

Demonstration of Weeds Controlled by the Herbicide Components of Acuron and Resicore in Field Corn at Rochester, MN in 2018.

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The objective of this trial was to demonstrate which weeds the herbicide components in Acuron and Resicore controlled in field corn in southeastern Minnesota. The research site was a loamy sand series with a pH of 6.7, O.M. of 2.1%, and soil test P and K levels of 29 ppm and 167 ppm, respectively. Spring fertilizer was broadcast on April 30, 2018 at a rate of 120-52-120-24 lbs/A (N-P-K-S). The field was disked and field cultivated once prior to planting. The previous crop was soybean. The corn hybrid, DEKALB DKC51-38RIB, was planted May 7, 2018 at a depth of 1.5 inches in 30-inch rows at 32,000 seeds per acre. A randomized complete block design with four replications was used. Preemergence (PRE) treatments were applied with a tractor-mounted sprayer delivering 15 gpa at 40 psi using TTI-110015 tips. Evaluations were made May 30, June 13, and August 29, 2018. The center two rows of each plot were machine harvested on November 1, 2018. Application date, environmental conditions and weed densities are in Table 1. Performance ratings for giant ragweed, common lambsquarters, common waterhemp and grass control can be found in Tables 2 through 6 respectively.

DISCUSSION

Understanding effective sites of action (SOA) of herbicides has been and will continue to be an important concept in chemical weed control. Unfortunately, the glyphosate era of weed control made chemical weed control too easy, as glyphosate provided effective broad-spectrum control of many weeds in many crops. Overreliance on glyphosate, leading to herbicide resistance, brought the “easy” era to an end. With this also came a lack of understanding of what different herbicide SOAs provide in terms of weed control.

This SOA demonstration revealed that either Callisto or bicyclopyrone (both SOA 27) provided over 90% control of giant ragweed. However, Callisto was the key component for effective waterhemp control, providing excellent control of waterhemp, 99%, compared to only 60% for bicyclopyrone. This demonstration also provided a unique opportunity to see bicyclopyrone by itself and in combination with other herbicides. The addition of atrazine (SOA 5) or Callisto to bicyclopyrone improved waterhemp control to 81% and 97%, respectively. Stinger (SOA 4) soil applied was the weakest link, with about 35% control of giant ragweed, increasing to 93% with the addition of Callisto. (University of Minnesota Extension Regional Office, Rochester.)

Table 1. Application timing, plant stage, environmental conditions.

Date	5/8
Treatment	PRE (A)
Temperature (F)	
Air	72
Soil	60.1
Relative Humidity (%)	37
Wind (mph)	17
Soil Moisture	Normal
Giant Ragweed	
Weed Density (ft ²)	4
Common Waterhemp	
Weed Density (ft ²)	10
Common Lambsquarter	
Weed Density (ft ²)	16
Grass	
Weed Density (ft ²)	2
Rainfall after each application (inch)	
Week 1	2.33
Week 2	0.35
Week 3	0.77

Table 2. Giant ragweed control with different components of herbicide premixes in corn at Rochester, MN in 2018.

