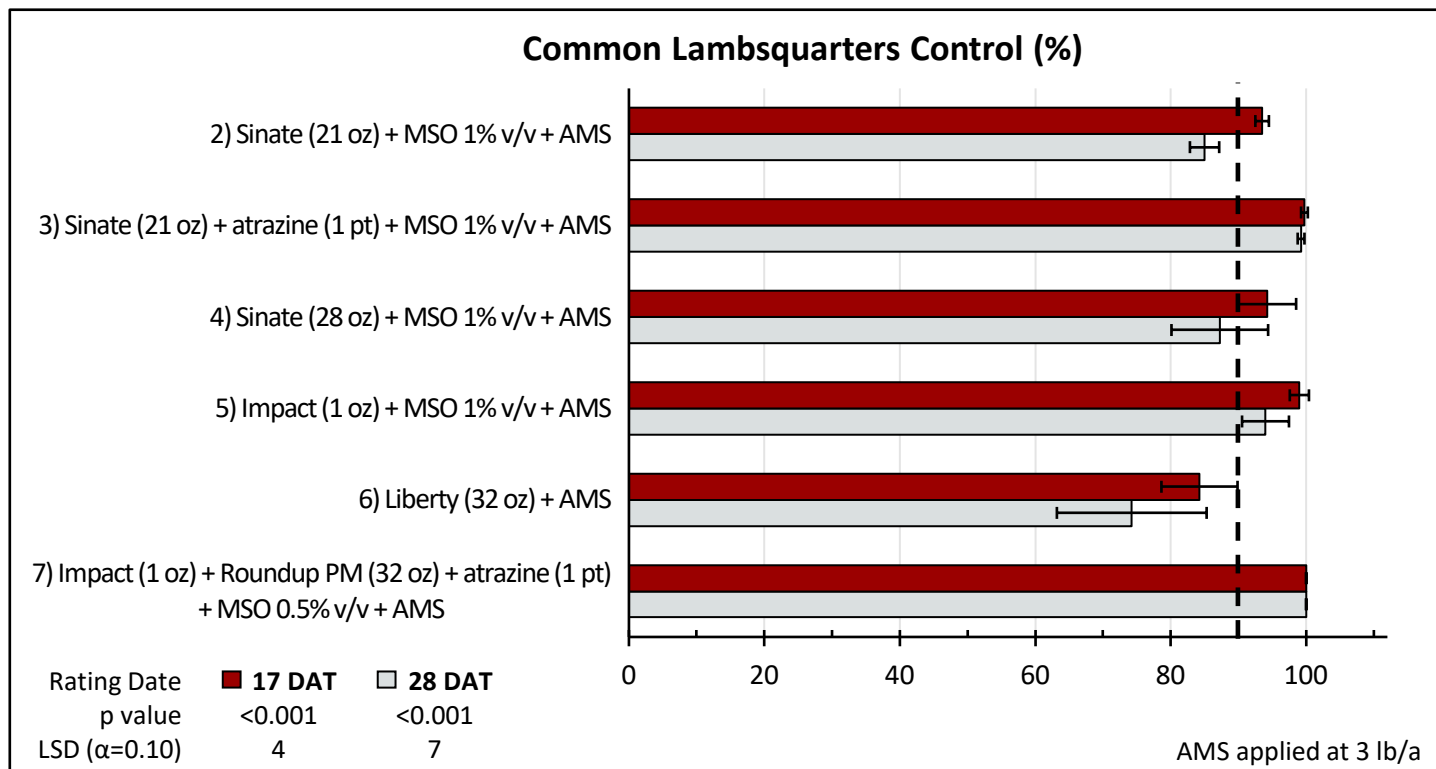


Figure 15: Common lambsquarters efficacy ratings for trial #20-ROK-CN12. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. The dashed line indicates 90% control.

Multi-Trial Summary:

The following figures summarize giant ragweed control from some of the corn herbicide evaluation trials conducted in 2020 at the Rock County Farm in Janesville, WI. Giant ragweed at the Rock County Farm is a biotype with a prolonged emergence pattern as emergence typically starts in mid- to late-April and continues well into June. Treatments were grouped by one of three herbicide systems: 1-pass preemergence (PRE), 1-PASS early-postemergence (EPOST), and 2-pass PRE + POST. There were varying levels of effectiveness among the herbicides within each system, but by grouping we can get a better sense of what systems perform best on average. To see how certain herbicides or herbicide tank mixes perform see individual trial data presented in this report.

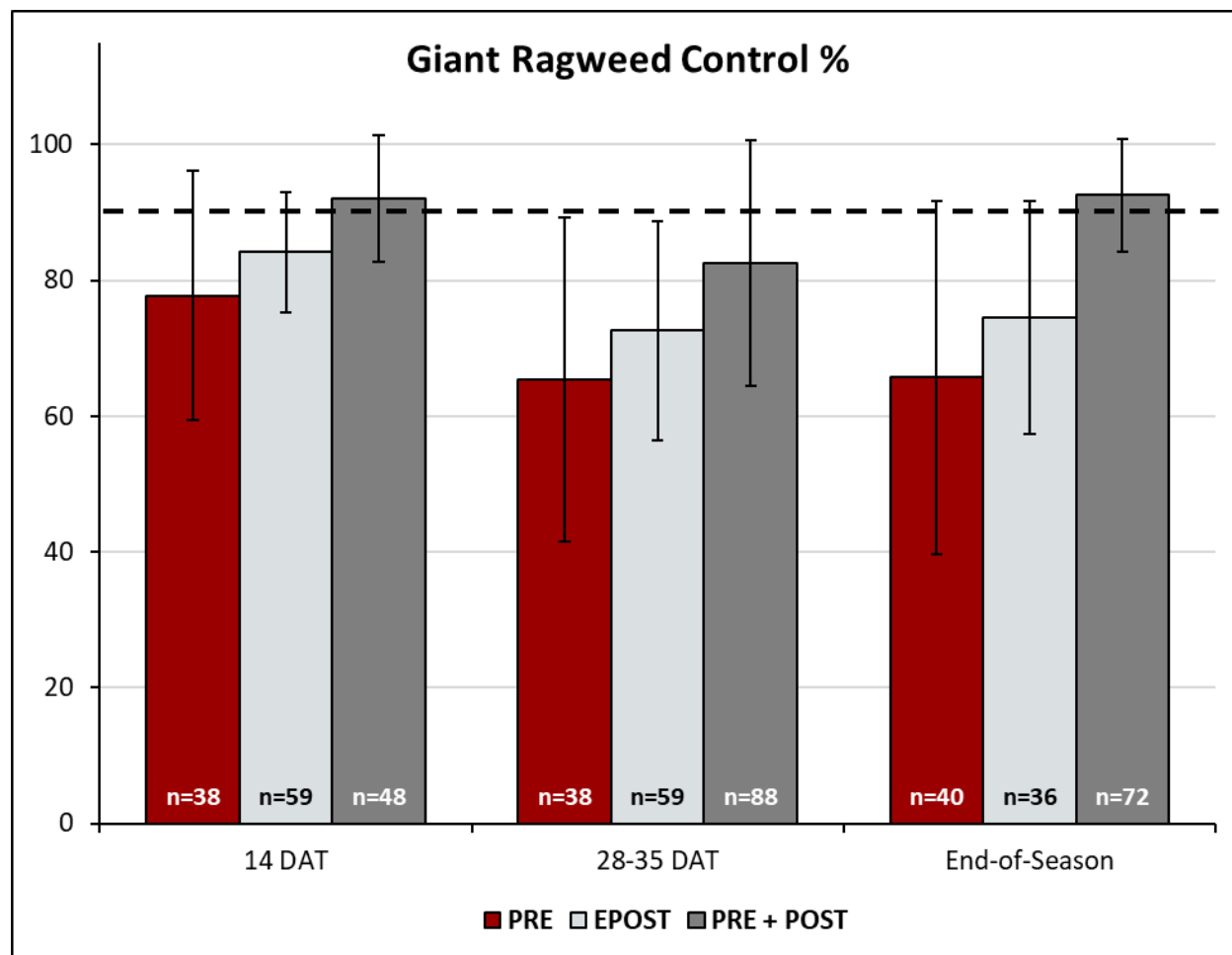


Figure 16. Giant ragweed control (%) of three corn herbicide systems (PRE only, EPOST only, PRE + POST). Bars indicate the average % control \pm the standard deviation 14 and 28-35 days after POST herbicide application and at the end of the growing season. n-values at the base of each bar represent the number of observations (plots) evaluated in each herbicide system.

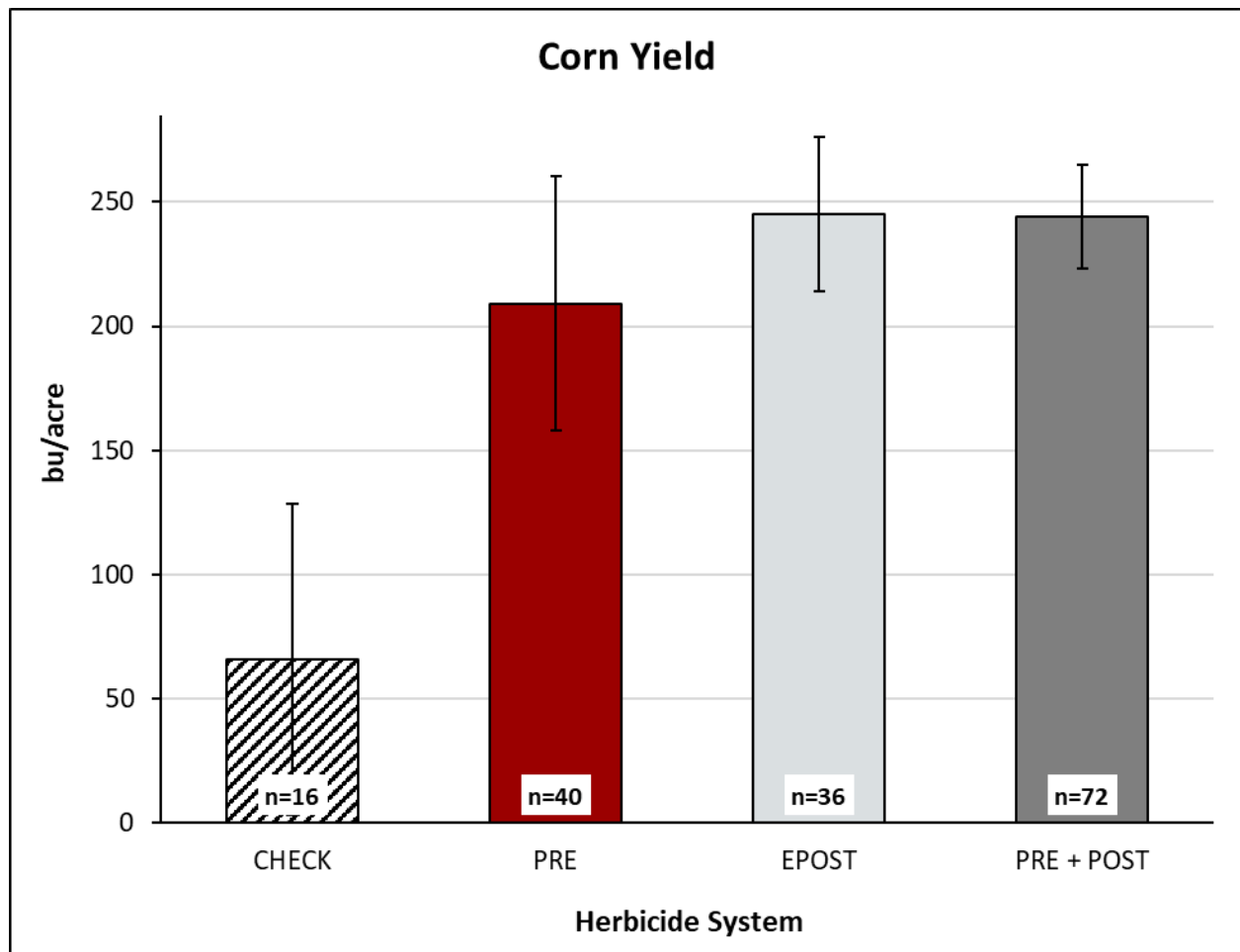


Figure 17. Corn yield (bu/acre) of three corn herbicide systems (PRE only, EPOST only, PRE + POST). Yields of the untreated checks are included for comparison. Bars indicate the average yield \pm the standard deviation. n-values at the base of each bar represent the number of observations (plots) evaluated in each herbicide system.

Multi-Trial Summary: Giant Ragweed Control in Corn

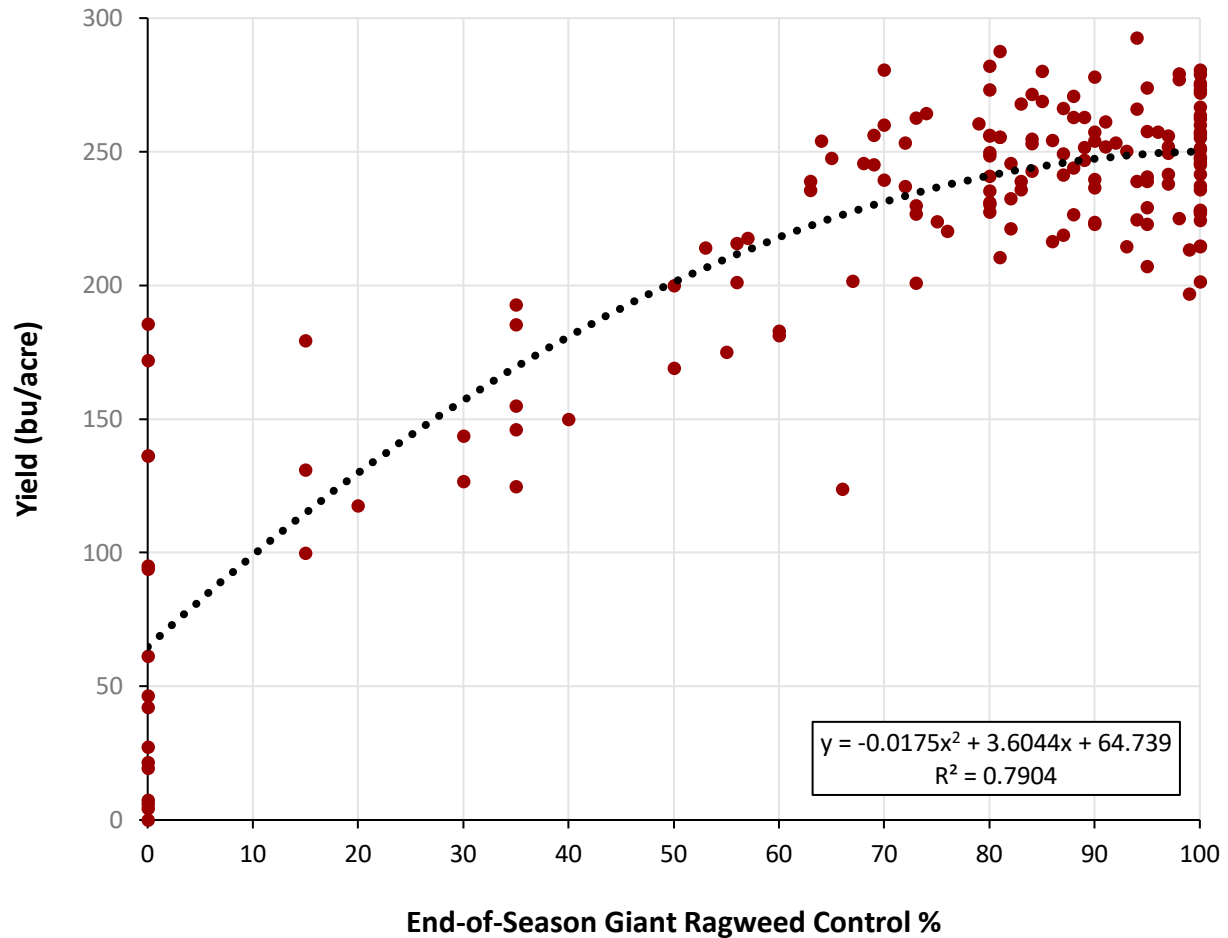


Figure 18. Corn yield regressed over end-of-season giant ragweed control from multiple corn herbicide evaluation trials at Janesville, WI. The formula and corresponding R^2 value is overlaid on the figure.

Project Goal: Evaluate multiple herbicide programs to provide recommendations for the 2021 launch of XtendFlex soybeans.

Site Description:

Location:	Brooklyn, WI	Crop:	XtendFlex soybean
Field #:	OB-2	Variety:	AG23XF0
Soil type:	Kegonsa silt loam	Planting Date:	5/22
% OM:	2	Emergence Date:	6/1
pH:	7.1	Population:	140,000 seeds/acre
Fertilization:	-	Depth:	1.5 in
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	conventional	Plot Size:	10 x 30 ft
Weed species:	gly-R waterhemp (AMATA), velvetleaf (ABUTH), wild-proso millet (PANMI), woolly cupgrass (ERBVI)		

Herbicide Application Information:

Date:	5/22	6/23	7/8
Treatment:	PRE (A)	POST (B)	LPOST (C)
Air Temp (°F):	66	59	86
2" Soil Temp (°F):	61	60	88
Soil moisture [surface]:	moist	moist	wet
RH %:	79	78	76
Cloud cover %	10	10	5
Wind speed (mph)/direction	0-4/E	2-7/ENE	0-3/E
Rainfall (in) 1 wk after APP:	1.63	1.63	2.94
GPA:	15	15	15
PSI:	36	34	34
Nozzle:	TTI 110015	TT*/TTI**	TT 110015
Nozzle spacing (in):	20	20	20
Boom Height (in):	20	26	28-34

*Used TT 110015 nozzles for all treatments without XtendiMax.

**Used TTI 110015 nozzles for all treatments with XtendiMax.

Crop and weed information at application:

	Date:	5/22	6/23	7/8
Soybean	Height:	-	4-6"	11-12"
	Stage:	-	V3/V4	V6
waterhemp	Height:	-	1-6"	1-9"
	Density:	-	7-16/m ²	1-13/m ²
velvetleaf	Height:	-	1-4"	6-24"
	Density:	-	0-3/m ²	0-4/m ²
annual grasses	Height:	-	1-3"	6-24"
	Density:	-	1-10/m ²	0-4/m ²

*Weed density recorded from plots with a previous herbicide treatment.

Density and height varied depending on the effectiveness of the previous herbicide.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	PRE	A
	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	Intact			0.5% v/v	POST	B
	Class Act Ridion			1% v/v	POST	B
3	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	PRE	A
	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
4	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	PRE	A
	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
5	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	PRE	A
	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	LPOST	C
	AMS			2.5% v/v	LPOST	C
6	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	PRE	A
	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	Warrant Ultra	3.45 lb/gal	14, 15	48 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	LPOST	C
	AMS			2.5% v/v	LPOST	C
7	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	Intact			0.5% v/v	POST	B
	Class Act Ridion			1% v/v	POST	B

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
8	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	Intact			0.5% v/v	POST	B
	Class Act Ridion			1% v/v	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	LPOST	C
9	AMS			2.5% v/v	LPOST	C
	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	Class Act Ridion			1% v/v	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	LPOST	C
	AMS			2.5% v/v	LPOST	C
10	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	Class Act Ridion			1% v/v	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	LPOST	C
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	LPOST	C
	AMS			2.5% v/v	LPOST	C
11	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	Class Act Ridion			1% v/v	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	LPOST	C
	AMS			2.5% v/v	LPOST	C
12	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B
13	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Mauler	4 lb/gal	5	8 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
14	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	PRE	A
	Warrant Ultra	3.45 lb/gal	14, 15	48 fl oz/a	PRE	A
	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	Intact			0.5% v/v	POST	B
	Class Act Ridion			1% v/v	POST	B
15	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	PRE	A
	Warrant Ultra	3.45 lb/gal	14, 15	48 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	Warrant	3 lb/gal	15	48 fl oz/a	POST	B
	AMS			2.5% v/v	POST	B

Adjuvants: AMS = Amsol (liquid AMS); Intact = DRA; Class Act Ridion = non-AMS water conditioner. ***XtendiMax will require the use of an approved volatility reducing agent in 2021.**

Trial Summary:

This trial evaluated multiple 2- and 3-pass herbicide programs to provide recommendations for the 2021 launch of XtendFlex soybeans. There was no observable soybean injury from the PRE herbicides (data not shown). The POST application of Warrant Ultra (trt 6) resulted in 8-14% leaf necrosis (burn). All other POST herbicide programs had only minor leaf necrosis.

Velvetleaf control was not as good in the Liberty based 2-pass programs (82%) as the XtendiMax + Roundup 2-pass programs (100%). All 3-pass programs provided 100% velvetleaf control. The first POST application of XtendiMax + Warrant (treatments 9-11) did not provide any grass control; however, the LPOST application of either Roundup or Liberty in those treatments did provide good control. Late season grass control was excellent (>93%) for all treatments.

The trial was conducted in a field with a heavy population (15-45 plants/ft²) of glyphosate resistant waterhemp. Waterhemp control from the PRE herbicides at the time of first POST application was ~75-85%. Waterhemp control differed amongst herbicide treatments (Figure 19). For optimal waterhemp control a 3-pass herbicide program was necessary at this location. End-of-season waterhemp control was better in the 3-pass herbicide systems (95%) compared to 2-pass systems (76%). Within the 2-pass systems, end-of-season control was greater in the XtendiMax based treatments (86%) than the Liberty treatments (70%).

Yield did not differ significantly amongst herbicide treatments (data not shown). Yield across all 2-pass systems = 35 bu/a, 3-pass systems = 38 bu/a, while the untreated check was 21 bu/acre.

Plot photos from throughout the growing season are available in the [XtendFlex Soybean Herbicide Programs](#) visual report published on wiscweeds.info.

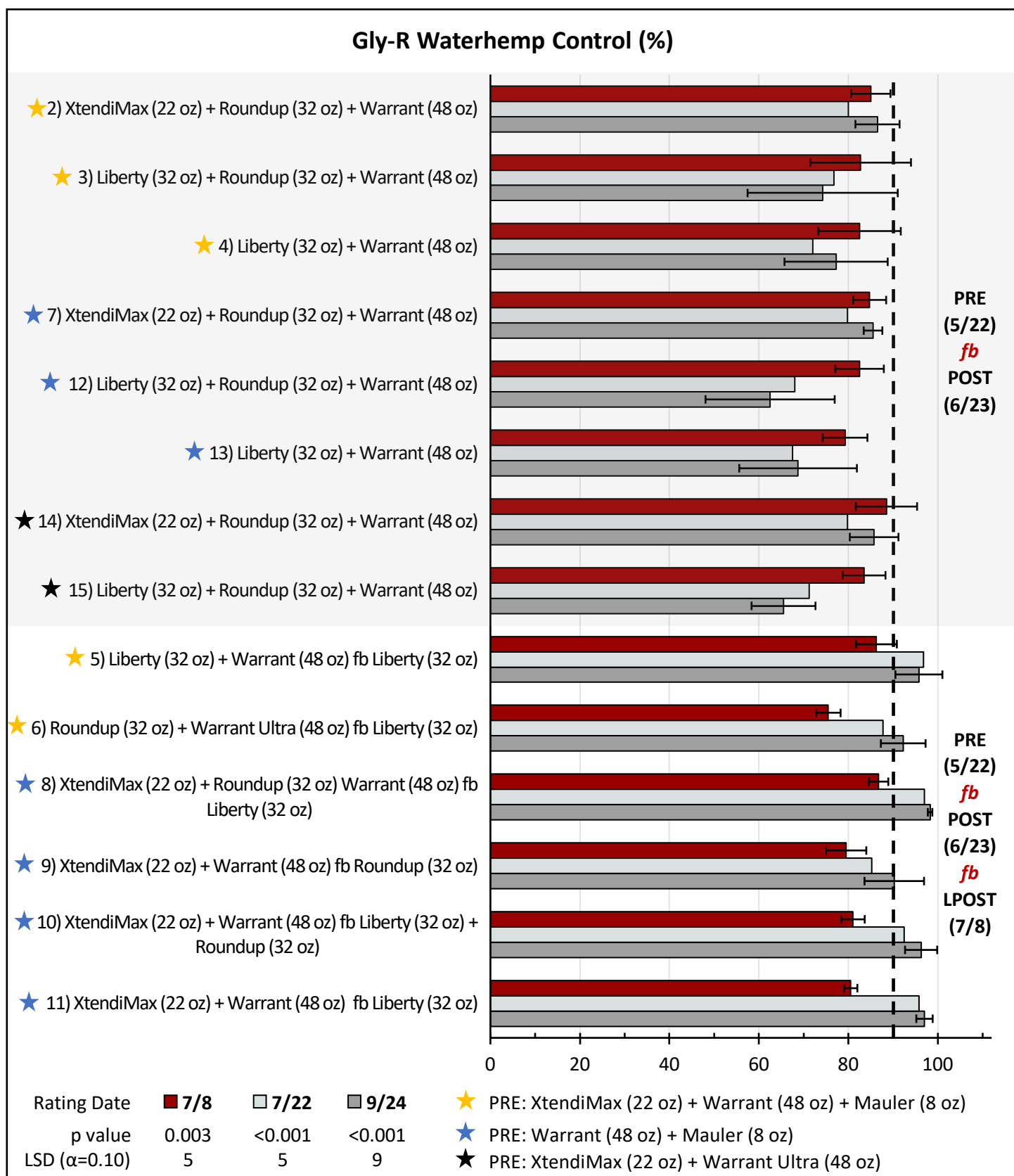


Figure 19: Gly-R waterhemp efficacy ratings for trial #20-BRO-SB02. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. The dashed line indicates 90% control.

Project Goal: Evaluate the efficacy and crop safety of Valent herbicides and similar competitor programs in Enlist soybeans.

Site Description:

Location:	Brooklyn, WI	Crop:	Enlist soybean
Field #:	OB-2	Variety:	P22T86E
Soil type:	Kegonsa loam	Planting Date:	5/22
% OM:	2	Emergence Date:	-
pH:	7.1	Population:	140,000 seeds/acre
Fertilization:	-	Depth:	1.5
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	Conventional	Plot Size:	10 x 25 ft
Weed species:	glyphosate-resistant waterhemp (AMATA), velvetleaf (ABUTH), wild-proso millet (PANMI), woolly cupgrass (ERBVI)		

Herbicide Application Information:

Date:	5/22	6/15	6/23	7/8
Treatment:	PRE (A)	EPOST (B)	POST (C)	LPOST (D)
Air Temp (°F):	66	77	59	86
2" Soil Temp (°F):	61	86	60	88
Soil moisture [surface]:	moist	dry	moist	wet
RH %:	79	40	78	76
Cloud cover %	10	5	70	5
Wind speed (mph)/direction	0-4/E	2-8/WSW	2-7/ENE	0-3/E
Rainfall (in) 1 wk after APP:	1.63	0.82	1.63	3.42
GPA:	15	20	20	20
PSI:	36	36	35	35
Nozzle:	TTI 110015	TT 110015	TT 110015	TT 110015
Nozzle spacing (in):	20	20	20	20
Boom Height (in):	20	22	30	26

Crop and Weed Information at Application:

	Date:	5/22	6/15	6/23	7/8
Soybean	Height:	-	3-4"	4-7"	12-15"
	Stage:	-	late V1	V3/V4	R2*
waterhemp	Height:	-	1-4"	1-6"	1-11"
	Density:	-	25-60/ft ²	8-31/m ²	10-43/m ²
velvetleaf	Height:	-	-	-	-
	Density:	-	0-1/m ²	-	-
annual grasses	Height:	-	2-4"	2-7"	6-12"
	Density:	-	1-7/m ²	0-4/m ²	0.1-7/m ²

*Off label application. Application cutoff for glufosinate is R1 soybean.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Check					
2	Scout (glufosinate)	2.34 lb/gal	10	32 fl oz/a	EPOST	B
	AMS			3 lb/a	EPOST	B
	Scout (glufosinate)	2.34 lb/gal	10	32 fl oz/a	LPOST	D
	AMS			3 lb/a	LPOST	D
3	Scout (glufosinate)	2.34 lb/gal	10	32 fl oz/a	EPOST	B
	Perpetuo	2.3 lb/gal	14, 15	6 fl oz/a	EPOST	B
	AMS			3 lb/a	EPOST	B
	Scout (glufosinate)		10	32 fl oz/a	LPOST	D
	AMS	2.34 lb/gal		3 lb/a	LPOST	D
4	Fierce EZ	3.04 lb/gal	14, 15	6 fl oz/a	PRE	A
	Scout (glufosinate)	2.34 lb/gal	10	32 fl oz/a	POST	C
	AMS			3 lb/a	POST	C
5	Fierce MTZ	2.64 lb/gal	5, 14, 15	1 pt/a	PRE	A
	Scout (glufosinate)	2.34 lb/gal	10	32 fl oz/a	POST	C
	AMS			3 lb/a	POST	C
6	Fierce EZ	3.04 lb/gal	14, 15	6 fl oz/a	PRE	A
	Scout (glufosinate)	2.34 lb/gal	10	32 fl oz/a	POST	C
	Perpetuo	2.3 lb/gal	14, 15	6 fl oz/a	POST	C
	AMS			3 lb/a	POST	C
7	Fierce MTZ	2.64 lb/gal	5, 14, 15	1 pt/a	PRE	A
	Scout (glufosinate)	2.34 lb/gal	10	32 fl oz/a	POST	C
	Perpetuo	2.3 lb/gal	14, 15	6 fl oz/a	POST	C
	AMS			3 lb/a	POST	C
8	Authority MTZ	45% w/w	5, 14	11 oz/a	PRE	A
	Scout (glufosinate)	2.34 lb/gal	10	32 fl oz/a	POST	C
	Anthem Maxx	4.3 lb/gal	14, 15	2.5 fl oz/a	POST	C
	AMS			3 lb/a	POST	C
9	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Scout (glufosinate)	2.34 lb/gal	10	32 fl oz/a	POST	C
	Perpetuo	2.3 lb/gal	14, 15	6 fl oz/a	POST	C
	AMS			3 lb/a	POST	C

Adjuvants: AMS = BlueAg spray grade ammonium sulfate

Trial Summary:

This trial evaluated the efficacy and crop safety of Valent herbicides and similar competitor programs in Enlist soybeans. There was only minor soybean injury (<5%) observed from the PRE herbicides 20 days after application. In order from more severe to less severe: Fierce MTZ (4%) > Fierce EZ (2.5%) > Authority MTZ (2%) > Zidua PRO (<1%). Soybean leaf necrosis was observed 15 days after the POST (C) application. Treatments of Scout + either Perpetuo or Anthem Maxx had greater injury (~14%) than the Scout only treatments (~6%). This was likely caused by the PPO active ingredients in Perpetuo (flumiclorac) and Anthem Maxx (fluthiacet).

All treatments provided >90% control of velvetleaf, wild-proso millet, and woolly cupgrass in late July.

The trial was conducted in a field with a heavy population of glyphosate-resistant waterhemp. Fierce EZ, Fierce MTZ, and Zidua PRO provided >94% control of waterhemp 20 days after the PRE application, whereas control with Authority MTZ was 78% (Figure 20). Adding Perpetuo to the tank with Scout at the POST application improved end-of-season waterhemp control of some treatments, most notably treatments 5 vs 7. While the 2-pass POST only system did provide good control and did not lead to a yield reduction, there were still escapes that survived and produced seed at the end of the year. A POST only system is also not a recommended strategy for waterhemp management as it places higher selection pressure on a single SOA (glufosinate in this trial), which will likely lead to resistance in the future.

Soybean yield did not differ among the herbicide treatments (data not shown). Yield across all herbicide treatments was 44 bu/acre, while the untreated check was 24 bu/acre, a 45% reduction.

Plot photos from throughout the growing season are available in the [Valent Herbicides in Enlist Soybeans](#) visual report published on wiscweeds.info.

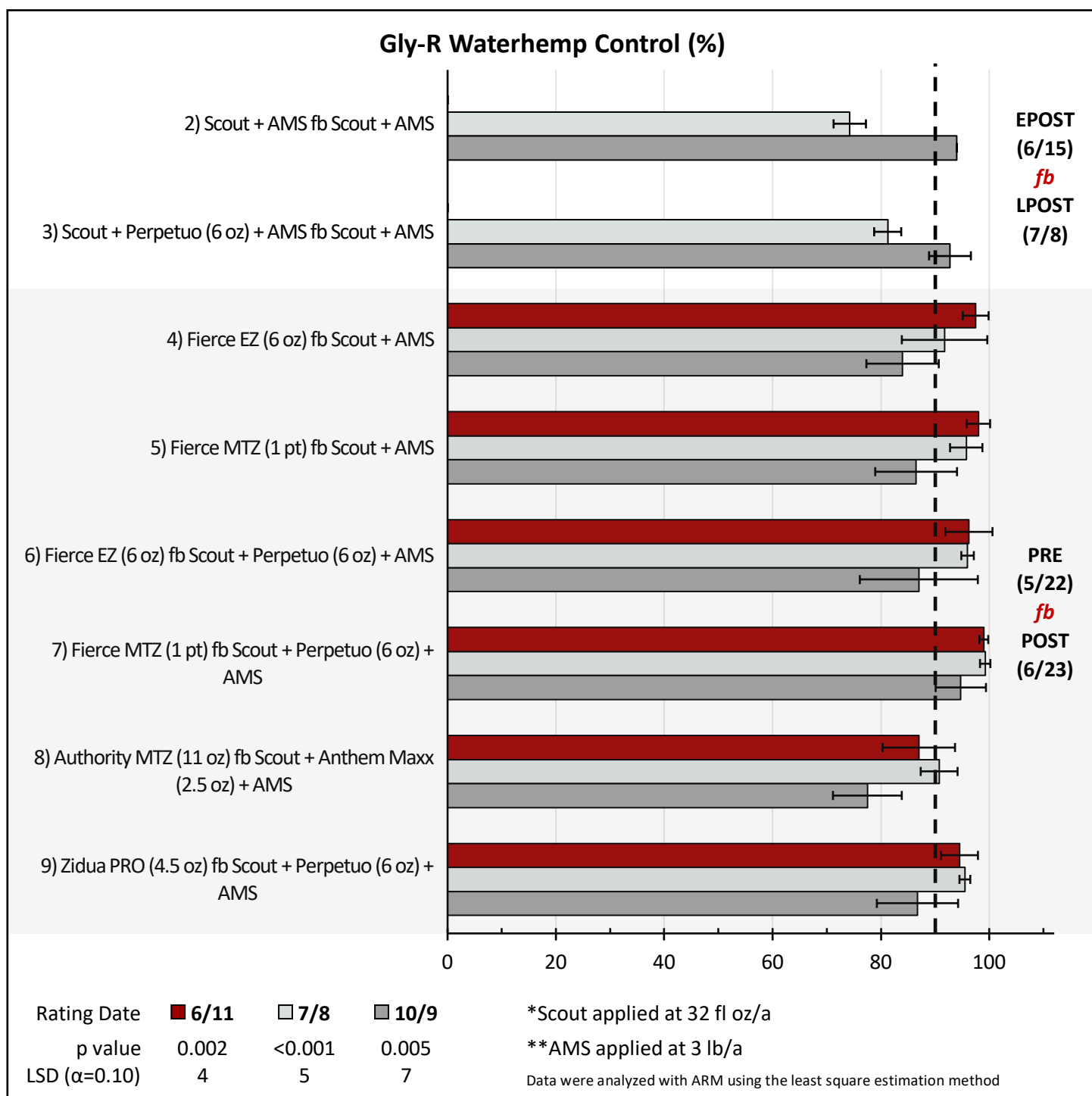


Figure 20: Glyphosate-resistant waterhemp efficacy ratings for trial #20-BRO-SB05. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Evaluate the efficacy and crop safety of Authority brand herbicides and similar competitor PRE herbicides in Enlist soybeans.

Site Description:

Location:	Brooklyn, WI	Crop:	Enlist soybean
Field #:	OB-2	Variety:	P22T86E
Soil type:	Kegonsa loam	Planting Date:	5/22
% OM:	2	Emergence Date:	-
pH:	7.1	Population:	140,000 seeds/acre
Fertilization:	-	Depth:	1.5
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	Conventional	Plot Size:	10 x 25 ft
Weed species:	glyphosate-resistant waterhemp (AMATA), velvetleaf (ABUTH), wild-proso millet (PANMI), woolly cupgrass (ERBVI)		

Herbicide Application Information:

Date:	5/22	6/23
Treatment:	PRE (A)	POST (B)
Air Temp (°F):	66	59
2" Soil Temp (°F):	61	60
Soil moisture [surface]:	moist	moist
RH %:	79	78
Cloud cover %	10	70
Wind speed (mph)/direction	0-4/E	2-7/ENE
Rainfall (in) 1 wk after APP:	1.63	1.63
GPA:	15	20
PSI:	36	35
Nozzle:	TTI 110015	TT 110015
Nozzle spacing (in):	20	20
Boom Height (in):	20	24

Crop and weed information at application:

	Date:	5/22	6/23*
Soybean	Height:	-	4-7"
	Stage:	-	V3/V4
waterhemp	Height	-	1-4"
	Density:	-	1-64/m ²
velvetleaf	Height:	-	1-4"
	Density:	-	0-3/m ²
annual grasses	Height:	-	1-4"
	Density:	-	0-15/m ²

*All weed densities and heights were recorded from plots with a PRE herbicide. Average waterhemp density in the check was 202 plants/m² on 6/23.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Authority Supreme	4.16 lb/gal	14, 15	8 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
3	Authority Edge	4.25 lb/gal	14, 15	8 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
4	Authority Edge	4.25 lb/gal	14, 15	10 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
5	Authority Edge	4.25 lb/gal	14, 15	8 fl oz/a	PRE	A
	Anthem Maxx	4.3 lb/gal	14, 15	2.5 fl oz/a	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
6	Zidua PRO	4.09 lb/gal	2, 14, 15	6 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
7	Boundary	6.5 lb/gal	5, 15	1.8 pt/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
8	Authority First DF	70% w/w	2, 15	6.4 oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B

Adjuvants: AMS = BlueAg spray grade ammonium sulfate

Trial Summary:

This trial evaluated the weed control and crop safety of FMC's Authority herbicide brands and some competitor products. The trial was located in a grower's field with a heavy population of glyphosate-resistant waterhemp. There was no significant herbicide injury from the PRE herbicides evaluated as average percent injury was <5% for all treatments (data not shown).

All the PRE herbicides provided excellent (>90%) grass and velvetleaf control at the time of the POST application (data not shown).

Waterhemp control varied at all rating timings (Figure 21). Waterhemp density at the time of POST application (6/23) was also impacted by PRE herbicide treatment (Table 1). The POST application of Liberty was mostly effective at controlling the emerged waterhemp as indicated by control data collected 15 days after application on 7/8. In treatments with less effective PRE herbicides (trts 7, 8) POST waterhemp control was below 90%. Most of the treatments had <90% control at soybean harvest as some waterhemp emerged after POST application.

Soybean yield did not differ among the herbicide treatments (data not shown). Yield averaged across all herbicide treatments was 41 bu/acre, while the untreated check was 27 bu/acre, a 34% reduction.

Plot photos from throughout the growing season are available in the [Authority Brand Herbicide Programs in Enlist Soybeans](#) visual report published on wiscweeds.info.

Table 1: Waterhemp density at the time of POST herbicide application at Brooklyn, WI

Trt #	PRE Herbicide	Rate	Density (m ²)*	Standard Deviation	% Reduction**
1	Check		202	45.9	-
2	Authority Supreme	8 fl oz	12	7.1	94
3, 5	Authority Edge	8 fl oz	8	5.9	96
4	Authority Edge	10 fl oz	5	5.2	97
6	Zidua PRO	6 fl oz	13	10.7	94
7	Boundary	1.8 pt	38	29.2	81
8	Authority First DF	6.4 oz	59	27.6	71

*density was collected from one 1 m² area in each plot

**percent reduction in density from untreated check

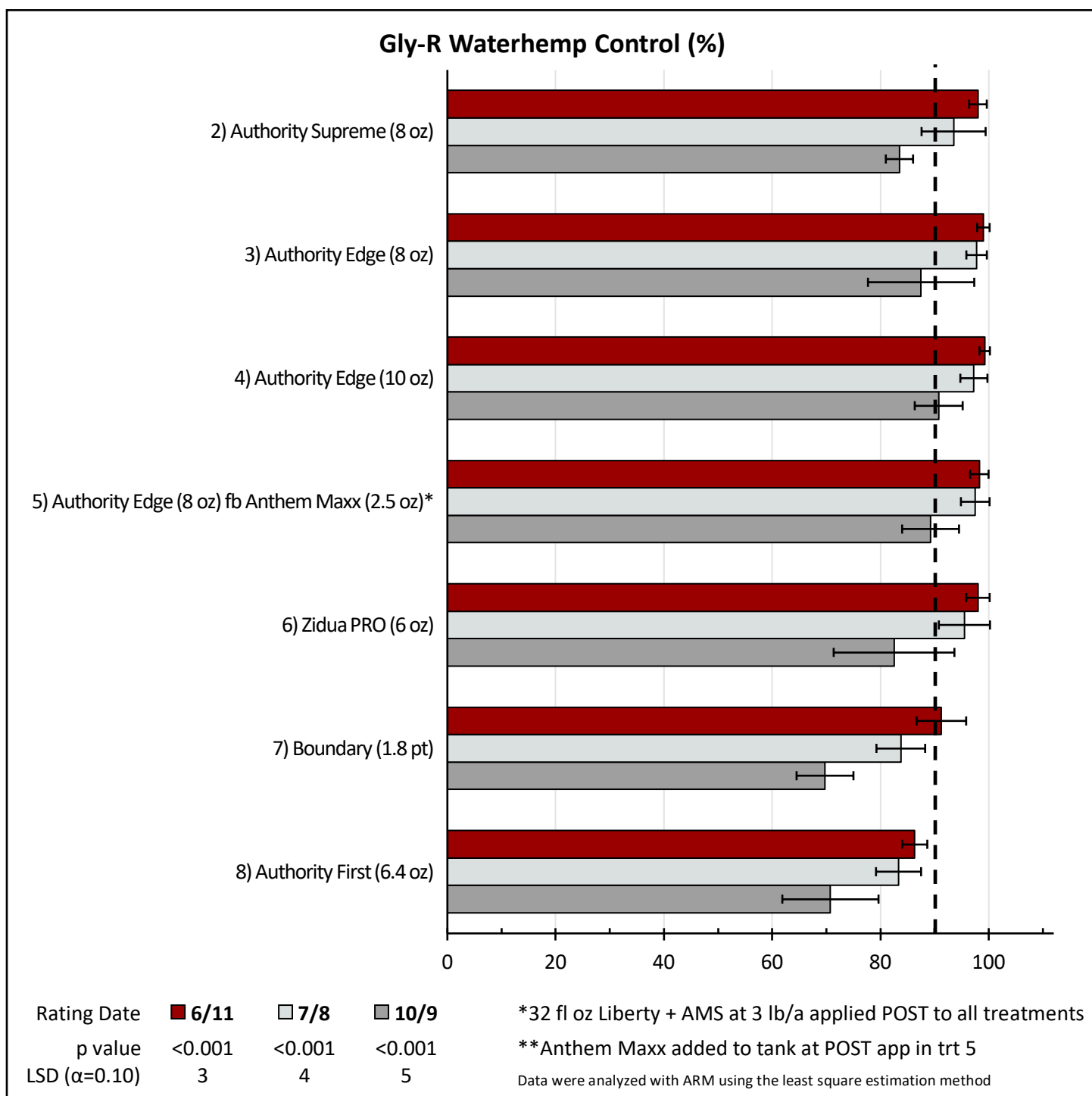


Figure 21: Glyphosate-resistant waterhemp efficacy ratings for trial #20-BRO-SB06. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Evaluate waterhemp control of Liberty and Enlist alone and in a tank mixture in Enlist soybean.

Site Description:

Location:	Brooklyn, WI	Crop:	Enlist soybean
Field #:	OB-2	Variety:	P22T86E
Soil type:	Kegonsa loam	Planting Date:	5/22
% OM:	2	Emergence Date:	-
pH:	7.1	Population:	140,000 seeds/acre
Fertilization:	-	Depth:	1.5
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	Conventional	Plot Size:	10 x 30 ft
Weed species:	glyphosate-resistant waterhemp (AMATA), velvetleaf (ABUTH), wild-proso millet (PANMI), woolly cupgrass (ERBVI)		

Herbicide Application Information:

Date:	5/22	6/18
Treatment:	PRE (A)	POST (B)
Air Temp (°F):	66	85
2" Soil Temp (°F):	61	80
Soil moisture [surface]:	moist	dry
RH %:	79	39
Cloud cover %	10	0
Wind speed (mph)/direction	0-4/E	0-4/SSW
Rainfall (in) 1 wk after APP:	1.63	0.97
GPA:	15	15
PSI:	36	36
Nozzle:	TTI 110015	TT*/TTI**
Nozzle spacing (in):	20	20
Boom Height (in):	20	23

*Used TT 110015 nozzles for treatments without Enlist One (trt 3).

**Used TTI 110015 nozzles for treatments with Enlist One or Enlist Duo (trt 2, 4).

Crop and weed information at application:

	Date:	5/22	6/18*
Soybean	Height:	-	3-5"
	Stage:	-	V2/V3
waterhemp	Height	-	0.25-2"
	Density:	-	8-12/m ²
velvetleaf	Height:	-	-
	Density:	-	-
annual grasses	Height:	-	-
	Density:	-	-

*All weed densities and heights were recorded from plots with a PRE herbicide. There was no emerged velvetleaf or grass sp. at the time of the POST application.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Enlist Duo	3.3 lbae/gal	4, 9	56 fl oz/a	POST	B
	Zidua SC	4.17 lb/gal	15	2.5 fl oz/a	POST	B
3	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	Zidua SC	4.17 lb/gal	15	2.5 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
4	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	B
	Zidua SC	4.17 lb/gal	15	2.5 fl oz/a	POST	B
	AMS			3 lb/a	POST	B

Adjuvants: AMS = BlueAg spray grade ammonium sulfate

Trial Summary:

This trial evaluated waterhemp control of Liberty and Enlist alone and in a tank mixture. The trial was located in a grower's field with a heavy population of glyphosate-resistant waterhemp. There was no significant herbicide injury observed at any time in the growing season.

Zidua PRO was very effective at controlling velvetleaf, wild-proso millet, and woolly cupgrass as there were no emerged weeds of these species at the time of the POST application (data not shown).

All POST tank mixtures provided at least 90% waterhemp control 13 days after application (Figure 22). Tank mixtures with Liberty had better initial control than the Enlist Duo treatment. The waterhemp population in this field is glyphosate resistant, so the glyphosate component of Enlist Duo is not active on waterhemp. The Liberty + Roundup tank mix and slightly better control (90%) than the Liberty + Enlist One tank mix (84%) 34 days after the POST application. This could have been a result of nozzle selection and spray coverage as a TurboTeeJet (TT) nozzle was used for the Liberty + Roundup treatment while a TurboTeeJet air induction (TTI) nozzle was used for the Liberty + Enlist One treatment. TT nozzles produce more fine droplets and have better coverage when compared to TTI nozzles. Spray coverage is very important for Liberty efficacy. All treatments had <90% control at soybean harvest as some waterhemp emerged after the POST application, and there was no significant difference among treatments

Soybean yield did not differ among the herbicide treatments (data not shown). Yield averaged across all herbicide treatments was 43 bu/acre, while the untreated check was 26 bu/acre, a 40% reduction.

Plot photos from throughout the growing season are available in the [Liberty and Enlist Efficacy in Enlist Soybeans – BASF](#) visual report published on wiscweeds.info.