Pest Code				AMBTR						YIELD Nov-1-2018		
				GIANT RAGWEED								
Rating Date				May-30-2018		Jun-13-2018		Aug-29-2018				
Trt	Treatment	Rate	Appl	PERCENT CONTROL (%)								Bu/A
1	UNTREATED CHECK			0	e	0	f	0	g	7.7	d	
PRE (5/8/18)												
2	SOA 27 CALLISTO	6 fl oz/a	A	96	bc	96	ab	95	bcd	175.1	b	
3	SOA 4 STINGER	5.07 fl oz/a	A	86	d	40	e	36	f	12.7	d	
4	SOA 27 BICYCLOPYRONE	3.46 fl oz/a	A	88	d	90	d	91	e	159.2	c	
5	SOA 5,27 CALLISTO AATREX	5.76 fl oz/a 24 fl oz/a	A A	98	a	98	a	98	a	177.8	ab	
6	SOA 5,27 BICYCLOPYRONE AATREX	3.46 fl oz/a 24 fl oz/a	A A	97	abc	97	a	97	abc	177.6	ab	
7	SOA 4,27 STINGER CALLISTO	5.07 fl oz/a 6.0 fl oz/a	A A	96	bc	93	c	93	de	176.9	ab	
8	SOA 27 BICYCLOPYRONE CALLISTO	3.46 fl oz/a 5.76 fl oz/a	A A	97	abc	97	a	98	a	190.3	a	
9	SOA 5,27 BICYCLOPYRONE CALLISTO AATREX	3.46 fl oz/a 5.76 fl oz/a 24 fl oz/a	A A A	98	ab	98	a	99	a	184.1	ab	
10	SOA 15,27 ACURON FLEXI	2.25 qt/a	A	95	c	94	bc	94	cd	179.4	ab	
11	SOA 5,15,27 ACURON	3 qt/a	A	98	ab	98	a	98	ab	184.0	ab	
12	SOA 4,15,27 RESICORE	2.5 qt/a	A	96	bc	97	ab	97	abc	182.7	ab	
LSD P=.10				2		2		3		14.1		

Table 3. Common lambsquarters control with different components of herbicide premixes in corn at Rochester, MN in 2018.

Pest Code				CHEAL COMMON LAMBSQUARTERS						YIELD Nov-1-2018	
				May-30-2018		Jun-13-2018		Aug-29-2018			
Rating Date				PERCENT CONTROL (%)						Bu/A	
Trt	Treatment	Rate	Appl								
1	UNTREATED CHECK			0	b	0	c	0	c	7.7	d
PRE (5/8/18)											
2	SOA 27 CALLISTO	6 fl oz/a	A	99	a	99	a	99	a	175.1	b
3	SOA 4 STINGER	5.07 fl oz/a	A	0	b	0	c	0	c	12.7	d
4	SOA 27 BICYCLOPYRONE	3.46 fl oz/a	A	99	a	98	b	98	b	159.2	c
5	SOA 5, 27 CALLISTO AATREX	5.76 fl oz/a 24 fl oz/a	A A	99	a	99	a	99	a	177.8	ab
6	SOA 5,27 BICYCLOPYRONE AATREX	3.46 fl oz/a 24 fl oz/a	A A	99	a	99	a	99	a	177.6	ab
7	SOA 4,27 STINGER CALLISTO	5.07 fl oz/a 6.0 fl oz/a	A A	99	a	99	a	99	a	176.9	ab
8	SOA 27 BICYCLOPYRONE CALLISTO	3.46 fl oz/a 5.76 fl oz/a	A A	99	a	99	a	99	a	190.3	a
9	SOA 5,27 BICYCLOPYRONE CALLISTO AATREX	3.46 fl oz/a 5.76 fl oz/a 24 fl oz/a	A A A	99	a	99	a	99	a	184.1	ab
10	SOA 15,27 ACURON FLEXI	2.25 qt/a	A	99	a	99	a	99	a	179.4	ab
11	SOA 5,15,27 ACURON	3 qt/a	A	99	a	99	a	99	a	184.0	ab
12	SOA 4,15,27 RESICORE	2.5 qt/a	A	99	a	99	a	99	a	182.7	ab
LSD P=.10				NS		0.7		0.7		14.1	

Table 4. Common waterhemp control with different components of herbicide premixes in corn at Rochester, MN in 2018.