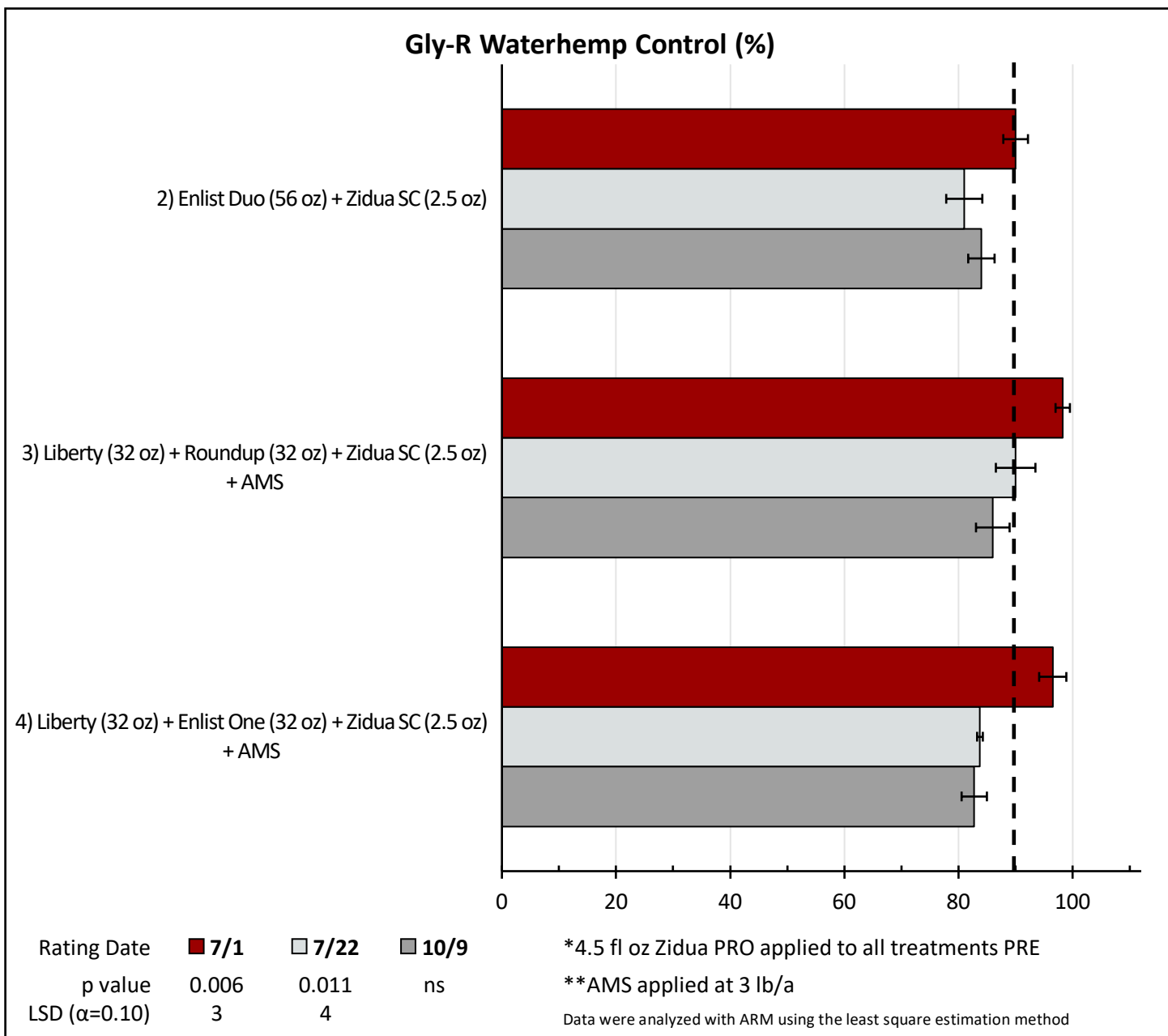


Figure 22: Glyphosate-resistant waterhemp efficacy ratings for trial #20-BRO-SB09. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Evaluate waterhemp control of Liberty and Enlist One tank mixtures in Enlist soybean.

Site Description:

Location:	Brooklyn, WI	Crop:	Enlist soybean
Field #:	OB-2	Variety:	P22T86E
Soil type:	Kegonsa loam	Planting Date:	5/22
% OM:	2	Emergence Date:	-
pH:	7.1	Population:	140,000 seeds/acre
Fertilization:	-	Depth:	1.5
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	Conventional	Plot Size:	10 x 25 ft
Weed species:	glyphosate-resistant waterhemp (AMATA), velvetleaf (ABUTH), wild-proso millet (PANMI), woolly cupgrass (ERBVI)		

Herbicide Application Information:

Date:	5/22	6/23
Treatment:	PRE (A)	POST (B)
Air Temp (°F):	66	63
2" Soil Temp (°F):	61	60
Soil moisture [surface]:	moist	moist
RH %:	79	78
Cloud cover %	10	70
Wind speed (mph)/direction	0-4/E	2-8/ENE
Rainfall (in) 1 wk after APP:	1.63	1.63
GPA:	15	15
PSI:	36	36
Nozzle:	TTI 110015	TTI 110015
Nozzle spacing (in):	20	20
Boom Height (in):	20	25

Crop and weed information at application:

	Date:	5/22	6/23*
Soybean	Height:	-	3-5"
	Stage:	-	V2/V3
waterhemp	Height	-	1-6"
	Density:	-	7-75/m ²
velvetleaf	Height:	-	-
	Density:	-	-
annual grasses	Height:	-	1-2"
	Density:	-	0-10/m ²

*All weed densities and heights were recorded from plots with a PRE herbicide. There was no emerged velvetleaf at the time of the POST application.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Sonic	70% w/w	2, 14	4 oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 oz/a	POST	B
	Durango DMA	4 lbae/gal	9	32 oz/a	POST	B
	EverpreX	7.62 lb/gal	15	1 pt/a	POST	B
	AMS			2.5% v/v	POST	B
2	Sonic	70% w/w	2, 14	4 oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 oz/a	POST	B
	Durango DMA	4 lbae/gal	9	32 oz/a	POST	B
	AMS			2.5% v/v	POST	B
3	Sonic	70% w/w	2, 14	4 oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 oz/a	POST	B
	Liberty	2.34 lb/gal	10	32 oz/a	POST	B
	EverpreX	7.62 lb/gal	15	1 pt/a	POST	B
	AMS			2.5% v/v	POST	B
4	Sonic	70% w/w	2, 14	4 oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 oz/a	POST	B
	Liberty	2.34 lb/gal	10	32 oz/a	POST	B
	AMS			2.5% v/v	POST	B

Adjuvants: AMS = Amsol liquid AMS

Trial Summary:

This trial evaluated waterhemp control of Liberty and Enlist tank mixtures. The trial was located in a grower's field with a heavy population of glyphosate-resistant waterhemp. There was no significant injury observed at any time in the growing season related to herbicides applied in this trial.

Sonic was very effective at controlling velvetleaf as there were no emerged weeds at the time of the POST application (data not shown). Wild-proso millet and woolly cupgrass PRE control ranged from 77-87%.

Waterhemp control from the PRE application of Sonic was 72-74% 31 days after application (data not shown). Liberty + Enlist One tank mixes provided 94% waterhemp control 15 days after application while Enlist + Durango control was 86% (Figure 23). The waterhemp population in this field is glyphosate resistant, so Durango did not have activity on waterhemp. All treatments had similar levels of waterhemp control later in the growing season. All treatments had <90% control at soybean harvest as some waterhemp emerged after the POST application, and there was no significant difference among treatments.

Soybean yield did not differ among the herbicide treatments (data not shown). Yield averaged across all herbicide treatments was 45 bu/acre, while the untreated check was 27 bu/acre, a 40% reduction.

Plot photos from throughout the growing season are available in the [Liberty and Enlist Efficacy in Enlist Soybeans – Corteva](#) visual report published on wiscweeds.info.

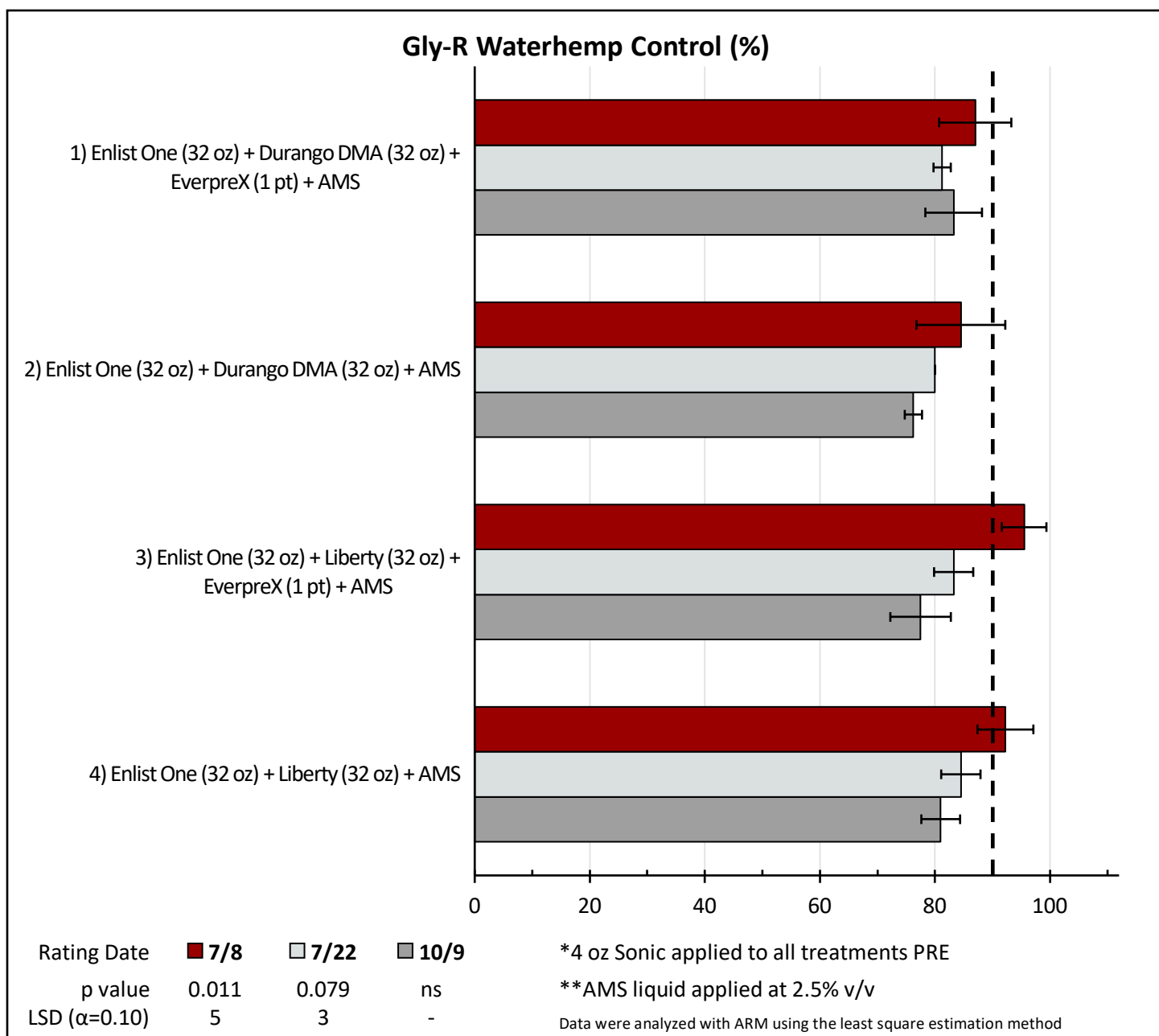


Figure 23: Glyphosate-resistant waterhemp efficacy ratings for trial #20-BRO-SB10. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Evaluate the efficacy and crop safety of Syngenta herbicides and similar competitor programs in Enlist soybeans.

Site Description:

Location:	Brooklyn, WI	Crop:	Enlist soybean
Field #:	OB-2	Variety:	S20-J5E
Soil type:	Kegonsa loam	Planting Date:	5/22
% OM:	2	Emergence Date:	-
pH:	7.1	Population:	140,000 seeds/acre
Fertilization:	-	Depth:	1.5
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	Conventional	Plot Size:	10 x 25 ft
Weed species:	glyphosate-resistant waterhemp (AMATA), velvetleaf (ABUTH), wild-proso millet (PANMI), woolly cupgrass (ERBVI)		

Herbicide Application Information:

Date:	5/22	6/8	6/23
Treatment:	PRE (A)	EPOST (B)	POST (C)
Air Temp (°F):	66	76	63
2" Soil Temp (°F):	61	73	60
Soil moisture [surface]:	moist	dry	moist
RH %:	79	46	78
Cloud cover %	10	0	70
Wind speed (mph)/direction	0-4/E	1-4/S	2-7/ENE
Rainfall (in) 1 wk after APP:	1.63	1.6	1.63
GPA:	15	15	20
PSI:	36	36	36
Nozzle:	TTI 110015	TTI 110015	TTI 110015
Nozzle spacing (in):	20	20	20
Boom Height (in):	20	21	25

Crop and Weed Information at Application:

	Date:	5/22	6/8	6/23*
Soybean	Height:	-	2-3"	3-6"
	Stage:	-	VC/V1	V3/V4
waterhemp	Height:	-	0.25-0.5"	1-6"
	Density:	-	11-20/ft ²	1-9/ft ²
velvetleaf	Height:	-	0.5-1"	1-2"
	Density:	-	0-1/m ²	0-4/m ²
annual grasses	Height:	-	0.5-1"	1-2"
	Density:	-	1-15/m ²	0-2/m ²

*All weed densities and heights were recorded from plots with a PRE herbicide.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Prefix	5.3 lb/gal	14, 15	2 pt/a	PRE	A
	Tricor DF	75% w/w	5	6 oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	C
	Roundup PowerMAX	4.5 lbae/gal	9	28 fl oz/a	POST	C
	Request			0.5% v/v	POST	C
3	Prefix	5.3 lb/gal	14, 15	2 pt/a	PRE	A
	Tricor DF	75% w/w	5	6 oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	C
	Sequence	5.25 lb/gal	9, 15	3 pt/a	POST	C
	Request			0.5% v/v	POST	C
4	Prefix	5.3 lb/gal	14, 15	2 pt/a	EPOST	B
	FirstRate	84% w/w	2	0.4 oz/a	EPOST	B
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	EPOST	B
	Roundup PowerMAX	4.5 lbae/gal	9	28 fl oz/a	EPOST	B
	Request			0.5% v/v	EPOST	B
5	Boundary	6.5 lb/gal	5, 15	1.8 pt/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	C
	Roundup PowerMAX	4.5 lbae/gal	9	28 fl oz/a	POST	C
	Request			0.5% v/v	POST	C
6	Boundary	6.5 lb/gal	5, 15	1.8 pt/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	C
	Sequence	5.25 lbae/gal	9, 15	3 pt/a	POST	C
	Request			0.5% v/v	POST	C
7	Prefix	5.3 lb/gal	14, 15	2 pt/a	PRE	A
	FirstRate	84% w/w	2	0.4 oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	C
	Roundup PowerMAX	4.5 lbae/gal	9	28 fl oz/a	POST	C
	Request			0.5% v/v	POST	C
8	Sonic	70% w/w	2, 14	4.5 oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	C
	Roundup PowerMAX	4.5 lbae/gal	9	28 fl oz/a	POST	C
	Request			0.5% v/v	POST	C
9	Zidua PRO	4.09 lb/gal	2, 14, 15	6 fl oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	C
	Roundup PowerMAX	4.5 lbae/gal	9	28 fl oz/a	POST	C
	Request			0.5% v/v	POST	C
10	Boundary	6.5 lb/gal	5, 15	1.8 pt/a	PRE	A
	FirstRate	84% w/w	2	0.4 oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	C
	Roundup PowerMAX	4.5 lbae/gal	9	28 fl oz/a	POST	C
	Request			0.5% v/v	POST	C

Adjuvants: Request = non-AMS water conditioner

Trial Summary:

This trial evaluated the efficacy and crop safety of Syngenta herbicides and similar competitor programs in Enlist soybeans. The trial was conducted in a field with a heavy population of glyphosate-resistant waterhemp. There was only minor soybean injury (<5%) observed from the PRE herbicides 14 and 21 days after application. 14 days after the EPOST (B) application of Prefix 12% leaf necrosis was observed. There was minor injury observed 15 days after the POST (C) application. Treatments with Sequence had slightly more injury than other POST herbicides (data not shown).

All treatments provided >90% control of wild-proso millet, and woolly cupgrass throughout the growing season. Adding a group 2 herbicide to the the PRE tank mixture improved velvetleaf control. PRE herbicide treatments with an ALS (group 2) active ingredient (FirstRate, Sonic, Zidua PRO) had 100% velvetleaf control 31 days after application. PRE treatments without group 2 herbicides averaged 77%.

All PRE herbicide treatments provided excellent (>93%) waterhemp control 21 days after application (Figure 24). The EPOST program (trt 4) provided excellent control (97%) 14 days after application, but numerous waterhemp plants emerged after application and control at the end of the season was only 51%. All POST herbicide programs were effective at controlling the emerged waterhemp as indicated by control data collected 15 days after application on 7/8. However, most of the treatments had <90% control at soybean harvest as some waterhemp emerged after POST application. Treatments with less effective PRE herbicides (Sonic, Boundary) tended to have slightly less control at the end of the season.

Soybean yield did not differ among the herbicide treatments (data not shown). Yield across all herbicide treatments was 35 bu/acre, while the untreated check was 16 bu/acre, a 54% reduction. Overall yields were much lower in this trial due to early season deer feeding that stunted soybean growth in a majority of the plots.

Plot photos from throughout the growing season are available in the [Syngenta Herbicide Programs in Enlist Soybeans](#) visual report published on wiscweeds.info.

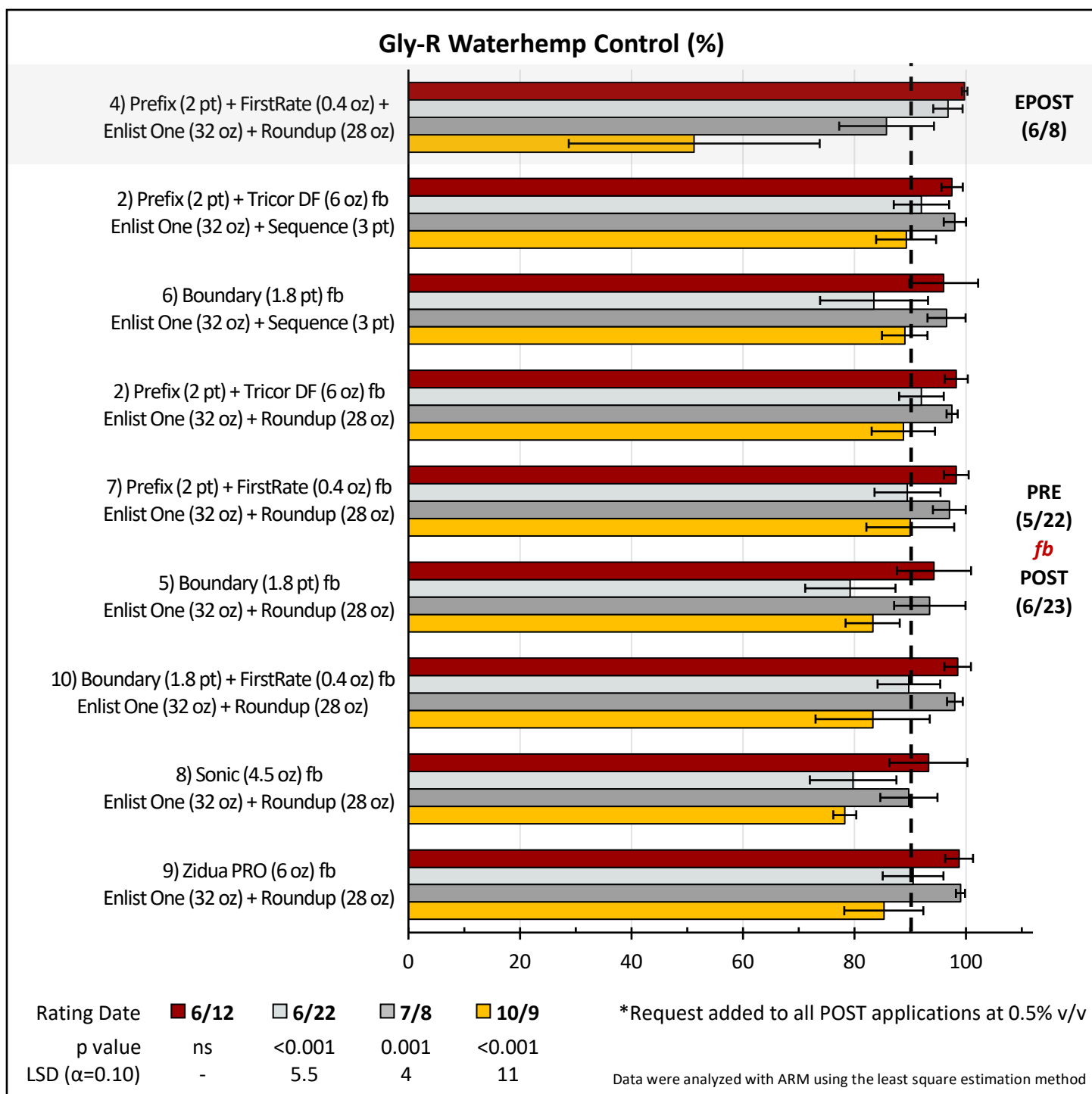


Figure 24: Glyphosate-resistant waterhemp efficacy ratings for trial #20-BRO-SB11. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Determine the utility of layering residual herbicides for waterhemp control in soybean.

Site Description:

Location:	Brooklyn, WI	Crop:	Enlist soybean
Field #:	OB-2	Variety:	S20-J5E
Soil type:	Kegonsa loam	Planting Date:	5/22
% OM:	2	Emergence Date:	-
pH:	7.1	Population:	140,000 seeds/acre
Fertilization:	-	Depth:	1.5
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	Conventional	Plot Size:	10 x 30 ft
Weed species:	glyphosate-resistant waterhemp (AMATA), velvetleaf (ABUTH), wild-proso millet (PANMI), woolly cupgrass (ERBVI)		

Herbicide Application Information:

Date:	5/22	6/17
Treatment:	PRE (A)	POST (B)
Air Temp (°F):	66	87
2" Soil Temp (°F):	61	82
Soil moisture [surface]:	moist	dry
RH %:	79	43
Cloud cover %	10	0
Wind speed (mph)/direction	0-4/E	2-4/SSE
Rainfall (in) 1 wk after APP:	1.63	0.97
GPA:	15	15
PSI:	36	36
Nozzle:	TTI 110015	TT 110015
Nozzle spacing (in):	20	20
Boom Height (in):	20	22

Crop and Weed Information at Application:

	Date:	5/22	6/17
Soybean	Height:	-	4-5"
	Stage:	-	V2
waterhemp	Height:	-	1-3"
	Density:	-	11-100/m ²
velvetleaf	Height:	-	-
	Density:	-	0/m ²
annual grasses	Height:	-	1-2"
	Density:	-	0-1/m ²

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Authority MTZ	45% w/w	5, 14	12 oz/a	A	PRE
2	Authority MTZ	45% w/w	5, 14	12 oz/a	A	PRE
	Liberty	2.34 lb/gal	10	32 fl oz/a	B	POST
	AMS			2 lb/a	B	POST
3	Authority MTZ	45% w/w	5, 14	12 oz/a	A	PRE
	Pursuit	2 lb/gal	2	4 fl oz/a	B	POST
	Liberty	2.34 lb/gal	10	32 fl oz/a	B	POST
	AMS			2 lb/a	B	POST
4	Authority MTZ	45% w/w	5, 14	12 oz/a	A	PRE
	Flexstar	1.88 lb/gal	14	1 pt/a	B	POST
	Liberty	2.34 lb/gal	10	32 fl oz/a	B	POST
	AMS			2 lb/a	B	POST
5	Authority MTZ	45% w/w	5, 14	12 oz/a	A	PRE
	Warrant	3 lb/gal	15	48 fl oz/a	B	POST
	Liberty	2.34 lb/gal	10	32 fl oz/a	B	POST
	AMS			2 lb/a	B	POST
6	Authority MTZ	45% w/w	5, 14	12 oz/a	A	PRE
	Dual II Magnum	7.64 lb/gal	15	1.25 pt/a	B	POST
	Liberty	2.34 lb/gal	10	32 fl oz/a	B	POST
	AMS			2 lb/a	B	POST
7	Authority MTZ	45% w/w	5, 14	12 oz/a	A	PRE
	Outlook	6 lb/gal	15	10 fl oz/a	B	POST
	Liberty	2.34 lb/gal	10	32 fl oz/a	B	POST
	AMS			2 lb/a	B	POST
8	Authority MTZ	45% w/w	5, 14	12 oz/a	A	PRE
	Zidua	85% w/w	15	1.5 oz/a	B	POST
	Liberty	2.34 lb/gal	10	32 fl oz/a	B	POST
	AMS			2 lb/a	B	POST
9	Authority MTZ	45% w/w	5, 14	12 oz/a	A	PRE
	Prefix	5.3 lb/gal	14, 15	2 pt/a	B	POST
	Liberty	2.34 lb/gal	10	32 fl oz/a	B	POST
	AMS			2 lb/a	B	POST
10	Authority MTZ	45% w/w	5, 14	12 oz/a	A	PRE
	Warrant Ultra	3.45 lb/gal	14, 15	50 fl oz/a	B	POST
	Liberty	2.34 lb/gal	10	32 fl oz/a	B	POST
	AMS			2 lb/a	B	POST

Adjuvants: AMS = Blue Ag spray grade ammonium sulfate

Trial Summary:

This study was a joint effort between the [UW-Madison Nutrient and Pest Management Program](#) (NPM; Dan Smith) and the WiscWeed team. This trial was conducted at two locations with natural infestations of waterhemp in Brooklyn and Lancaster, WI. The Brooklyn waterhemp population has a greater density and is known to be glyphosate-resistant. Soybean varieties with traits that confer resistance to glufosinate were chosen so that Liberty could be used as part of the POST herbicide program. An Enlist soybean variety was used at Brooklyn and a LLGT variety was chosen for Lancaster. Only data from the Brooklyn, WI location is included in this report.

Key Take Home Points from 2020 Data:

- The PRE application of Authority MTZ provided ~70-80% control at the time of POST application (data not shown)
- All POST herbicide programs provided excellent control (>95%) of emerged waterhemp 14 days after application (Figure 25).
- 2020 results indicate that the addition of residual herbicide at the POST application improved late season waterhemp control relative to Liberty applied alone (Figure 22)
- The addition of fomesafen, an active ingredient in Flexstar, Prefix, and Warrant Ultra, to the tank at the POST application improved waterhemp control relative to Liberty applied alone (Figure 25).
- Yield was not significantly affected by POST herbicide program (data not shown)
 - PRE only treatment yielded 36 bu/acre
 - Averaged across all POST herbicide programs, soybean yielded 49 bu/acre.

Plot photos from throughout the growing season are available in the [Utility of Layering Residual Herbicides in Soybean](#) visual report published on wiscweeds.info.

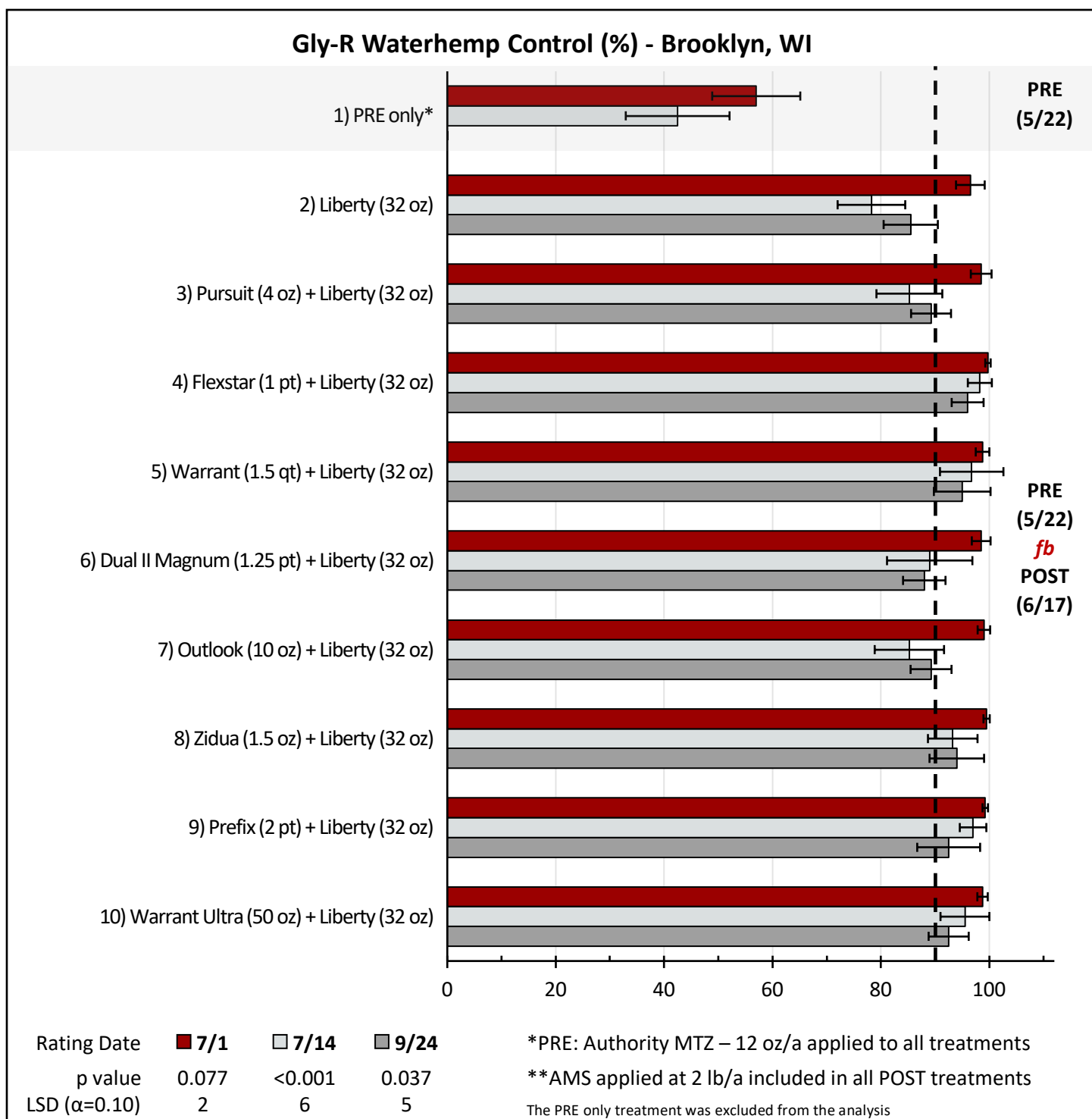


Figure 25: Glyphosate-resistant waterhemp efficacy ratings for trial #20-BRO-SB12. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Evaluate tank mixture combinations of Liberty with Enlist, Basagran, and PPO herbicides for waterhemp control.

Site Description:

Location:	Brooklyn, WI	Crop:	Enlist soybean
Field #:	OB-2	Variety:	P22T86E
Soil type:	Kegonsa loam	Planting Date:	5/22
% OM:	2	Emergence Date:	5/29
pH:	7.1	Population:	140,000 seeds/acre
Fertilization:	-	Depth:	1.5
Previous crop:	Soybean	Row spacing:	30 in
Tillage:	Conventional	Plot Size:	10 x 30 ft
Weed species:	glyphosate-resistant waterhemp (AMATA), velvetleaf (ABUTH), wild-proso millet (PANMI), woolly cupgrass (ERBVI)		

Herbicide Application Information:

Date:	5/22	6/24
Treatment:	PRE (A)	POST (B)
Air Temp (°F):	66	75
2" Soil Temp (°F):	61	74
Soil moisture [surface]:	moist	damp
RH %:	79	62
Cloud cover %	10	5
Wind speed (mph)/direction	0-4/E	3-9/SW
Rainfall (in) 1 wk after APP:	1.63	1.49
GPA:	15	15
PSI:	36	35
Nozzle:	TTI 110015	AIXR110015
Nozzle spacing (in):	20	20
Boom Height (in):	20	25

Crop and weed information at application:

	Date:	5/22	6/24*
Soybean	Height:	-	4-6"
	Stage:	-	V4
waterhemp	Height	-	1-8"
	Density:	-	4-30/m ²
velvetleaf	Height:	-	-
	Density:	-	-
annual grasses	Height:	-	3-8"
	Density:	-	1-13/m ²

*All weed densities and heights were recorded from plots with a PRE herbicide.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Valor SX	51% w/w	14	2 oz/a	PRE	A
3	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			2 lb/a	POST	B
4	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Cobra	2 lb/gal	14	12.5 fl oz/a	POST	B
	COC			1% v/v	POST	B
	AMS			2 lb/a	POST	B
5	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Cobra	2 lb/gal	14	12.5 fl oz/a	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			2 lb/a	POST	B
7	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Flexstar	1.88 lb/gal	14	1 pt/a	POST	B
	COC			1% v/v	POST	B
	AMS			2 lb/a	POST	B
8	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Flexstar	1.88 lb/gal	14	1 pt/a	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			2 lb/a	POST	B
10	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Resource	0.86 lb/gal	14	8 fl oz/a	POST	B
	COC			1% v/v	POST	B
	AMS			2 lb/a	POST	B
11	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Resource	0.86 lb/gal	14	8 fl oz/a	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			2 lb/a	POST	B
13	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Cadet	0.91 lb/gal	14	0.9 fl oz/a	POST	B
	COC			1% v/v	POST	B
	AMS			2 lb/a	POST	B
14	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Cadet	0.91 lb/gal	14	0.9 fl oz/a	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			2 lb/a	POST	B

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
16	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Basagran	5 lb/gal	6	1.6 pt/a	POST	B
	COC			1% v/v	POST	B
	AMS			2 lb/a	POST	B
17	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Basagran	5 lb/gal	6	1.6 pt/a	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			2 lb/a	POST	B
19	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	B
	AMS			2 lb/a	POST	B
20	Valor SX	51% w/w	14	2 oz/a	PRE	A
	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	AMS			2 lb/a	POST	B

Adjuvants: AMS = BlueAg spray grade ammonium sulfate; COC = CropOil

Trial Summary:

This study was a joint effort between the [UW-Madison Nutrient and Pest Management Program](#) (NPM; Dan Smith) and the WiscWeed team. This study evaluated the impact of glufosinate tank-mixes with PPO-inhibitors (Cobra, Flexstar, Resource, and Cadet at recommended and reduced rates; 1X and 1/3X label rate), Basagran (1X and 1/3X label rate), and Enlist One (1X label rate). Data from the 1/3 rate treatments are excluded in this report. The trial was conducted at two locations with natural infestations of waterhemp in Brooklyn and Lancaster, WI. The Brooklyn waterhemp population has a greater density and is known to be glyphosate resistant. Only data from the Brooklyn, WI location is included in this report. The study will be replicated in 2021.

Key Take Home Points from 2020 Data:

- The PRE application of Valor SX provided ~60-75% waterhemp control at the time of POST application (data not shown).
- Cobra treatments had the greatest crop injury 14 days after application (Figure 26).
- Adding Cobra, Flexstar, or Enlist One in the tank with Liberty improved waterhemp control 14 DAT compared to the Liberty only treatment (Figure 27).
- Enlist One and Enlist One + Liberty treatments provided the best end-of-season waterhemp control (Figure 28).
- Flexstar, Resource, Cadet, and Basagran alone did not provide adequate waterhemp control (Figures 27, 28).
- Soybean yield was similar for all treatments containing Liberty (Figure 29).

Plot photos from throughout the growing season are available in the [Liberty Tank Mix Combinations for Waterhemp Control](#) visual report published on wiscweeds.info.

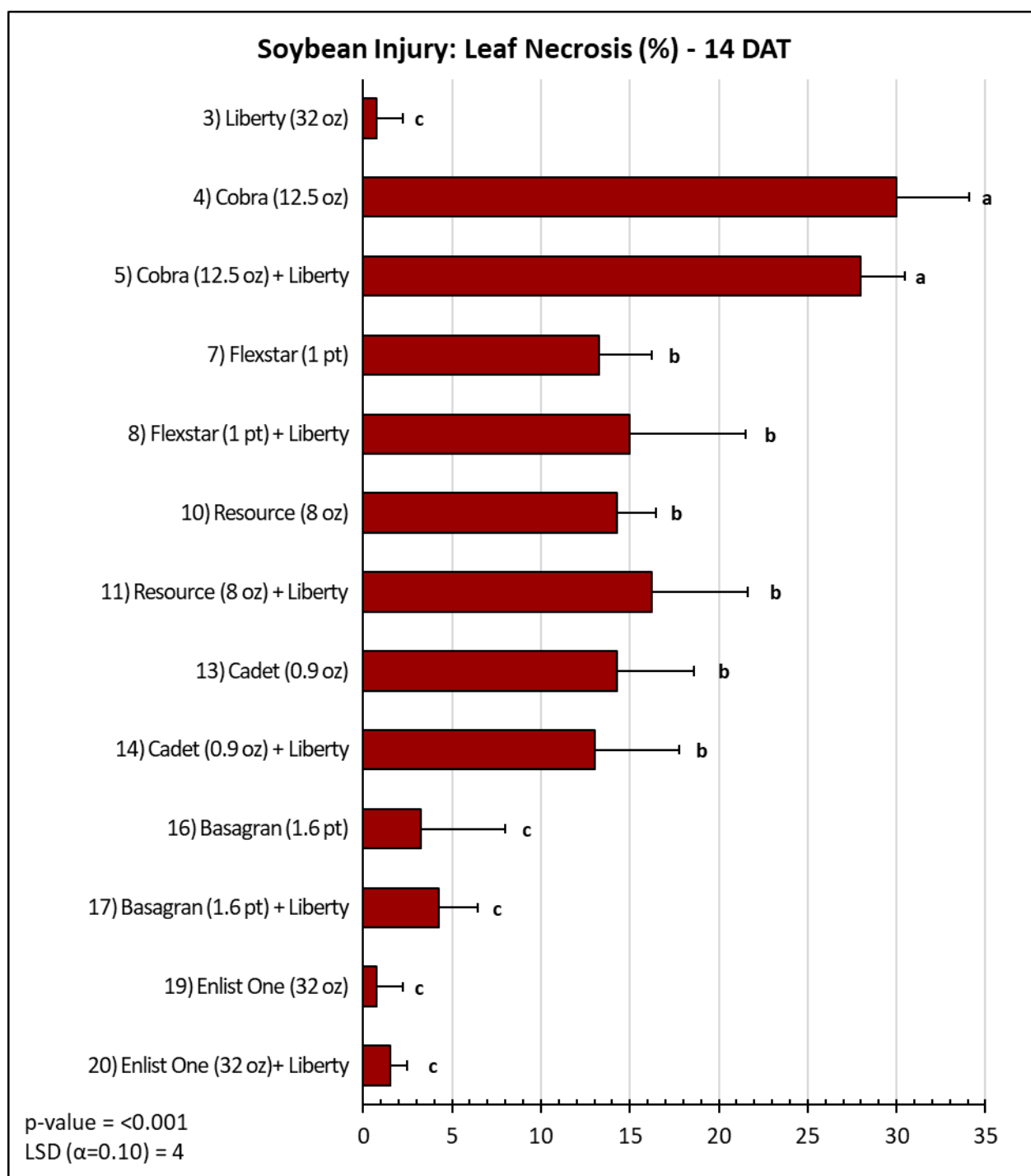


Figure 26: Soybean injury ratings (leaf necrosis %) 14 days after the POST application for trial #20-BRO-SB16. Bars indicate the average % soybean injury \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. Bars with the same letter are not significantly different ($p < 0.001$).

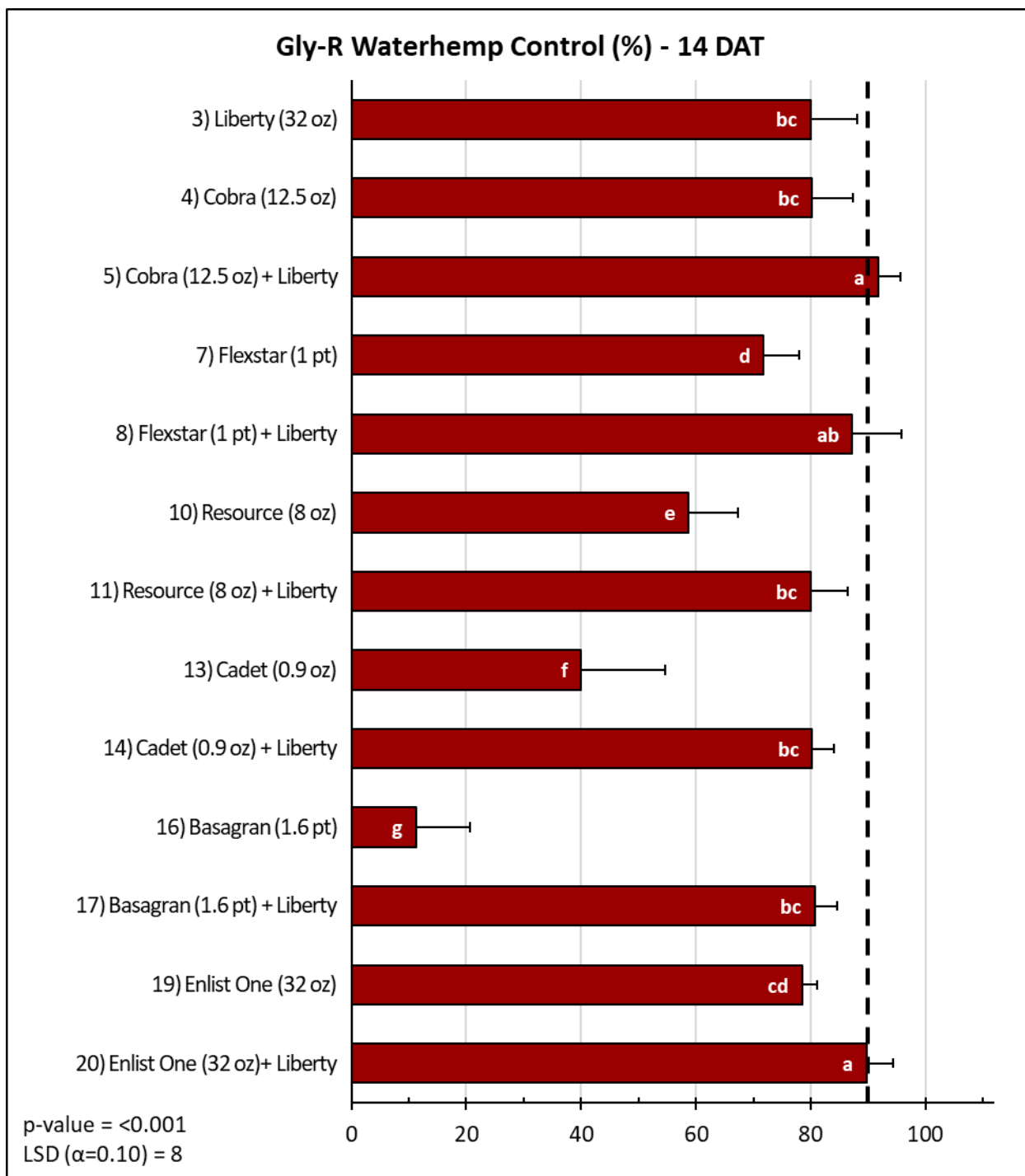


Figure 27: Glyphosate resistant waterhemp efficacy ratings 14 days after POST application for trial #20-BRO-SB16. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control. Bars with the same letter are not significantly different ($p < 0.001$).

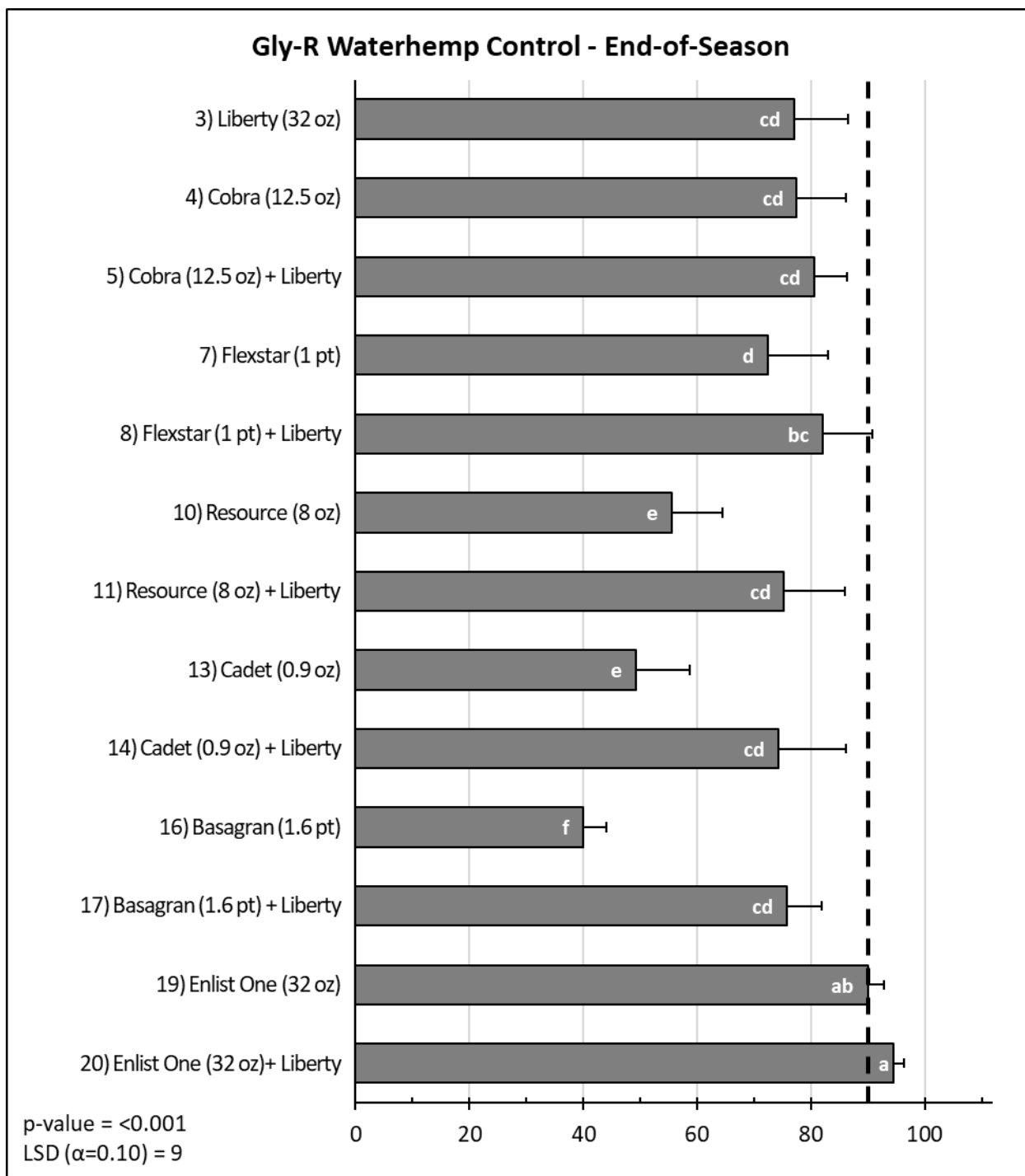


Figure 28: Glyphosate resistant waterhemp efficacy ratings at the end of the season for trial #20-BRO-SB16. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control. Bars with the same letter are not significantly different ($p < 0.001$).

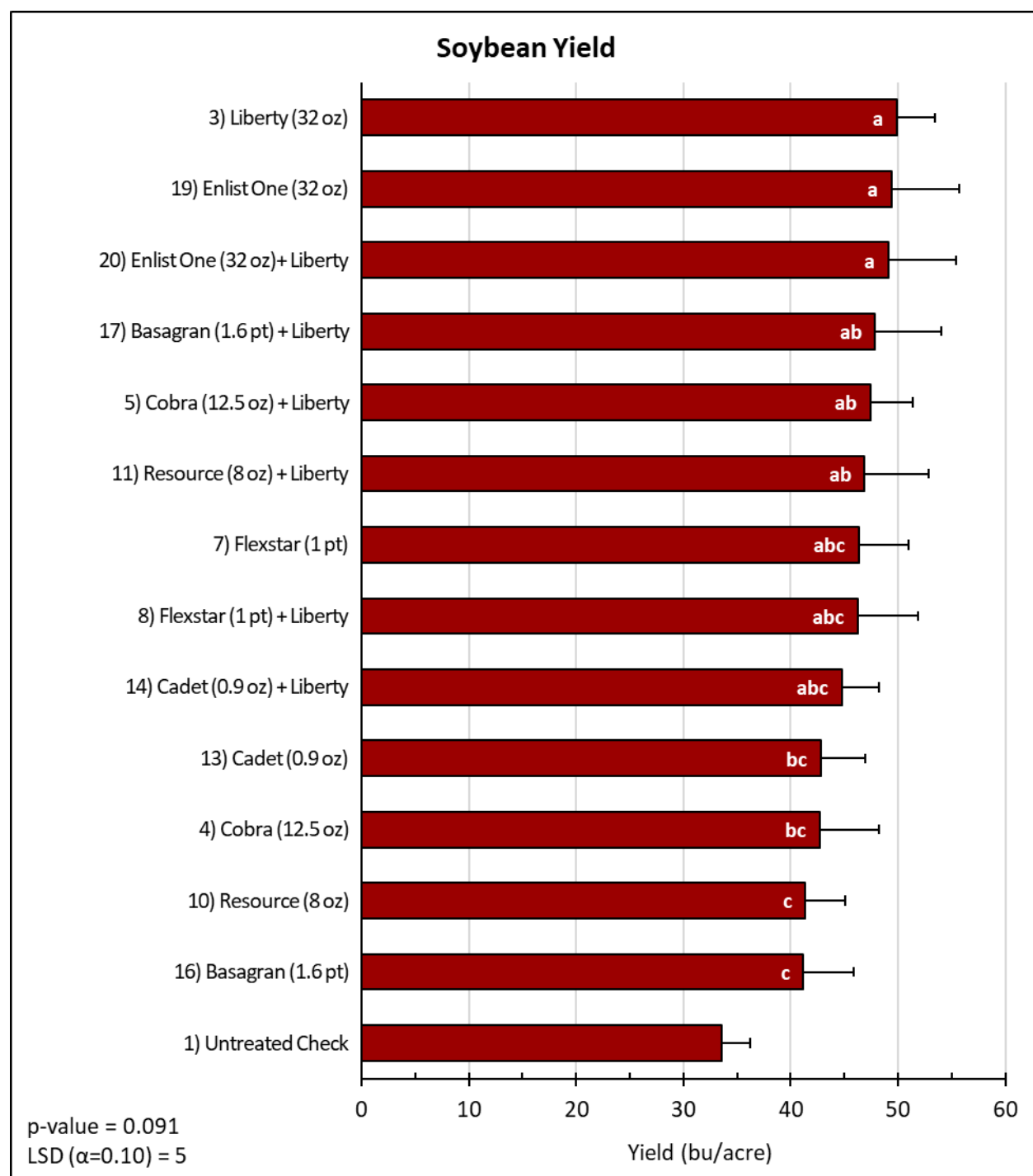


Figure 29. Soybean yield for trial #20-BRO-SB16. Bars indicate the average yield in bushels per acre + the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. Bars with the same letter are not significantly different ($p=0.091$).

Multi-Trial Summary:

The following figures summarize waterhemp control from some of the soybean and bareground herbicide evaluation trials conducted in 2020 at the Obrien Hybrids Farm near Brooklyn, WI. Waterhemp at this location is known to be resistant to glyphosate and ALS herbicides. All trials were conducted on soybeans with either the Enlist E3 or XtendFlex herbicide tolerant traits.

Treatments were grouped by POST herbicide program: XtendiMax (dicamba), Enlist (2,4-D choline), Liberty (glufosinate), and Liberty + Enlist. Some of the POST herbicide programs included glyphosate, as either a tank-mix partner or as part of the same herbicide formulation (i.e. Enlist Duo). Some of the POST treatments also had a group 15 herbicide for further residual control. To see how certain herbicides or herbicide tank mixes performed see individual trial data presented in this report.

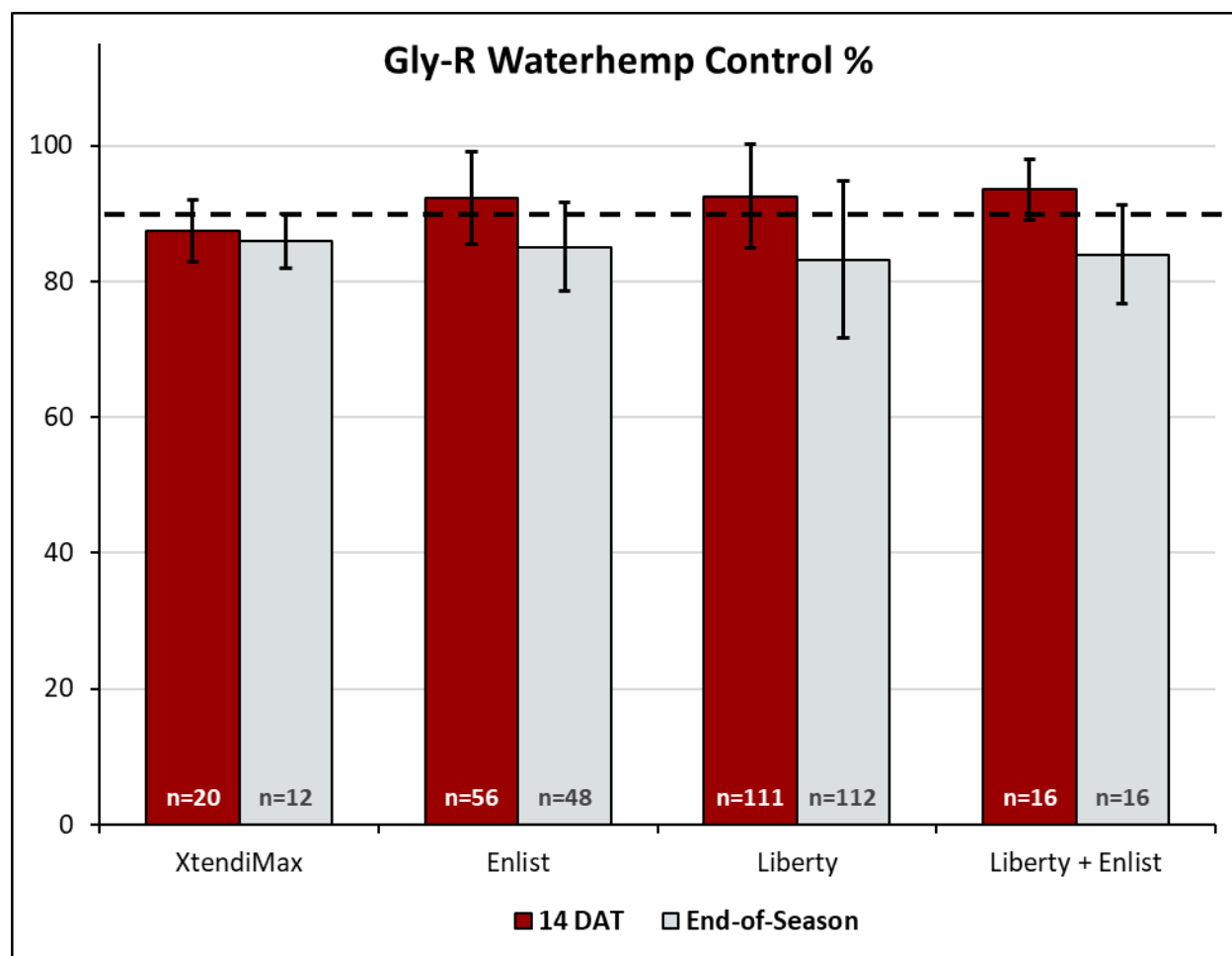


Figure 30. Glyphosate resistant waterhemp control (%) of four soybean POST herbicide systems. Bars indicate the average % control \pm the standard deviation 14 days after POST herbicide application and at the end of the growing season. n-values at the base of each bar represent the number of observations (plots) evaluated in each POST herbicide system. Some of the POST treatments included glyphosate as either a tank-mix partner or as part of the same herbicide formulation (i.e. Enlist Duo).

Multi-Trial Summary: Waterhemp Control in Soybean

Waterhemp control was also broken down by the relative effectiveness of the PRE herbicide used prior the POST herbicide application. PRE herbicide efficacy was evaluated at or near the time of POST application and was categorized as excellent (90-100%), good (80-89%), or fair (60-79%). See Figure 32 for a visual representation of each category. Waterhemp control averaged across all POST herbicide systems is presented in Figure 31. For a breakdown of control within each system see Table 2 (14 DAT) and Table 3 (end-of-season).

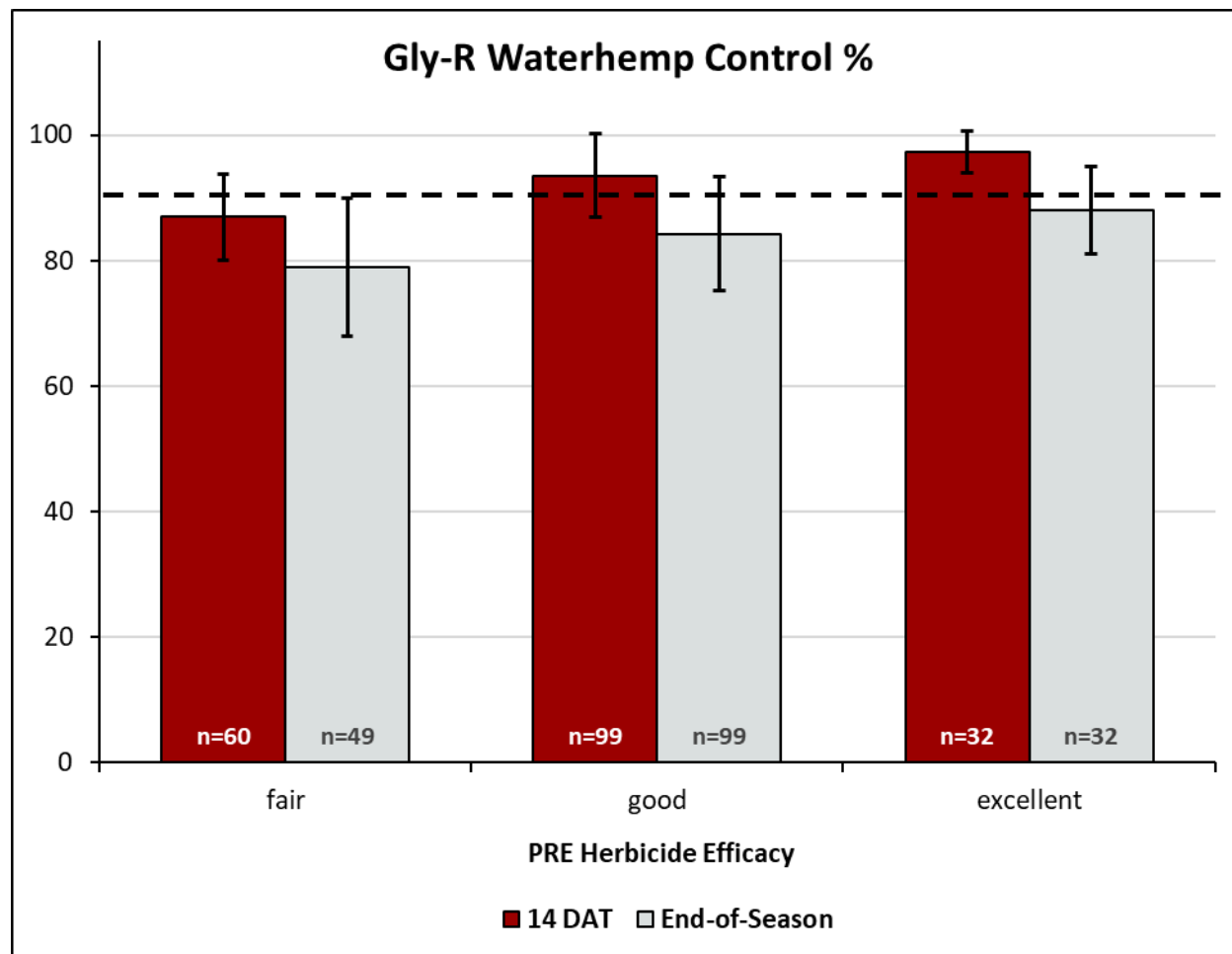


Figure 31. Glyphosate resistant waterhemp control (%) of four soybean POST herbicide systems (XtendiMax, Liberty, Enlist, Liberty plus Enlist). PRE herbicide efficacy was evaluated at or near the time of POST application. Bars indicate the average % control \pm the standard deviation 14 days after POST herbicide application and at the end of the growing season. n-values at the base of each bar represent the number of observations (plots) evaluated in each POST herbicide system.

Table 2. POST-emergence glyphosate resistant waterhemp control (%) 14 days after application of four soybean POST herbicide systems at Brooklyn, WI

PRE-Emergence Herbicide Efficacy ^a								
POST System ^b	Fair (60-79%)		Good (80-89%)		Excellent (90-100%)		Average	
XtendiMax	88	n=8 ^c	87	n=8	-	-	88	n=20
Enlist	85	n=18	95	n=22	99	n=12	92	n=56
Liberty	86	n=23	94	n=64	96	n=20	92	n=111
Liberty <i>plus</i> Enlist	92	n=11	97	n=5	-	-	94	n=16

^a PRE herbicide efficacy was evaluated at or near the time of POST application^b Some of the POST treatments included glyphosate as either a tank-mix partner or as part of the same herbicide formulation (i.e. Enlist Duo)^c n values are the number of observations (plots) evaluated in each POST herbicide system**Table 3.** End-of-season glyphosate resistant waterhemp control (%) of four soybean POST herbicide systems at Brooklyn, WI

POST System ^b	PRE-Emergence Herbicide Efficacy ^a						Average	
	Fair (60-79%)		Good (80-89%)		Excellent (90-100%)			
XtendiMax	86	n=4 ^c	86	n=8	-	-	86	n=12
Enlist	83	n=14	83	n=22	90	n=12	85	n=48
Liberty	71	n=20	85	n=64	87	n=20	83	n=112
Liberty <i>plus</i> Enlist	85	n=11	82	n=5	-	-	84	n=16

^a PRE herbicide efficacy was evaluated at or near the time of POST application^b Some of the POST treatments included glyphosate as either a tank-mix partner or as part of the same herbicide formulation (i.e. Enlist Duo)^c n values are the number of observations (plots) evaluated in each POST herbicide system



Figure 32. Plot photos indicating categories of PRE herbicide waterhemp efficacy.

Project Goal: Evaluate BASF soybean herbicide programs to support recommendations for the 2021 launch of XtendFlex soybeans.

Site Description:

Location:	Janesville, WI	Crop:	XtendFlex soybean
Field #:	0	Variety:	AG23XF0
Soil type:	Plano silt loam	Planting Date:	5/12
% OM:	3.5	Emergence Date:	5/24
pH:	6.4	Population:	140,000 seeds/acre
Fertilization:	80 lbs P/acre 70 lbs K/acre	Depth:	1.5
Previous crop:	Corn	Row spacing:	30 in
Tillage:	Conventional	Plot Size:	10 x 25 ft
Weed species:	giant ragweed (AMBTR), common lambsquarters (CHEAL), velvetleaf (ABUTH), giant foxtail (SETFA), barnyardgrass (ECHCG), fall panicum (PANDI)		

Herbicide Application Information:

Date:	5/12	6/5	6/8	7/2
Treatment:	PRE (A)	EPOST (B)	POST (C)	LPOST (D)
Air Temp (°F):	61	78	89	88
2" Soil Temp (°F):	61	80	80	86
Soil moisture [surface]:	moist	dry	dry	moist
RH %:	12	52	42	42
Cloud cover %	0	90	5	5
Wind speed (mph)/direction	0-2/NNW	3-7/SSE	2-7/NNW	0-4/E
Rainfall (in) 1 wk after APP:	2.27	0.97	0.97	3.31
GPA:	15	15	15	15
PSI:	36	36	36	35
Nozzle:	TTI 110015	TTI 110015	TT*/TTI**	TT
Nozzle spacing (in):	20	20	20	20
Boom Height (in):	20	23	24	32

*Used TT 110015 nozzles for all treatments without dicamba.

**Used TTI 110015 nozzles for all treatments with dicamba.

Crop and Weed Information at Application:

	Date:	5/12	6/5	6/8*	7/2
Soybean	Height:	-	3"	3-4"	12-14"
	Stage:	-	VC/V1	V1	V6
giant ragweed	Height:	-	1-3"	1-5"	
	Density:	-	4-7/ft ²	2-8/ft ²	
lambsquarters	Height:	-	0.5-1.5	-	
	Density:	-	4-9/ft ²	-	
velvetleaf	Height:	-	1-2"	0.5-1"	
	Density:	-	0-2/ft ²	0-2/ft ²	
annual grasses	Height:	-	0.5-1"	-	
	Density:	-	0-1/ft ²	-	

*All weed densities and heights were recorded from plots with a PRE herbicide.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Engenia PRO*	4.5 lb/gal	4, 15	16 fl oz/a	POST	C
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	C
3	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	C
	Outlook	6 lb/gal	15	16 fl oz/a	POST	C
	AMS			3 lb/a	POST	C
4	Engenia Prime**	5.2 lb/gal	2, 4, 15	16 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	C
	Outlook	6 lb/gal	15	16 fl oz/a	POST	C
	AMS			3 lb/a	POST	C
5	Engenia PRO*	4.5 lb/gal	4, 15	16 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	C
	Outlook	6 lb/gal	15	16 fl oz/a	POST	C
	AMS			3 lb/a	POST	C
6	Engenia Prime**	5.2 lb/gal	2, 4, 15	16 fl oz/a	EPOST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	LPOST	D
7	Engenia PRO*	4.5 lb/gal	4, 15	16 fl oz/a	EPOST	B
	Liberty	2.34 lb/gal	10	32 fl oz/a	LPOST	D
	Outlook	6 lb/gal	15	16 fl oz/a	LPOST	D
	AMS			3 lb/a	LPOST	D
8	XtendiMax	2.89 lbae/gal	4	44 fl oz/a***	PRE	A
	Warrant	3 lb/gal	15	48 fl oz/a	PRE	A
	Warrant Ultra	3.45 lb/gal	14, 15	55 fl oz/a	POST	C
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	C
9	Sonic	70% w/w	2, 14	5 oz/a	PRE	A
	FeXapan	2.89 lbae/gal	4	22 fl oz/a	POST	C
	EverpreX	7.62 lb/gal	15	16 fl oz/a	POST	C
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	C
10	Fierce XLT	62.4% w/w	2, 14, 15	4.25 oz/a	PRE	A
	XtendiMax	2.89 lbae/gal	4	22 fl oz/a	POST	C
	Warrant	3 lb/gal	15	48 fl oz/a	POST	C
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	C

Adjuncts: AMS = BlueAg spray grade ammonium sulfate. **Engenia, XtendiMax, and FeXapan will require the use of an approved volatility reducing agent in 2021.**

***Engenia PRO** is a premix formulation of dicamba and pyroxasulfone. Registration is pending EPA approval.

****Engenia Prime** is a premix formulation of dicamba, imazethapyr, and pyroxasulfone. Registration is pending EPA approval.

*******44 fl oz rate of XtendiMax will not be permitted under new registration

Trial Summary:

This trial evaluated multiple 2-pass herbicide programs to provide recommendations for the 2021 launch of XtendFlex soybeans. Giant ragweed was the predominant species and in plots with heavy densities it largely outcompeted other species. Giant ragweed at this research location is a biotype with a prolonged emergence pattern as emergence typically starts in mid- to late-April and continues well into June.

There was no observable soybean injury from the PRE herbicides (data not shown). There was >5% soybean injury 14 days after the POST (C) application for some treatments (Figure 33). Injury symptoms mostly consisted of minor leaf burn/necrosis and some leaf “drawstringing” injury typical of group 15 herbicides. There was also 5% leaf necrosis 7 days after the LPOST (D) application of Liberty + Outlook (trt 7) (data not shown).

Adding a group 2 herbicide to the the PRE tank mixture improved residual velvetleaf control (Figure 34). PRE herbicide treatments with an ALS (group 2) active ingredient (Zidua PRO, Engenia Prime, Sonic, Fierce XLT) averaged 96% velvetleaf control 27 days after application. PRE treatments without group 2 herbicides averaged 38%. All herbicide programs had >90% velvetleaf control at the 7/22 rating. Late season grass control was excellent (>95%) for all treatments (data not shown).

None of the PRE herbicides provided excellent giant ragweed control (Figure 35). Fierce XLT had the best control at 80%. POST treatments with dicamba had higher levels of control than glufosinate based treatments. Within PRE fb POST systems, end-of-season control was greater in the dicamba based treatments (78%) than the Liberty treatments (33%). The 2-pass POST herbicide programs (trts 6, 7) had excellent (100%) end-of-season giant ragweed control.

Soybean yield was impacted by herbicide program (Figure 36). The 2-pass POST systems (trts 6,7) had the highest numerical yield of 70 bu/acre. Dicamba based POST treatments were statistically similar with yields that averaged 61 bu/acre. Glufosinate based POST treatments yields were significantly lower and averaged 38 bu/acre. The untreated check only yielded 9 bu/acre an indication of the very heavy giant ragweed pressure in the trial.

Plot photos from throughout the growing season are available in the [Liberty and Engenia in XtendFlex Soybean](#) visual report published on [wiscweeds.info](#).

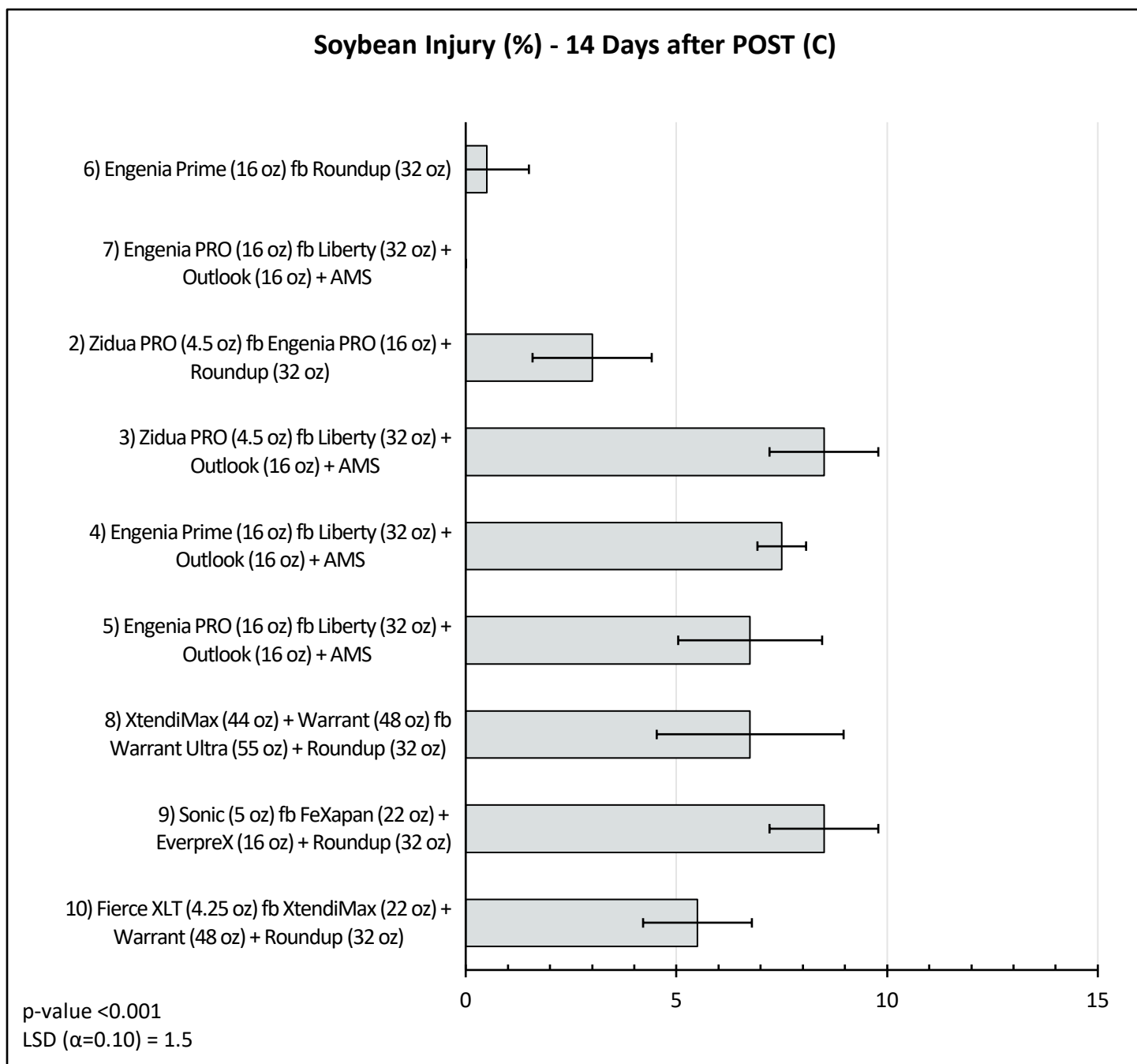


Figure 33: Soybean injury ratings 14 days after the POST (C) application for trial #20-R0K-SB07. Bars indicate the average % soybean injury \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table

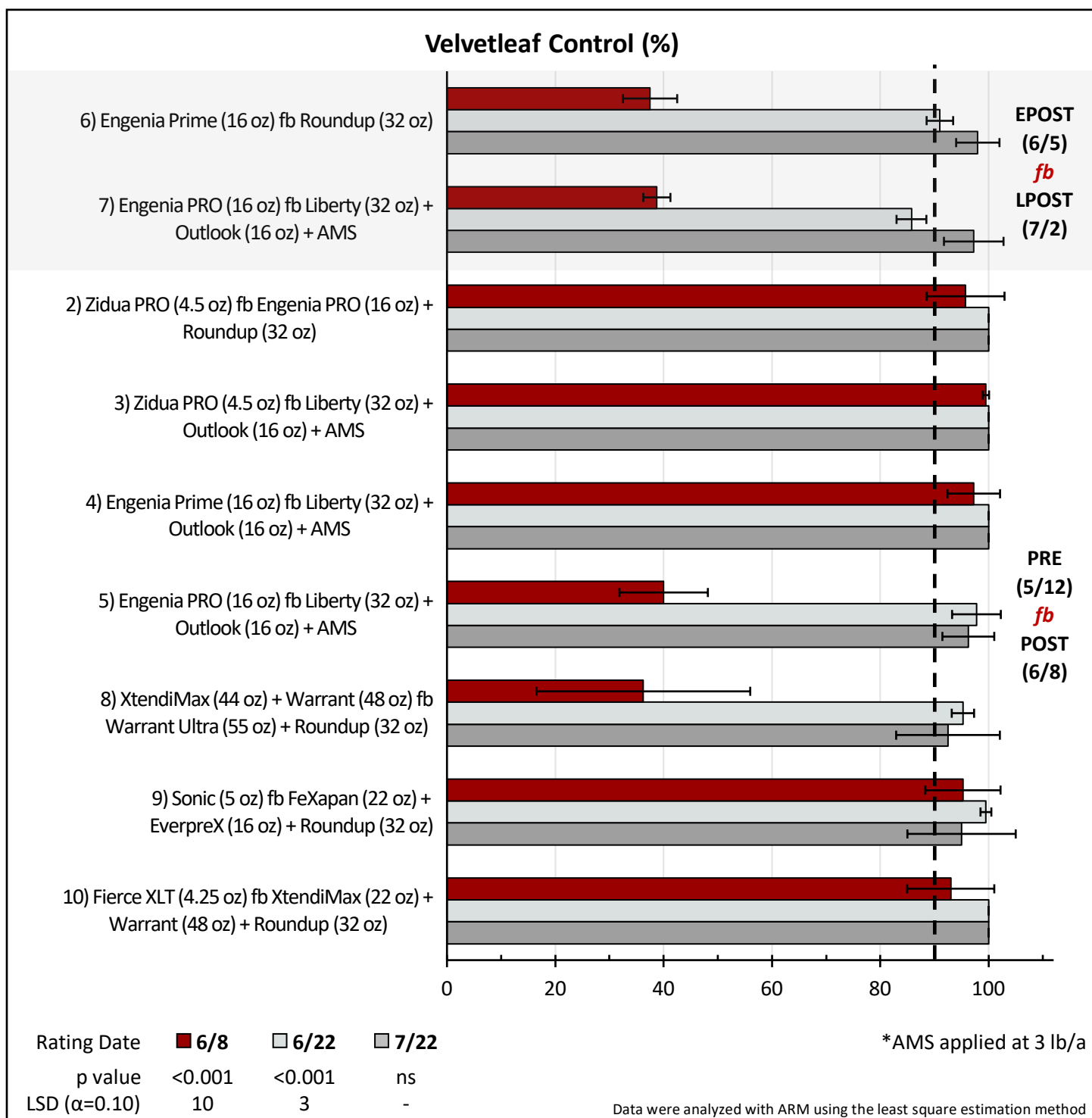


Figure 34: Velvetleaf efficacy ratings for trial #20-ROK-SB07. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

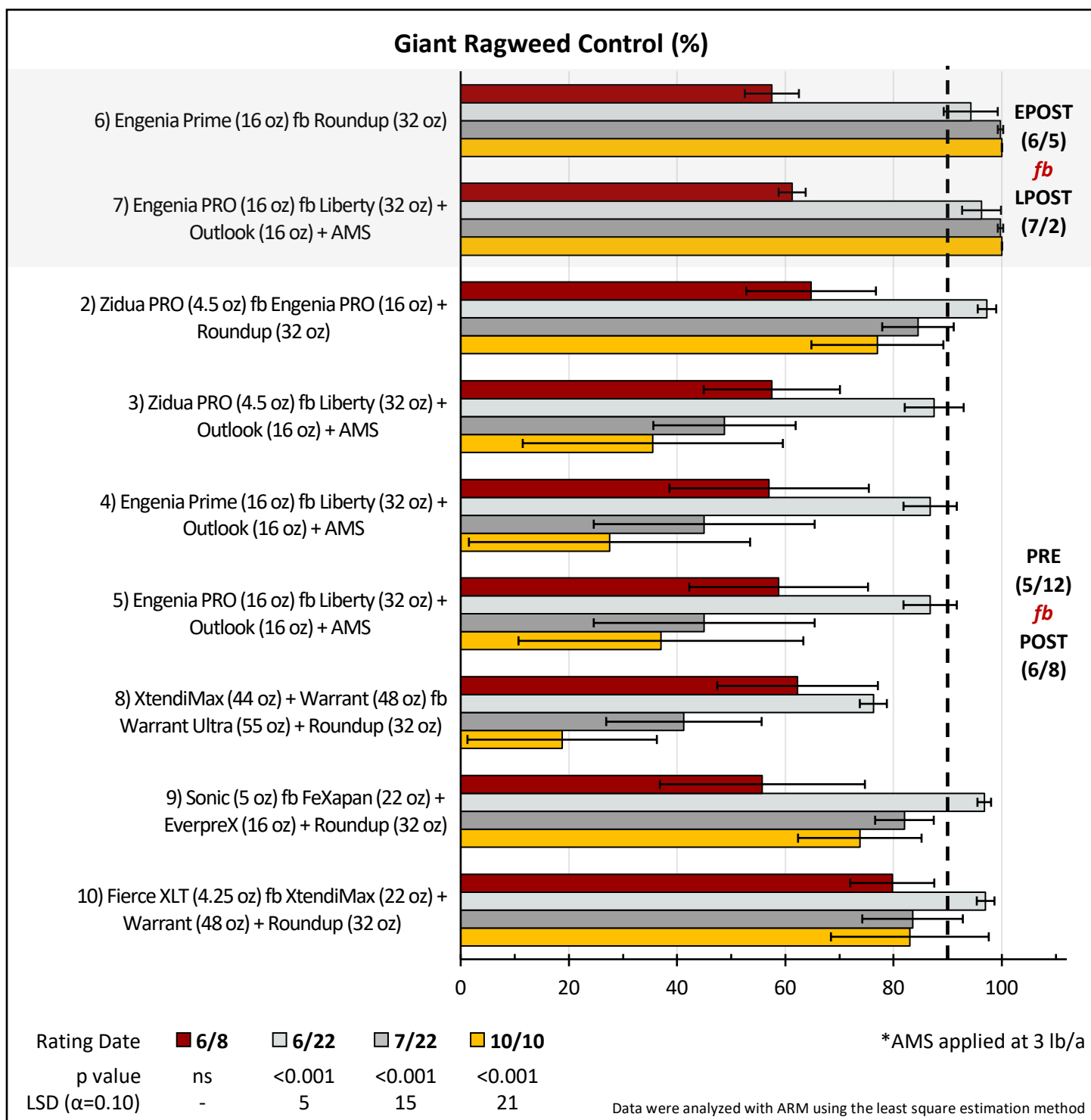


Figure 35: Giant ragweed efficacy ratings for trial #20-R0K-SB07. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

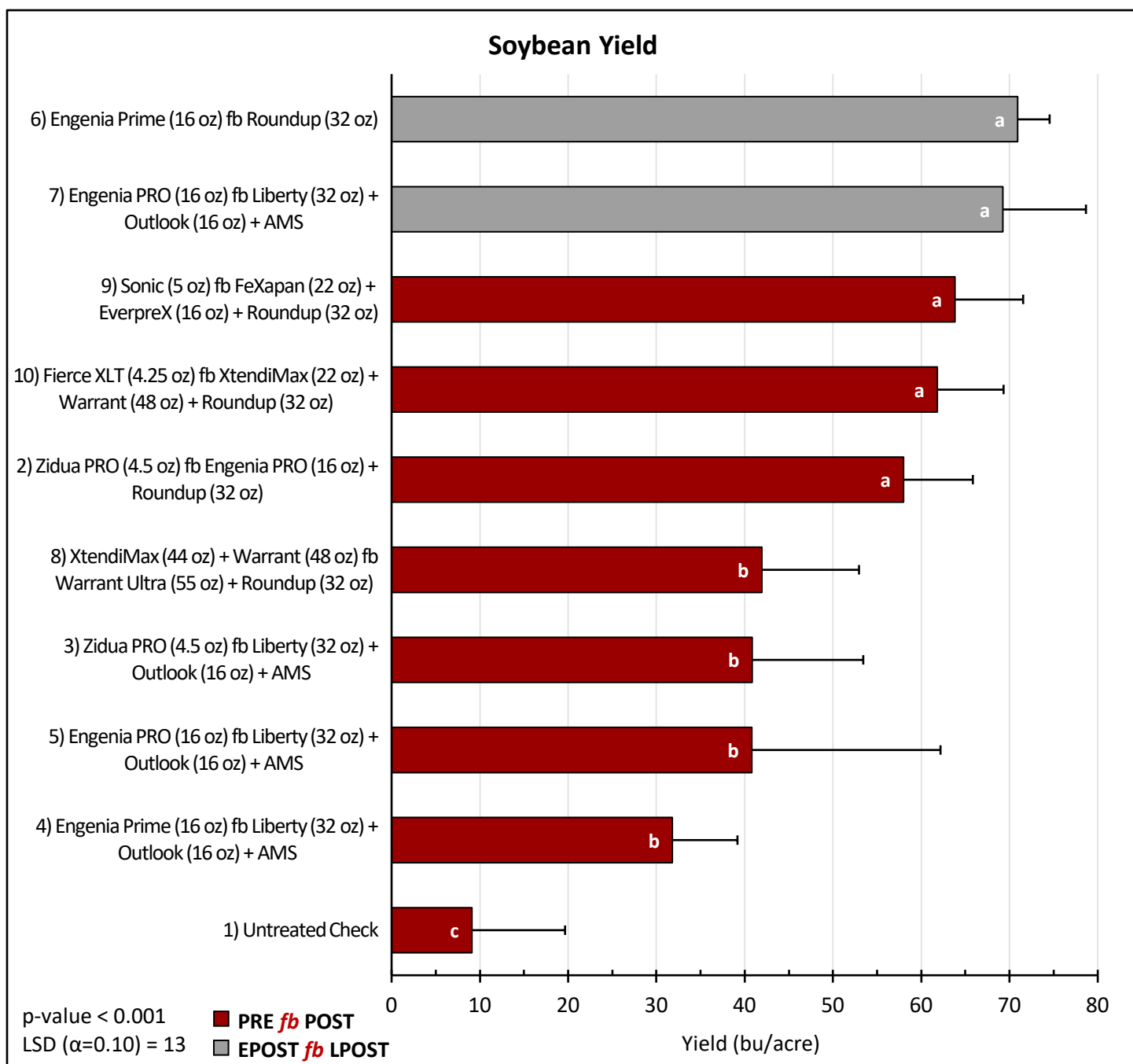


Figure 36. Soybean yield for trial #20-ROK-SB07. Bars indicate the average yield in bushels per acre + the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. Bars with the same letter are not significantly different ($p < 0.001$).

Project Goal: Demonstrate the added residual control Alite 27 provides in the LibertyLink GT27 soybean system.

Site Description:

Location:	Janesville, WI	Crop:	LLGT27 Soybean
Field #:	5	Variety:	Credenz
Soil type:	Plano silt loam	Planting Date:	5/12
% OM:	3.2	Emergence Date:	5/24
pH:	6.5	Population:	140,000 seeds/acre
Fertilization:	80 lbs P/acre 70 lbs K/acre	Depth:	1.5
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), barnyardgrass (ECHCG), fall panicum (PANDI)		

Herbicide Application Information:

Date:	5/12	6/5
Treatment:	PRE (A)	EPOST (B)
Air Temp (°F):	61	78
2" Soil Temp (°F):	61	80
Soil moisture [surface]:	moist	dry
RH %:	12	52
Cloud cover %	0	90
Wind speed (mph)/direction	0-2/NNW	1-3/SSE
Rainfall (in) 1 wk after APP:	2.27	0.97
GPA:	15	15
PSI:	36	36
Nozzle:	TTI 110015	TT 110015
Nozzle spacing (in):	20	20
Boom Height (in):	20	24

Crop and Weed Information at Application:

	Date:	5/12*	6/5**
Soybean	Height:	-	3"
	Stage:	-	VC/V1
giant ragweed	Height:	-	1-4"
	Density:	12-41/m ²	1-8/ft ²
lambsquarters	Height:	-	-
	Density:	5-15/ft ²	-
pigweed	Height:	-	-
	Density:	1-35/m ²	-
annual grasses	Height:	-	-
	Density:	3-25/m ²	-

*Density of weed species in checks on 6/5.

**All weed densities and heights were recorded from plots with a PRE herbicide.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Zidua SC	4.17 lb/gal	15	4 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
3	Zidua SC	4.17 lb/gal	15	4 fl oz/a	PRE	A
	Alite 27*	4 lb/gal	27	3 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
4	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
5	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Alite 27*	4 lb/gal	27	3 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
6	Zidua PRO	4.09 lb/gal	2, 14, 15	4.5 fl oz/a	PRE	A
	Alite 27*	4 lb/gal	27	3 fl oz/a	PRE	A
7	Matador	4.7 lb/gal	2, 5, 15	43 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B
8	Matador	4.7 lb/gal	2, 5, 15	43 fl oz/a	PRE	A
	Alite 27*	4 lb/gal	27	3 fl oz/a	PRE	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	B
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	B
	AMS			3 lb/a	POST	B

Adjuvants: AMS = BlueAg spray grade ammonium sulfate.

* **Alite 27** is a 4 lb/gal formulation of isoxaflutole for use on GT27 or isoxaflutole resistant soybean. Not currently registered for use in the state of Wisconsin.

Trial Summary:

The purpose of this trial was to demonstrate the added residual control Alite 27 provides in the LibertyLink GT27 soybean system. Alite 27 is a 4 lb/gal formulation of isoxaflutole for use on GT27 or isoxaflutole resistant soybean. Alite 27 is not currently registered for use in the state of Wisconsin. Giant ragweed was the predominant species and at this research location is a biotype with a prolonged emergence pattern as emergence typically starts in mid- to late-April and continues well into June.

There was no observable soybean injury from the PRE herbicides (data not shown).

All PRE herbicides provided excellent control of common lambsquarters, pigweed, and annual grass species (data not shown).

The addition of Alite 27 greatly improved the residual control of giant ragweed in all 3 tank mixes (Figure 37). Treatments with Alite 27 averaged 94% control 24 days after application, while treatments without averaged 63%. The POST application of Liberty + Roundup was effective at controlling emerged giant ragweed; however, several ragweed emerged after the POST application. The POST application could have been delayed to control some of the late emerging ragweed seedlings, especially in treatments with Alite 27.

Plot photos from throughout the growing season are available in the [Expanding Residual Control with Alite 27](#) visual report published on wiscweeds.info.

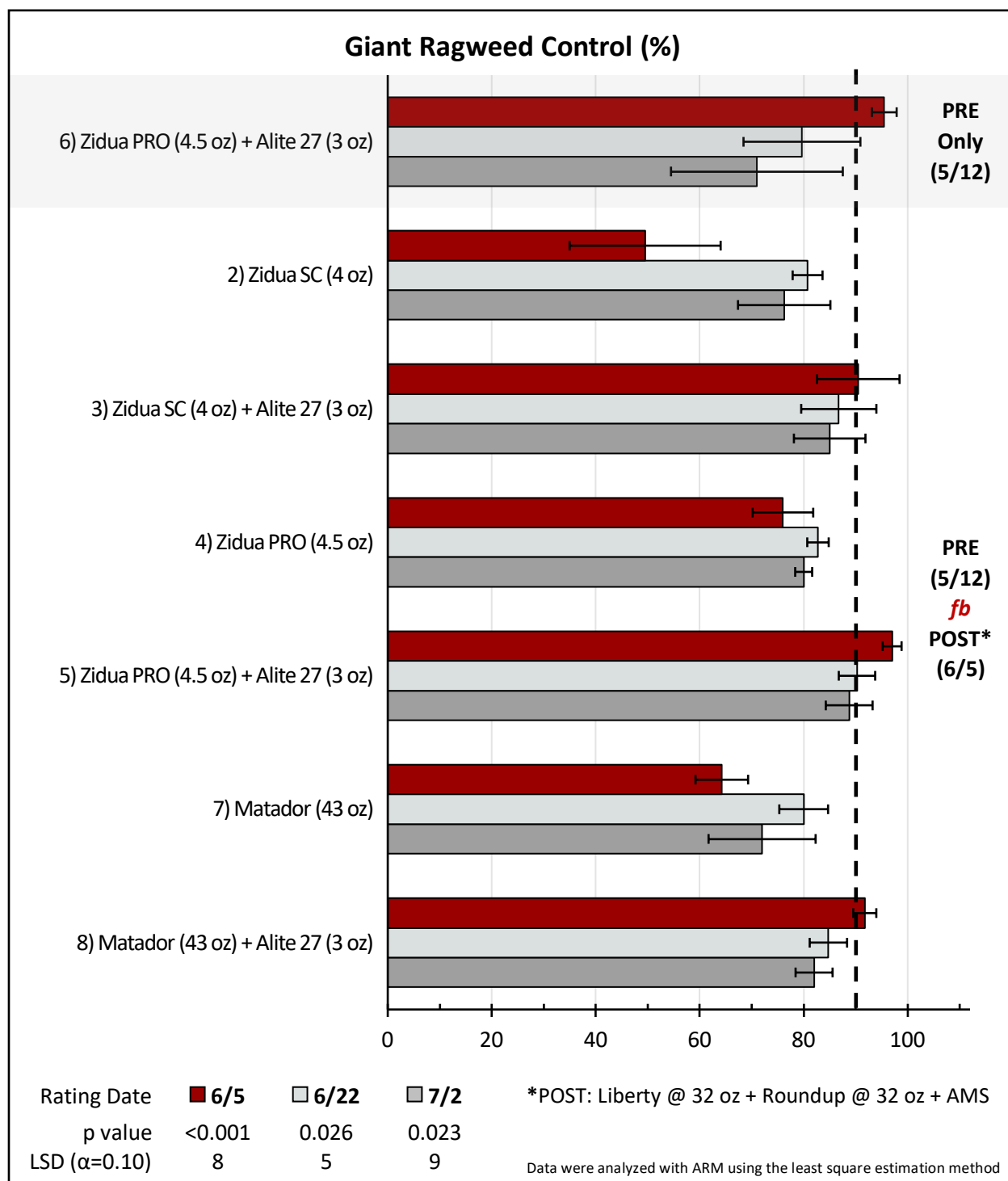


Figure 37: Giant ragweed efficacy ratings for trial #20-ROK-SB08. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

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

Site Description:

Location:	Janesville, WI	Crop:	RR2X Soybean
Field #:	5	Variety:	AG21X7
Soil type:	Plano silt loam	Planting Date:	5/12
% OM:	3.2	Emergence Date:	5/24
pH:	6.5	Population:	140,000 seeds/acre
Fertilization:	80 lbs P/acre 70 lbs K/acre	Depth:	1.5
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), barnyardgrass (ECHCG), fall panicum (PANDI)		

Herbicide Application Information:

Date:	5/12
Treatment:	PRE (A)
Air Temp (°F):	58
2" Soil Temp (°F):	60
Soil moisture [surface]:	moist
RH %:	30
Cloud cover %	5
Wind speed (mph)/direction	2-7/NNW
Rainfall (in) 1 wk after APP:	2.27
GPA:	15
PSI:	36
Nozzle:	TTI 110015
Nozzle spacing (in):	20
Boom Height (in):	20

Weed Density

Date:	6/3*	
giant ragweed	4-56/m ²	
common lambsquarters	5-15/ft ²	-
pigweed	2-13/m ²	-
annual grasses	1-50/ft ²	-

*Density of weed species in checks on 6/3.

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	48 fl oz/a
10	Dual II Magnum	S-metolachlor	7.64 lb/gal	15	26.7 fl oz/a
11	Outlook	dimethenamid-P	6 lb/gal	15	18 fl oz/a
12	Zidua	pyroxasulfone	85% w/w	15	3 oz/a
13	Authority Assist	imazethapyr + sulfentrazone	4 lb/gal	2, 14	10 fl oz/a
14	Sonic	cloransulam + sulfentrazone	70% w/w	2, 14	6.45 oz/a
15	Surveil	cloransulam + flumioxazin	48% w/w	2, 14	3.5 oz/a
16	Valor XLT	chlorimuron + flumioxazin	40.3% w/w	2, 14	3 oz/a
17	Broadaxe XC	sulfentrazone + S-metolachlor	7 lb/gal	14, 15	25 fl oz/a
18	Authority MTZ	metribuzin + sulfentrazone	45% w/w	5, 14	16 oz/a
19	Authority Supreme	sulfentrazone+ pyroxasulfone	4.16 lb/gal	14, 15	8 fl oz/a
20	Verdict	saflufenacil + dimethenamid	5.57 lb/gal	14, 15	5 fl oz/a
21	Prefix	fomesafen + S-metolachlor	5.29 lb/gal	14, 15	2 pt/a
22	Fierce	flumioxazin + pyroxasulfone	76% w/w	14, 15	3 oz/a
23	Boundary	metribuzin + S-metolachlor	6.5 lb/gal	5, 15	1.8 pt/a
24	Canopy DF	chlorimuron + metribuzin	75% w/w	2, 5	2.25 oz/a
25	Enlite	chlorimuron + thifensulfuron + flumioxazin	47.9% w/w	2, 14	2.8 oz/a
26	Afforia	thifensulfuron + tribenuron + flumioxazin	50.8% w/w	2, 14	2.5 oz/a
27	Trivence	chlorimuron + metribuzin + flumioxazin	61.3% w/w	2, 5, 14	6 oz/a
28	Zidua PRO	imazethapyr + saflufenacil + pyroxasulfone	4.09 lb/gal	2, 14, 15	6 fl oz/a
29	Fierce XLT	chlorimuron + flumioxazin + pyroxasulfone	62.4% w/w	2, 14, 15	3.75 oz/a
30	Fierce MTZ	flumioxazin + pyroxasulfone + metribuzin	2.64 lb/gal	14, 15 5	1 pt/a

Trial Summary:

The purpose of this study was to evaluate and demonstrate the giant ragweed residual control of multiple PRE-emergence soybean herbicides. Giant ragweed was the predominant species and at this research location and the population consists of a biotype with a prolonged emergence pattern as emergence typically starts in mid- to late-April and continues well into June. 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 the soil types at this location, thus, valuable information for decision-makers.

Key Take Home Points from 2020 Data:

- Several PRE-emergence soybean herbicides evaluated provided good levels of giant ragweed 22 days after application (Figure 38).
- Giant ragweed control was poor for all herbicides at 43 days after application (Figure 39).
 - Demonstrates that a 1-pass herbicide program is not recommended for giant ragweed control
- Treatments containing group 2 (ALS) active ingredients were more effective, particularly cloransulam (FirstRate) and chlorimuron (Classic).
 - 8 of the top 10 herbicides at 22 DAT contained a group 2 herbicide active ingredient
- Herbicides with 2 or more active ingredients/sites of action generally improved residual control of giant ragweed.
 - Group 2 (ALS) and 14 (PPO) was the most effective combination

Plot photos from throughout the growing season are available in the [Evaluation of Soybean Soil Residual Herbicides for Giant Ragweed Control](#) visual report published on wiscweeds.info.

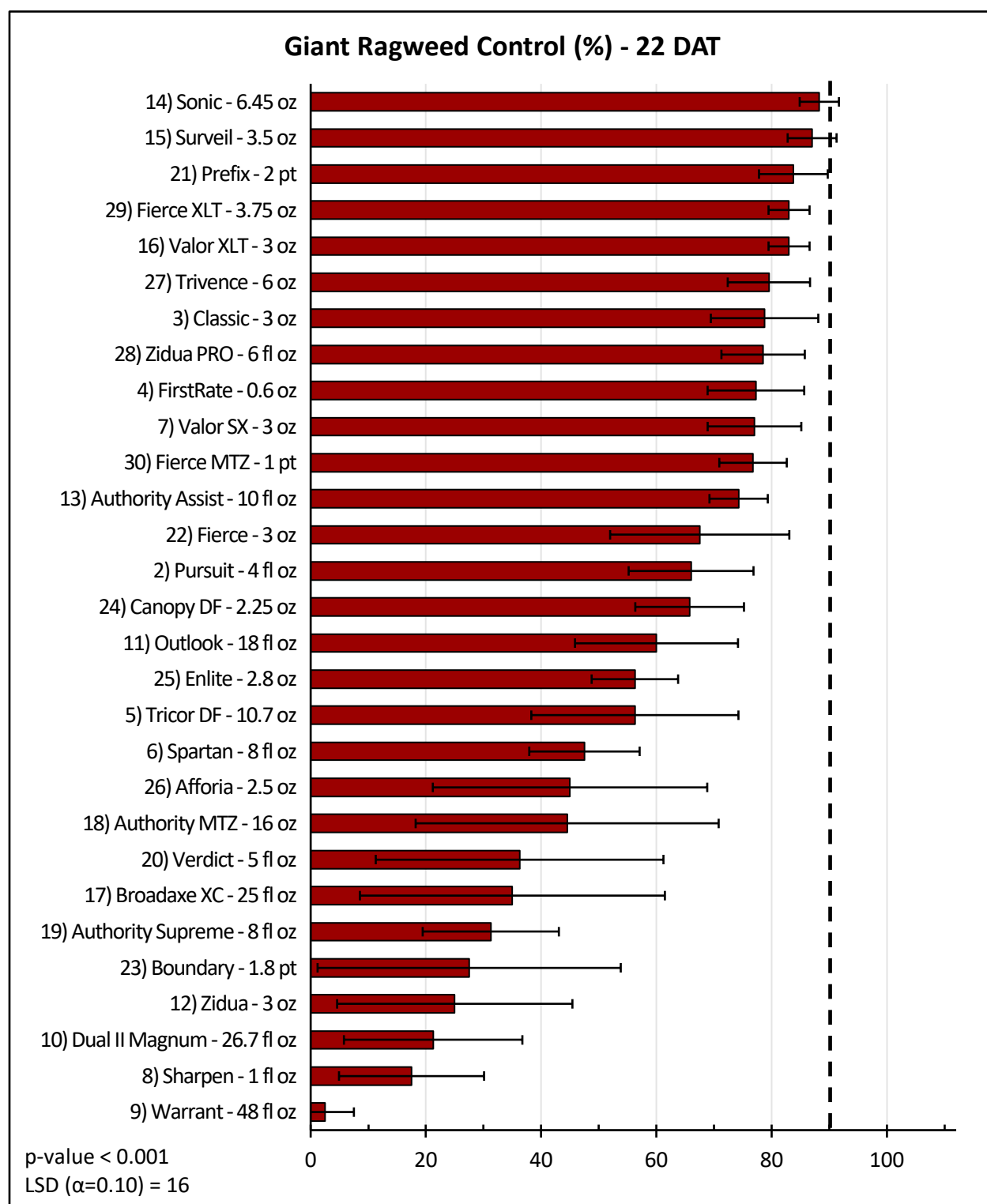


Figure 38: Giant ragweed residual control 22 days after application for trial #20-ROK-SB15. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on herbicides used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

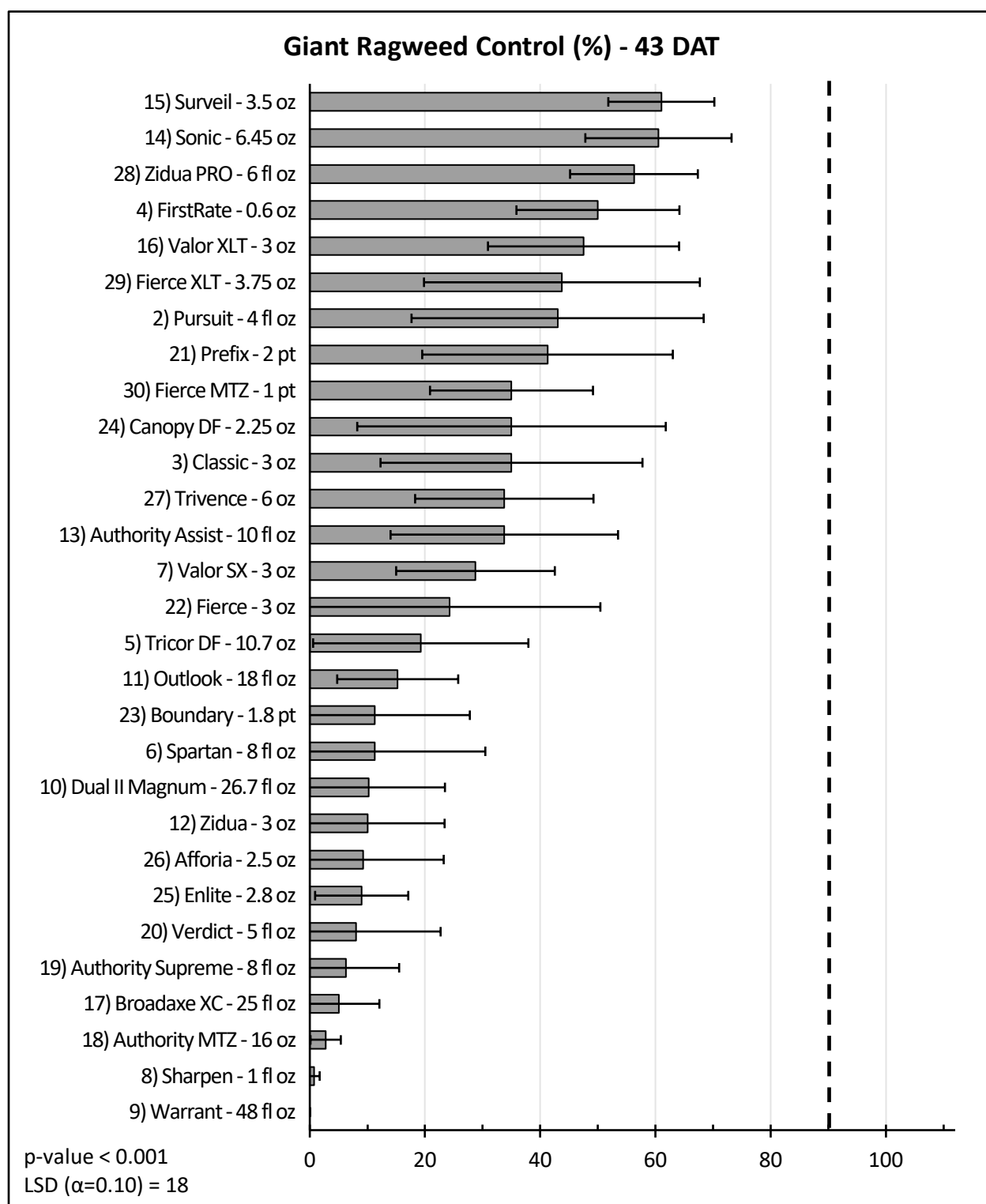


Figure 39: Giant ragweed residual control 43 days after application for trial #20-ROK-SB15. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on herbicides used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Evaluate various burndown herbicide programs for control of large (8-12") marestalk.

Site Description:

Location:	Arlington, WI	Crop:	none
Field #:	452	Variety:	-
Soil type:	Plano silt loam	Planting Date:	-
% OM:	3.3	Emergence Date:	-
pH:	7	Population:	-
Previous crop:	fallow	Row spacing:	-
Tillage:	no-till	Plot Size:	10 x 25 ft
Weed species:	marestalk (ERICA)		

Herbicide Application Information:

Date:	6/9
Treatment:	Burndown
Air Temp (°F):	80
2" Soil Temp (°F):	72
Soil moisture [surface]:	dry
RH %:	56
Cloud cover %	45
Wind speed (mph)/direction	3-5/WSW
Rainfall (in) 1 wk after APP:	1.23
GPA:	15
PSI:	34
Nozzle:	TTI 110015
Nozzle spacing (in):	20
Boom Height (in):	32

Crop and Weed Information at Application:

	Date:	6/9
marestalk	Height:	6-16"
	Density:	8-31/ft ²

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	MON 301286*	4 lbae/gal	4, 9	48 fl oz/a	burndown	A
	VaporGrip Xtra			1% v/v	burndown	A
	Intact			0.5% v/v	burndown	A
	Class Act Ridion			1% v/v	burndown	A
3	MON 301286*	4 lbae/gal	4, 9	48 fl oz/a	burndown	A
	VaporGrip Xtra			1% v/v	burndown	A
	Class Act Ridion			1% v/v	burndown	A
4	MON 301286*	4 lb/gal	4, 9	48 fl oz/a	burndown	A
	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	burndown	A
	VaporGrip Xtra			1% v/v	burndown	A
	Intact			0.5% v/v	burndown	A
	Class Act Ridion			1% v/v	burndown	A
5	XtendiMax	2.9 lbae/gal	4	22 fl oz/a	burndown	A
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	burndown	A
	VaporGrip Xtra			1% v/v	burndown	A
	Intact			0.5% v/v	burndown	A
	Class Act Ridion			1% v/v	burndown	A
6	XtendiMax	2.9 lbae/gal	4	44 fl oz/a**	burndown	A
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	burndown	A
	VaporGrip Xtra			1% v/v	burndown	A
	Intact			0.5% v/v	burndown	A
	Class Act Ridion			1% v/v	burndown	A
7	Enlist One	3.8 lbae/gal	4	24 fl oz/a	burndown	A
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	burndown	A
	AMS			2.5% v/v	burndown	A
8	Enlist One	3.8 lbae/gal	4	32 fl oz/a	burndown	A
	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	burndown	A
	AMS			2.5% v/v	burndown	A
9	Enlist One	3.8 lbae/gal	4	32 fl oz/a	burndown	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	burndown	A
	AMS			2.5% v/v	burndown	A
10	Sharpen	2.85 lb/gal	27	1 fl oz/a	burndown	A
	Weedar 64	3.8 lbae/gal	4	32 fl oz/a	burndown	A
	XtendiMax	2.9 lbae/gal	4	11 fl oz/a	burndown	A
	Roundup PowerMax	4.5 lbae/gal	9	32 fl oz/a	burndown	A
	Class Act Ridion				burndown	A

Adjuvants: AMS = Amsol (liquid AMS); Intact = DRA; Class Act Ridion = non-AMS water conditioner. VaporGrip Xtra = volatility reducing agent (VRA)

XtendiMax will require the use of an approved volatility reducing agent in 2021.

*MON 301286 is an experimental premix of dicamba + glyphosate with VaporGrip technology.

**44 fl oz rate of XtendiMax will not be permitted under new registration

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
11	XtendiMax	2.9 lb/ae/gal	4	22 fl oz/a	burndown	A
	Liberty	2.34 lb/gal	10	32 fl oz/a	burndown	A
	VaporGrip Xtra			1% v/v	burndown	A
	Intact			0.5% v/v	burndown	A
	Class Act Ridion			1% v/v	burndown	A
12	Gramoxone	2 lb/gal	22	48 fl oz/a	burndown	A
	Mauler	4 lb/gal	5	8 fl oz/a	burndown	A

Adjuvants: AMS = Amsol (liquid AMS); Intact = DRA; Class Act Ridion = non-AMS water conditioner. VaporGrip Xtra = volatility reducing agent (VRA)

XtendiMax will require the use of an approved volatility reducing agent in 2021.

*MON 301286 is an experimental premix of dicamba + glyphosate with VaporGrip technology.

**44 fl oz rate of XtendiMax will not be permitted under new registration

Trial Summary:

This trial evaluated various burndown herbicide programs with dicamba and 2,4-D for control of large (8-12") marestalk. Large marestalk was targeted to try and separate treatments. Better control of some programs would be expected when spraying smaller <4" marestalk.

Treatments with dicamba generally had better marestalk control than 2,4-D treatments 27 days after application (Figure 40). Adding Liberty to either Enlist One or XtendiMax decreased marestalk control 27 DAT when compared to Roundup PowerMax tankmixes with Enlist One and XtendiMax.

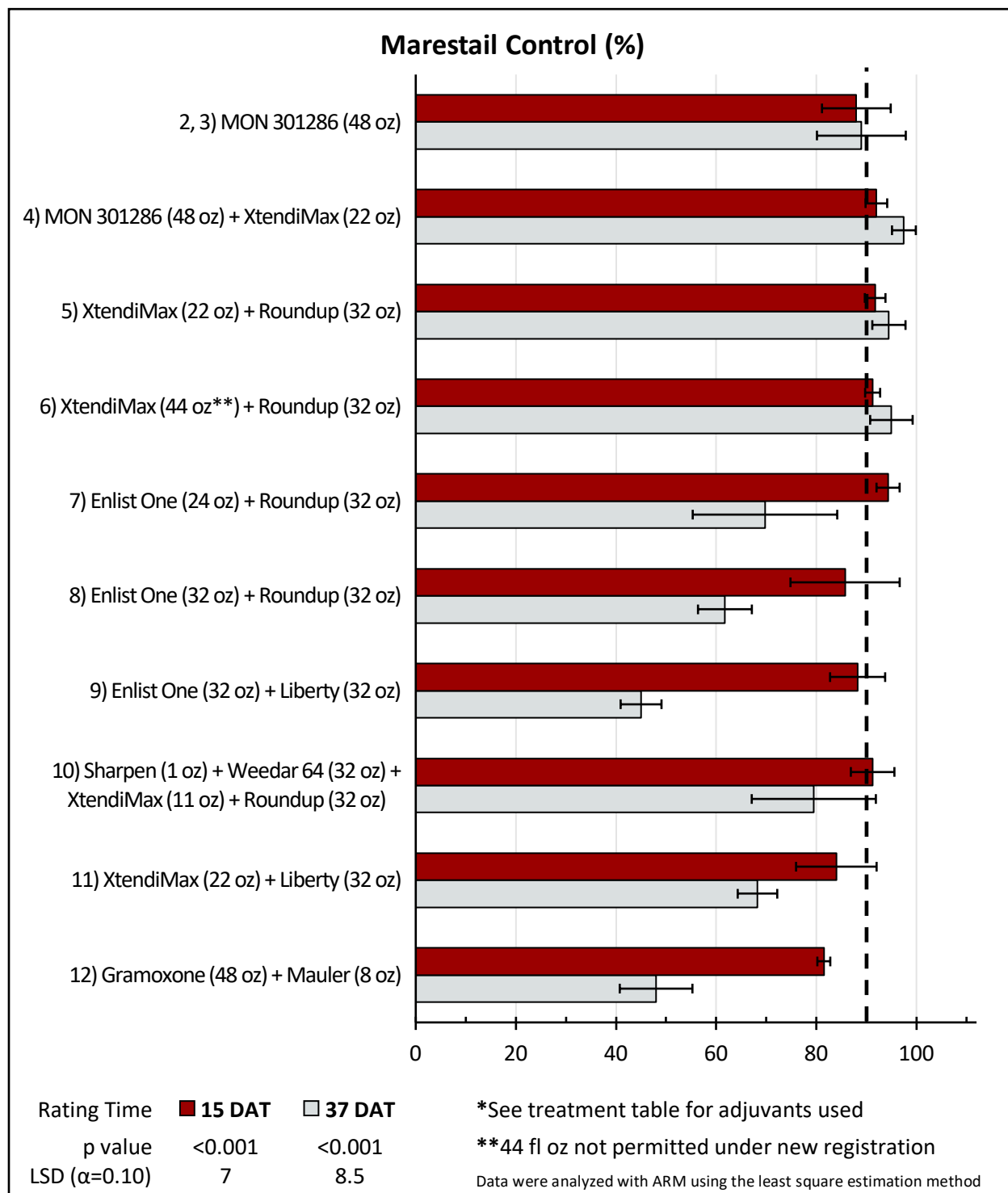


Figure 40: Marestalk efficacy ratings for trial #20-ARL-BG01. Bars indicate the average % control \pm the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control.

Project Goal: Evaluate weed control of Roundup PowerMAX 3 compared to other commercial glyphosate formulations.

Roundup PowerMAX 3 is a new formulation of glyphosate that contains a proprietary surfactant blend and a higher concentration of glyphosate acid per gallon.

Site Description:

Location:	Arlington, WI	Crop:	none
Field #:	370	Variety:	-
Soil type:	Plano silt loam	Planting Date:	-
% OM:	2.6	Emergence Date:	-
pH:	6.5	Population:	-
Previous crop:	corn	Row spacing:	-
Tillage:	conventional	Plot Size:	10 x 25 ft
Weed species:	common lambsquarters (CHEAL), common ragweed (AMBEL), velvetleaf (ABUTH), redroot pigweed (AMARE), giant foxtail (SETFA), green foxtail (SETVI)		

Herbicide Application Information:

Date:	6/19
Treatment:	burndown
Air Temp (°F):	85
2" Soil Temp (°F):	85
Soil moisture [surface]:	dry
RH %:	45
Cloud cover %	5
Wind speed (mph)/direction	1-6/SSW
Rainfall (in) 1 wk after APP:	2.46
GPA:	15
PSI:	34
Nozzle:	TTI 110015
Nozzle spacing (in):	20
Boom Height (in):	28-30

Crop and Weed Information at Application:

	Date:	6/19
lambsquarters	Height:	6-11"
	Density:	47-94/ft ²
common ragweed	Height:	5-14"
	Density:	1-11/ft ²
velvetleaf	Height:	4-9"
	Density:	4-14/ft ²
pigweed	Height:	4-7"
	Density:	1-9/ft ²
foxtails	Height:	4-11"
	Density:	3-38/ft ²

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Untreated Check					
2	Helosate Plus Advanced AMS	4 lbae/gal	9	33 fl oz/a 2% v/v	burndown burndown	A A
3	Credit Xtreme AMS	4.5 lbae/gal	9	22 fl oz/a 2% v/v	burndown burndown	A A
4	Roundup PowerMAX AMS	4.5 lbae/gal	9	22 fl oz/a 2% v/v	burndown burndown	A A
5	Roundup WeatherMAX AMS	4.5 lbae/gal	9	22 fl oz/a 2% v/v	burndown burndown	A A
6	Roundup PowerMAX 3* AMS	4.8 lbae/gal	9	20.7 fl oz/a 2% v/v	burndown burndown	A A
7	Helosate Plus Advanced AMS	4 lbae/gal	9	48.1 fl oz/a 2% v/v	burndown burndown	A A
8	Credit Xtreme AMS	4.5 lbae/gal	9	32 fl oz/a 2% v/v	burndown burndown	A A
9	Roundup PowerMAX AMS	4.5 lbae/gal	9	32 fl oz/a 2% v/v	burndown burndown	A A
10	Roundup WeatherMAX AMS	4.5 lbae/gal	9	32 fl oz/a 2% v/v	burndown burndown	A A
11	Roundup PowerMAX 3* AMS	4.8 lbae/gal	9	30 fl oz/a 2% v/v	burndown burndown	A A

Adjuvants: AMS = N-PAK (liquid AMS)

***Roundup PowerMAX 3** is a new formulation of glyphosate that contains a proprietary surfactant blend and a higher concentration of glyphosate acid per gallon.

Trial Summary:

This trial evaluated the weed control of Roundup PowerMAX 3 compared to other commercial glyphosate formulations. **Roundup PowerMAX 3** is a new formulation of glyphosate that contains a proprietary surfactant blend and a higher concentration of glyphosate acid per gallon. Two rates of glyphosate were evaluated: 0.77 lbae/a (22 fl oz Roundup PowerMAX) and 1.125 lbae/a (32 fl oz Roundup PowerMAX). At 0.77 lbae/a Roundup PowerMAX 3 had better common lambsquarters control than Roundup PowerMAX, Credit Xtreme, and Helosate Plus Advanced (Figure 41). At 1.125 lbae/a Roundup PowerMAX 3 had greater control than Credit Xtreme and Helosate Plus Advanced. Control of all other weed species was >90% for all glyphosate formulations and rates (data not shown).

Plot photos from throughout the growing season are available in the [Evaluation of Roundup PowerMAX 3](#) visual report published on wiscweeds.info.

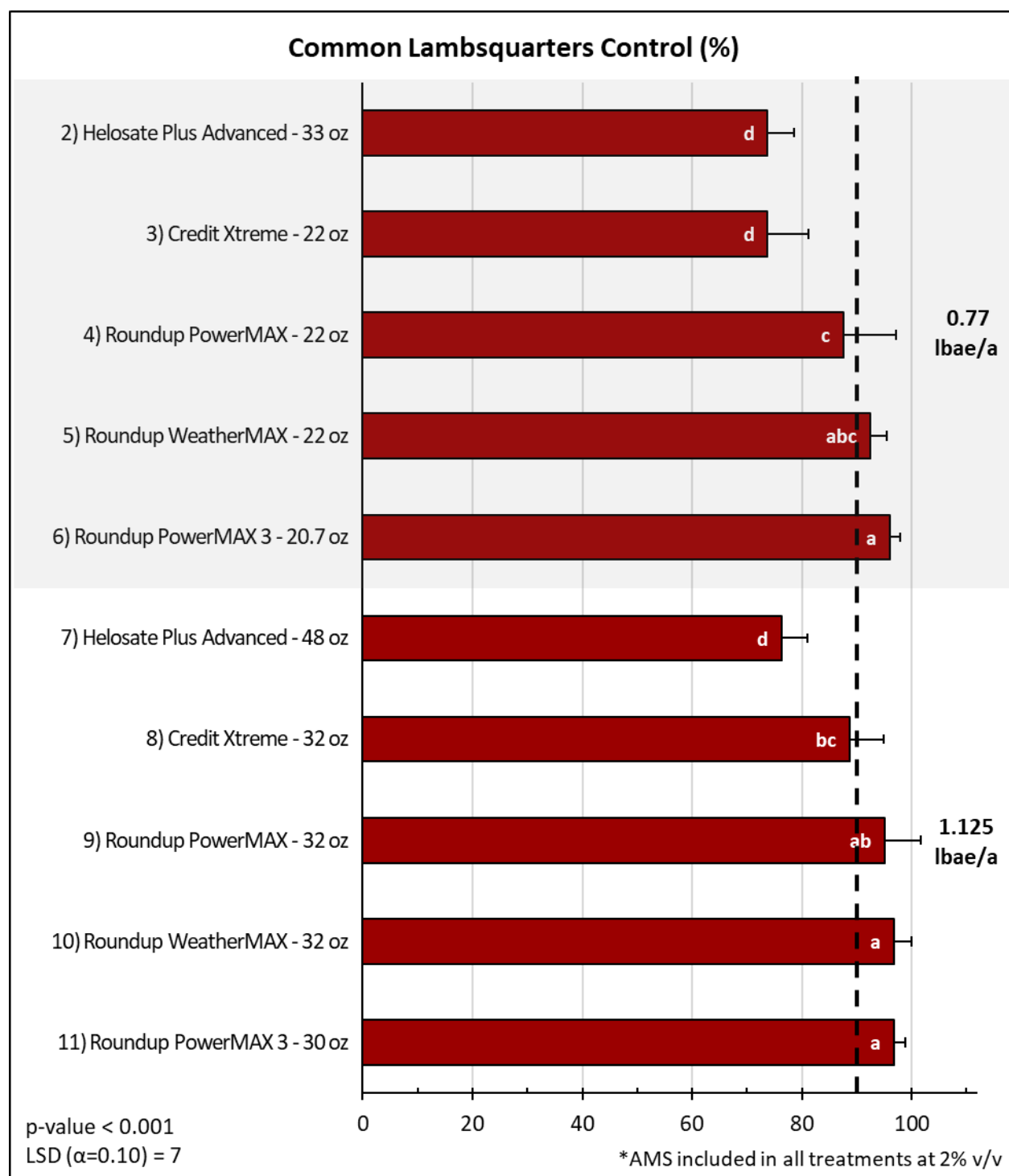


Figure 41: Common lambsquarters burndown efficacy ratings 21 days after application for trial #20-ARL-BG02. Bars indicate the average % control + the standard deviation of four replications. Treatment numbers with herbicides applied are listed on the y-axis. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control. Bars with the same letter are not significantly different ($p < 0.001$).

Project Goal: Evaluate and demonstrate the effectiveness of multiple single active ingredient postemergence corn and soybean herbicides on waterhemp and giant ragweed.

Site Description:

Location:	Brooklyn, WI	Crop:	none
Field #:	OB-2	Variety:	-
Soil type:	Kengonsa silt loam	Planting Date:	-
% OM:	2	Emergence Date:	-
pH:	7.1	Population:	-
Fertilization:	none	Depth:	-
Previous crop:	soybean	Row spacing:	-
Tillage:	conventional	Plot Size:	10 x 25 ft
Weed species:	glyphosate resistant waterhemp (AMATA)		

Herbicide Application Information:

Date:	6/17
Treatment:	POST (A)
Air Temp (°F):	83
2" Soil Temp (°F):	72
Soil moisture [surface]:	dry
RH %:	40
Cloud cover %	0
Wind speed (mph)/direction	1-4/S
Rainfall (in) 1 wk after APP:	0.97
GPA:	15
PSI:	34
Nozzle:	TT*/TTI*
Nozzle spacing (in):	20
Boom Height (in):	23

*Used TT 110015 nozzles for all treatments except XtendiMax and Enlist One.

**Used TTI 110015 nozzles for XtendiMax and Enlist One treatments.

Crop and Weed Information at Application:

	Date:	6/17
waterhemp	Height:	1-5" (Avg = 2")
	Density:	12-46/ft ²

Project Goal: Evaluate and demonstrate the effectiveness of multiple single active ingredient postemergence corn and soybean herbicides on waterhemp and giant ragweed.

Site Description:

Location:	Janesville, WI	Crop:	none
Field #:	0	Variety:	-
Soil type:	Plano silt loam	Planting Date:	-
% OM:	3.5	Emergence Date:	-
pH:	6.4	Population:	-
Fertilization:	-	Depth:	-
Previous crop:	corn	Row spacing:	-
Tillage:	conventional	Plot Size:	10 x 25 ft
Weed species:	giant ragweed (AMBTR)		

Herbicide Application Information:

Date:	5/27
Treatment:	POST (A)
Air Temp (°F):	84
2" Soil Temp (°F):	78
Soil moisture [surface]:	dry
RH %:	56
Cloud cover %	5
Wind speed (mph)/direction	2-5/SE
Rainfall (in) 1 wk after APP:	0.35
GPA:	15
PSI:	34
Nozzle:	TT*/TTI*
Nozzle spacing (in):	20
Boom Height (in):	23

*Used TT 110015 nozzles for all treatments except XtendiMax and Enlist One.

**Used TTI 110015 nozzles for XtendiMax and Enlist One treatments.

Crop and Weed Information at Application:

	Date:	6/17
giant ragweed	Height:	1-4" (Avg = 2")
	Density:	1-7/ft ²

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
1	Pursuit	3 lb/gal	2	4 fl oz/a	POST	A
	COC			1.25% v/v	POST	A
	AMS			2 lb/a	POST	A
2	Classic	25% w/w	2	0.75 oz/a	POST	A
	COC			1% v/v	POST	A
	AMS			2 lb/a	POST	A
3	FirstRate	84% w/w	2	0.3 oz/a	POST	A
	COC			1.2% v/v	POST	A
	AMS			2 lb/a	POST	A
4	Python	80% w/w	2	1 oz/a	POST	A
	COC			1% v/v	POST	A
	AMS			2 lb/a	POST	A
5	XtendiMax	2.89 lbae/gal	4	22 fl oz/a	POST	A
	Class Act Ridion			1% v/v	POST	A
6	Enlist One	3.8 lbae/gal	4	32 fl oz/a	POST	A
	AMS			2 lb/a	POST	A
7	Stinger	3 lbae/gal	4	6 fl oz/a	POST	A
8*	Aatrex	4 lb/gal	5	2 pt/a	POST	A
	COC			1 qt/a	POST	A
9	Buctril	2 lb/gal	6	1.5 pt/a	POST	A
10	Basagran 5L	5 lb/gal	6	1.6 pt/a	POST	A
	COC			1% v/v	POST	A
	AMS			2 lb/a	POST	A
11	Roundup PowerMAX	4.5 lbae/gal	9	32 fl oz/a	POST	A
	AMS			2 lb/a	POST	A
12	Liberty	2.34 lb/gal	10	32 fl oz/a	POST	A
	AMS			2 lb/a	POST	A
13	Cobra	2 lb/gal	14	12.5 fl oz/a	POST	A
	COC			1.5 pt/a	POST	A
	AMS			2 lb/a	POST	A
14	Flexstar	1.88 lb/gal	14	1 pt/a	POST	A
	MSO			1% v/v	POST	A
	AMS			2 lb/a	POST	A
15	Cadet	0.91 lb/gal	14	0.9 fl oz/a	POST	A
	COC			1% v/v	POST	A
	AMS			2 lb/a	POST	A
16	Resource	0.86 lb/gal	14	8 fl oz/a	POST	A
	COC			1 qt/a	POST	A
	AMS			2 lb/a	POST	A

Adjuvants: AMS = BlueAg spray grade ammonium sulfate; COC = Crop Oil; MSO=Emulate; Non-AMS water conditioner=Class Act Ridion

*Treatment 8, Aatrex, was not applied at the Brooklyn location due to atrazine restrictions.

Trt #	Treatment	Formulation	SOA Group	Rate	App Timing	App Code
17	Callisto	4 lb/gal	27	3 fl oz/a	POST	A
	COC			1% v/v	POST	A
	AMS			2 lb/a	POST	A
18	Laudis	3.5 lb/gal	27	3 fl oz/a	POST	A
	MSO			1% v/v	POST	A
	AMS			2 lb/a	POST	A
19	Armezon	2.8 lb/gal	27	0.75 fl oz/a	POST	A
	MSO			1% v/v	POST	A
	AMS			2 lb/a	POST	A
20	Balance Flexx	2 lb/gal	27	5 fl oz/a	POST	A
	MSO			1% v/v	POST	A
	AMS			2 lb/a	POST	A

Adjuvants: AMS = BlueAg spray grade ammonium sulfate; COC = Crop Oil; MSO=Emulate; Non-AMS water conditioner=Class Act Ridion

Trial Summary:

This study was a joint effort between the [UW-Madison Nutrient and Pest Management Program](#) (NPM; Dan Smith) and the WiscWeed team. This trial was conducted on a grower's field in Brooklyn, WI with a heavy infestation of waterhemp and at the [UW Lancaster Ag Research Station](#). The Brooklyn waterhemp population was known to be glyphosate resistant, and we suspect the Lancaster population is segregating to be glyphosate resistant. Waterhemp control data from the Lancaster location is not presented in this report. A trial was also placed at the Rock Co. Farm in Janesville, WI to evaluate control of giant ragweed. Treatments consisted of postemergence (POST) corn and soybean herbicides containing one active ingredient. Using a single active ingredient or site of action herbicide is not recommended for POST waterhemp or giant ragweed control due to resistance concerns. Our intent was not to promote the use of a single herbicide, but rather, demonstrate the value of each herbicide active ingredient for the control of emerged weeds. While results should be taken with a grain of salt (only one year of data), they clearly indicate the difference in effectiveness among herbicides evaluated for burndown control of waterhemp (Figure 42) and giant ragweed (Figure 43).

Key Take Home Points from 2020 Data: Waterhemp

- Few herbicides provided >90% control of glyphosate-resistant waterhemp (Figure 42).
- None of the group 2 or 6 herbicides controlled waterhemp.
- Not all active ingredients within a given SOA group are equal (see groups 4, 14, and 27 data)
- POST herbicide programs containing multiple effective sites of action are recommended to broaden weed control spectrum and to lower selection for additional herbicide resistance.
- Using an effective PRE herbicide to reduce the density and size of waterhemp can help improve POST efficacy.

Key Take Home Points from 2020 Data: Giant ragweed

- Several herbicides provided excellent burndown control of giant ragweed (Figure 43).
- None of the ALS (group 2) herbicides had >50% control. We suspect some level of ALS resistance in this population.

Plot photos from throughout the growing season are available in the [Burndown Control of Giant Ragweed](#) and [Burndown Control of Glyphosate-Resistant Waterhemp](#) visual reports published on wiscweeds.info.

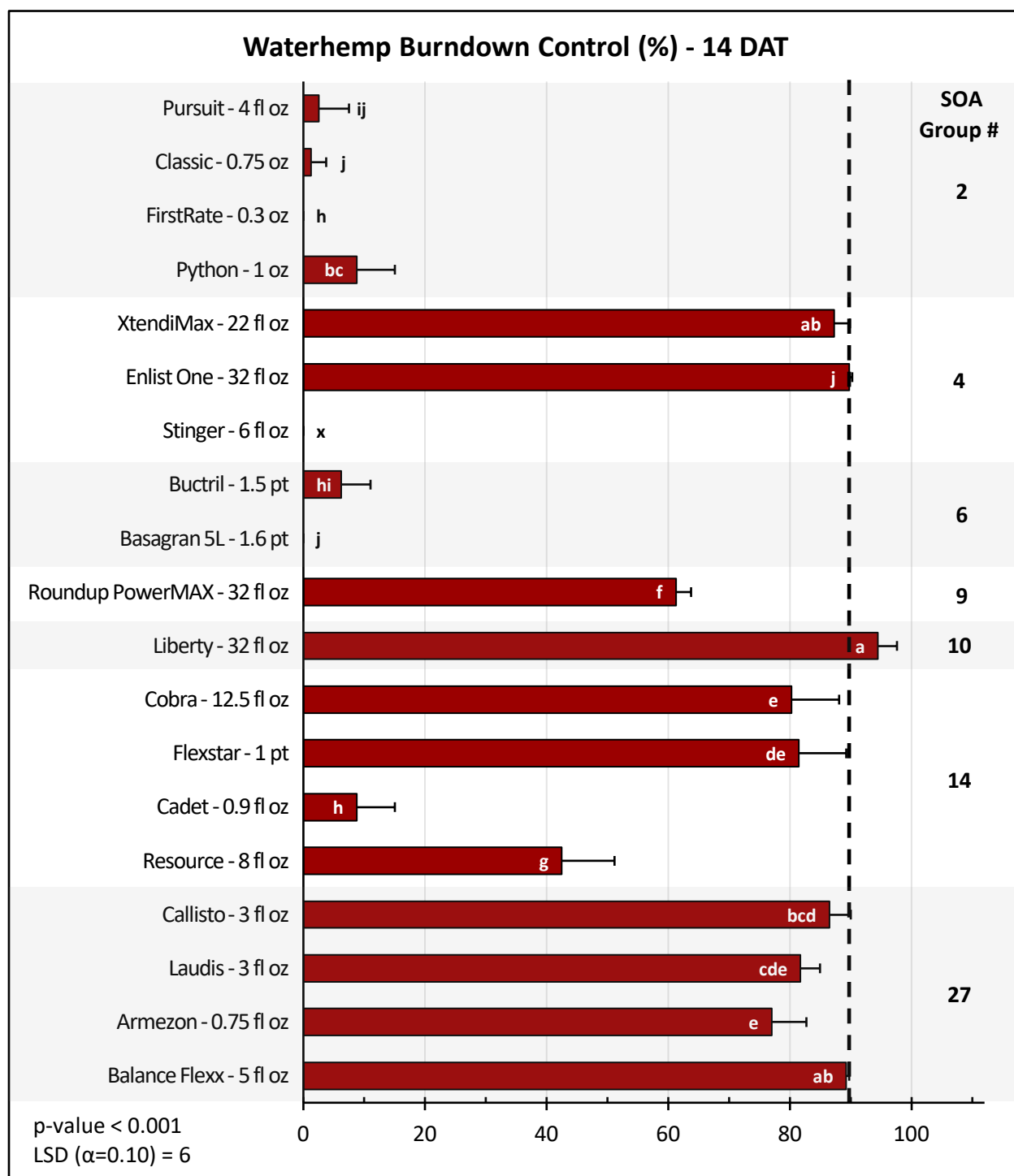


Figure 42: Glyphosate-resistant waterhemp burndown efficacy ratings 14 days after POST application for trial #20-BRO-BG04. Bars indicate the average % control + the standard deviation of four replications. Herbicides applied are listed on the y-axis and are grouped by herbicide site of action. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control. Bars with the same letter are not significantly different ($p < 0.001$).

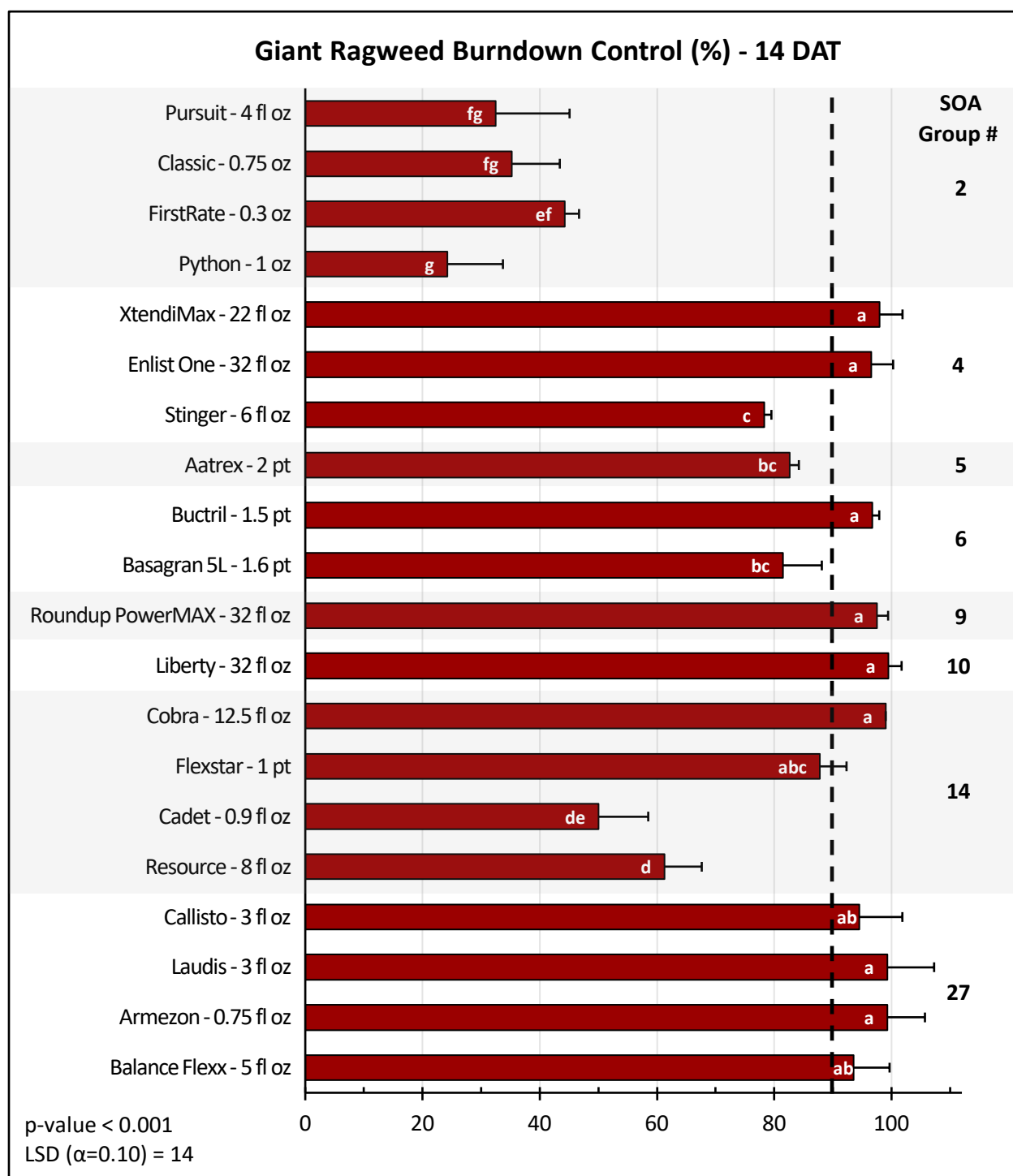


Figure 43: Giant ragweed burndown efficacy ratings 14 days after POST application for trial #20-ROK-BG04. Bars indicate the average % control + the standard deviation of four replications. Herbicides applied are listed on the y-axis and are grouped by herbicide site of action. For more details on rates and adjuvants used see the corresponding herbicide treatment table. The dashed line indicates 90% control. Bars with the same letter are not significantly different ($p < 0.001$).

Table 4. 2020 Temperature and Precipitation Summary

Location	Month	Precipitation (in)			Average Temperature (F)		
		2020	30-year norm***	2020 departure	2020	30-year norm***	2020 departure
Arlington*	May	4.43	3.69	0.74	55.2	55.7	-0.5
	June	4.33	4.68	-0.35	68.2	65.6	2.6
	July	5.60	4.16	1.44	72.1	69.4	2.7
	August	3.80	3.90	-0.10	67.4	67.3	0.1
	September	3.01	3.54	-0.53	57.7	59.3	-1.6
	Total	21.17	19.97	1.20	-	-	-
Brooklyn** (30-year norm from Stoughton NOAA station)	May	4.68	3.85	0.83	56.6	57.8	-1.2
	June	4.38	4.34	0.04	70.4	67.4	3.0
	July	4.64	3.85	0.79	74.3	71.7	2.6
	August	0.78	4.42	-3.64	70.6	69.5	1.1
	September	4.82	3.60	1.22	60.4	61.2	-0.8
	Total	19.31	20.07	-0.86	-	-	-
Janesville* (30-year norm from Beloit NOAA station)	May	4.20	3.80	0.40	57.0	58.7	-1.7
	June	3.23	4.73	-1.5	70.3	68.6	1.7
	July	5.84	3.85	1.99	75.4	72.5	2.9
	August	3.11	4.27	-1.16	71.3	70.8	0.5
	September	3.44	3.65	-0.21	60.2	62.9	-2.7
	Total	19.82	20.30	-0.48	-	-	-
Lancaster*	May	5.48	4.13	1.35	55.7	57.3	-1.6
	June	7.79	5.26	2.53	68.8	66.9	1.9
	July	5.15	4.32	0.83	74.2	70.8	3.4
	August	3.72	4.20	-0.48	70.6	69.0	1.6
	September	7.34	3.14	4.2	59.6	60.8	-1.2
	Total	29.48	21.05	8.43	-	-	-

*2020 data recorded from on-site weather stations. 2020 Janesville temperature data was recorded from a NOAA weather station at Rock County Regional Airport.

**2020 Brooklyn data recorded from an off-site weather station located near Verona, WI.

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

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Figure 6	Corn yield in 1 and 2-pass herbicide programs	CN05	13
Figure 7	Giant ragweed control with 1 and 2-pass programs	CN06	17
Figure 8	Annual grass control with 1 and 2-pass programs	CN06	18
Figure 9	Corn yield in 1 and 2-pass herbicide programs	CN06	19
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Figure 21	Waterhemp control in Enlist soybeans: FMC	SB06	51
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Figure 23	Waterhemp control in Enlist soybeans: Corteva	SB10	57
Figure 24	Waterhemp control in Enlist soybeans: Syngenta	SB11	61
Figure 25	Waterhemp control: layered residual approach in soybean	SB12	65
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Figure 34	Velvetleaf control in XtendFlex soybean: BASF	SB07	81
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Weed (common name)	Bayer Code	Page Number(s)
foxtail, giant	SETFA	24, 98
foxtail, yellow	SETPU	24
grasses, annual	GGGAN	3, 7, 11, 16, 27, 42, 46, 50, 53, 56, 60, 79, 86
lambsquarters, common	CHEAL	3, 7, 11, 16, 22, 27, 32, 35, 86, 99
marestail	ERICA	96
pigweed, redroot	AMARE	86, 98
purslane, common	POROL	31
ragweed, common	AMBEL	22, 98
ragweed, giant	AMBTR	4, 8, 12, 17, 28, 35, 36, 38, 82, 87, 91, 92, 106
velvetleaf	ABUTH	7, 11, 22, 31, 42, 46, 50, 53, 56, 60, 81, 98
waterhemp, common	AMATA	43, 47, 50, 51, 54, 57, 61, 65, 70, 71, 73, 74, 75, 105

Index of Adjuvants

Adjuvant Brand	Adjuvant Type	Page Number(s)
Amsol	ammonium sulfate (liquid)	21, 26, 30, 40, 56, 95
BlueAg spray grade AMS	ammonium sulfate (dry)	10, 15, 34, 45, 49, 53, 63, 68, 78, 85, 103
Class Act Ridion	water conditioner (non-AMS)	2, 21, 40, 94, 102
Crop Oil	crop oil concentrate	7, 68, 103
Emulate	methyated seed oil	21, 34, 103
Intact	drift retardant and deposition aid	21, 40, 94
N-PAK	ammonium sulfate (liquid)	2, 98
Prefer 90	nonionic surfactant	2, 10, 15, 21, 26
Request	water conditioner (non-AMS)	59
Superb HC	high surfactant petroleum oil concentrate	21, 26, 30
VaporGrip Xtra	volatility reducing agent	94

Index of Herbicides Evaluated

Herbicide	Active Ingredient(s)	Page Number(s)
Aatrex/atrazine 4L	atrazine	2, 7, 10, 15, 34, 102
Acuron	bicyclopyrone+mesotrione+ atrazine+S-metolachlor	2, 15
Acuron GT	bicyclopyrone+mesotrione+S-metolachlor+ glyphosate	21, 26
Acuron XR	bicyclopyrone+mesotrione+ atrazine+S-metolachlor	30
Acuron Flexi	bicyclopyrone + mesotrione + S-metolachlor	15
Acuron Flexi XR	bicyclopyrone + mesotrione + S-metolachlor	30
Afforia	thifensulfuron + tribenuron + flumioxazin	89
Alite 27*	isoxaflutole	85
Anthem Maxx	pyroxasulfone + fluthiacet	15, 45, 49
Armezon	topramezone	103
Armezon PRO	topramezone + dimethenamid-P	21, 26
Authority Assist	sulfentrazone + imazethapyr	89
Authority Edge	sulfentrazone + pyroxasulfone	49
Authority First DF	sulfentrazone + cloransulam	49
Authority MTZ	sulfentrazone + metribuzin	45, 63, 89
Authority Supreme	sulfentrazone + pyroxasulfone	49, 89
Balance Flexx	isoxaflutole	103
Basagran 5L	bentazon	68, 102
Bicep II Magnum	S-metolachlor + atrazine	7
Bicep Lite II Magnum	S-metolachlor + atrazine	10, 26
Boundary	S-metolachlor + metribuzin	49, 59, 89
Broadaxe XC	S-metolachlor + sulfentrazone	89
Buctril	bromoxynil	102
Cadet	fluthiacet	67, 102
Callisto	mesotrione	15, 103
Canopy DF	chlorimuron + metribuzin	89
Capreno	tembotrione + thienencarbazone	2, 10, 21, 26, 30
Classic	chlorimuron-ethyl	89, 102
Cobra	lactofen	67, 102
Corvus	isoxaflutole + thienencarbazone	15, 30
Credit Xtreme	glyphosate	98
Degree XTRA	acetochlor + atrazine	2
DiFlexx	dicamba (DGA salt)	2
Dual II Magnum	S-metolachlor	63, 89
Durango DMA	glyphosate (DMA salt)	10, 56
Engenia Prime*	dicamba (BAPMA salt) + pyroxasulfone + imazethapyr	78
Engenia PRO*	dicamba (BAPMA salt) + pyroxasulfone	78
Enlist Duo	2,4-D (choline salt) + glyphosate	53
Enlist One	2,4-D (choline salt)	53, 56, 59, 68, 94, 102
Enlite	chlorimuron + thifensulfuron + flumioxazin	89

Herbicide	Active Ingredient(s)	Page Number(s)
EverpreX	S-metolachlor	56, 78
FeXapan	dicamba (DGA salt) with VaporGrip® Technology	78
Fierce	flumioxazin + pyroxasulfone	89
Fierce EZ	flumioxazin + pyroxasulfone	45
Fierce MTZ	flumioxazin + pyroxasulfone + metribuzin	45, 89
Fierce XLT	flumioxazin + pyroxasulfone + chlorimuron	78, 89
FirstRate	cloransulam-methyl	59, 89, 102
Flexstar	fomesafen	63, 67, 102
Gramoxone	paraquat	95
Halex GT	S-metolachlor + mesotrione + glyphosate	2, 10, 15, 21
Harness	acetochlor	26
Harness MAX	acetochlor + mesotrione	2, 21, 30
Harness Xtra 5.6L	acetochlor + atrazine	2
Helosate Plus Advanced	glyphosate (isopropylamine salt)	98
Impact	topramezone	7, 21, 34
Laudis	tembotrione	7, 21, 26, 103
Liberty	glufosinate	34, 40, 49, 53, 56, 63, 67, 78, 85, 94, 102
Lumax EZ	mesotrione + atrazine + S-metolachlor	10, 26
Matador	metolachlor + metribuzin + imazethapyr	85
Mauler	metribuzin	40, 95
MON 301286*	dicamba (DGA salt) with VaporGrip® + glyphosate	94
Outlook	dimethenamid-P	63, 78, 89
Perpetuo	flumiclorac + pyroxasulfone	45
Prefix	S-metolachlor + fomesafen	59, 63, 89
Pursuit	imazethapyr	63, 89, 102
Python	flumetsulam	102
Realm Q	rimsulfuron + mesotrione	10, 21
Resicore	clopyralid + acetochlor + mesotrione	10, 15, 21, 26, 30
Resource	flumiclorac	67, 102
Roundup PowerMAX	glyphosate (potassium salt)	2, 10, 15, 21, 26, 30, 34, 40, 53, 59, 78, 85, 94, 98, 102
Roundup PowerMAX 3	glyphosate (potassium salt)	98
Roundup WeatherMAX	glyphosate (potassium salt)	98
Scout	glufosinate	45
Sequence	S-metolachlor + glyphosate	59
Sharpen	saflufenacil	89, 94
Shieldex	tolpyralate	7
Sinate	topramezone + glufosinate	34
Sonic	sulfentrazone + cloransulam	56, 59, 78, 89
Spartan	sulfentrazone	89
Status	dicamba (sodium salt) + diflufenzopyr	26, 30

Herbicide	Active Ingredient(s)	Page Number(s)
Stinger	clopyralid	102
Surestart II	acetochlor + clopyralid + flumetsulam	10, 26, 30
Surpass NXT	acetochlor	10
Surveil	flumioxazin + cloransulam	89
Tricor DF	metribuzin	59, 89
TripleFlex II	acetochlor + clopyralid + flumetsulam	2
Trivence	chlorimuron + flumioxazin + metribuzin	89
Valor SX	flumioxazin	67, 89
Valor XLT	flumioxazin + chlorimuron	89
Verdict	saflufenacil + dimethenamid-P	15, 26, 30, 89
Warrant	acetochlor	40, 63, 78, 89
Warrant Ultra	acetochlor + fomesafen	40, 63, 78
Weedar 64	2,4-D amine	94
XtendiMax	dicamba (DGA salt) with VaporGrip® Technology	21, 40, 78, 94, 102
Zidua	pyroxasulfone	63, 89
Zidua PRO	pyroxasulfone + saflufenacil + imazethapyr	45, 49, 53, 59, 78, 85, 89
Zidua SC	pyroxasulfone	53, 85

*Pending approval for use in Wisconsin as of January 2021.

Index of Trial Sponsors

Company	Trial Number (s)*
AMVAC	CN12
BASF	SB07 , SB08 , SB09
Bayer Crop Science	CN01 , CN02, SB01, SB02 , SB03, SB04, SB20, SB21, SB22, SB23, SB24, BG01 , BG02 , BG03
CHS Agronomy	BG05, BG06
Corteva Agriscience	CN05 , SB10 , SB25
FMC	CN06 , SB06
Sipcam Agro	CN07
Summit Agro	CN03, CN04
Syngenta	CN05 , CN08 , CN09 , CN10 , SB11
Valent	SB05
Wisconsin Corn Promotion Board	CN11
Wisconsin Soybean Marketing Board	SB12 , SB15
Wisconsin Weed Science	SB12 , SB15 , SB16 , BG04

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