Pest Code					AMATA COMMON WATERHEMP						YIELD Nov-1-2018		
					May-30-2018		Jun-13-2018		Aug-29-2018		BU/A		
Rating Date	Trt	Treatment	Rate	Appl	PERCENT CONTROL (%)								
1		UNTREATED CHECK			0	c	0	d	0	d	7.7	d	
PRE (5/8/18)													
2	SOA 27	CALLISTO	6	fl oz/a	A	99	a	98	a	99	a	175.1	b
3	SOA 4	STINGER	5.07	fl oz/a	A	0	c	0	d	0	d	12.7	d
4	SOA 27	BICYCLOPYRONE	3.46	fl oz/a	A	87	b	64	c	63	c	159.2	c
5	SOA 5, 27	CALLISTO	5.76	fl oz/a	A	99	a	99	a	99	a	177.8	ab
		AATREX	24	fl oz/a	A								
6	SOA 5,27	BICYCLOPYRONE	3.46	fl oz/a	A	98	a	82	b	81	b	177.6	ab
		AATREX	24	fl oz/a	A								
7	SOA 4,27	STINGER	5.07	fl oz/a	A	99	a	96	a	98	a	176.9	ab
		CALLISTO	6.0	fl oz/a	A								
8	SOA 27	BICYCLOPYRONE	3.46	fl oz/a	A	99	a	97	a	97	a	190.3	a
		CALLISTO	5.76	fl oz/a	A								
9	SOA 5,27	BICYCLOPYRONE	3.46	fl oz/a	A	99	a	99	a	99	a	184.1	ab
		CALLISTO	5.76	fl oz/a	A								
		AATREX	24	fl oz/a	A								
10	SOA 15,27	ACURON FLEXI	2.25	qt/a	A	99	a	99	a	99	a	179.4	ab
11	SOA 5,15,27	ACURON	3	qt/a	A	99	a	99	a	99	a	184.0	ab
12	SOA 4,15,27	RESICORE	2.5	qt/a	A	99	a	99	a	99	a	182.7	ab
LSD P=.10							2		4		4		14.1

Table 4. Common waterhemp control with different components of herbicide premixes in corn at Rochester, MN in 2018.

Pest Code Rating Date				GRASS						YIELD	
				May-30-2018		Jun-13-2018		Aug-29-2018		Nov-1-2018	
Trt	Treatment	Rate	Appl	PERCENT CONTROL (%)						BU/A	
1	UNTREATED CHECK			0	c	0	f	0	e	7.7	d
PRE (5/8/18)											
2	SOA 27 CALLISTO	6 fl oz/a	A	99	a	95	c	95	b	175.1	b
3	SOA 4 STINGER	5.07 fl oz/a	A	0	c	0	f	0	e	12.7	d
4	SOA 27 BICYCLOPYRONE	3.46 fl oz/a	A	0	c	0	f	0	e	159.2	c
5	SOA 5,27 CALLISTO AATREX	5.76 fl oz/a 24 fl oz/a	A A	99	a	95	c	95	b	177.8	ab
6	SOA 5,27 BICYCLOPYRONE AATREX	3.46 fl oz/a 24 fl oz/a	A A	92	b	64	e	64	d	177.6	ab
7	SOA 4,27 STINGER CALLISTO	5.07 fl oz/a 6.0 fl oz/a	A A	99	a	90	d	90	c	176.9	ab
8	SOA 27 BICYCLOPYRONE CALLISTO	3.46 fl oz/a 5.76 fl oz/a	A A	99	a	95	bc	95	b	190.3	a
9	SOA 5,27 BICYCLOPYRONE CALLISTO AATREX	3.46 fl oz/a 5.76 fl oz/a 24 fl oz/a	A A A	99	a	98	ab	98	a	184.1	ab
10	SOA 15,27 ACURON FLEXI	2.25 qt/a	A	99	a	99	a	99	a	179.4	ab
11	SOA 5,15,27 ACURON	3 qt/a	A	99	a	99	a	99	a	184.0	ab
12	SOA 4,15,27 RESICORE	2.5 qt/a	A	99	a	99	a	99	a	182.7	ab
LSD P=.10				1		3		3		14.1	

Demonstrating SOA Components of an Herbicide as an Extension Teaching Tool



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Introduction

Understanding effective sites of action (SOA) of herbicides has been and will continue to be an important concept in chemical weed control. Unfortunately, the glyphosate era of weed control made chemical weed control too easy, as glyphosate provided effective broad spectrum control of many weeds in many different crops. Overreliance on glyphosate, leading to herbicide resistant, brought the “easy” era to an end. With this, also came a lack of understanding of what different herbicide SOAs provide in terms of weed control.

Methods

SOA demonstration trials of preemergence herbicide premixes and their components were conducted in corn and soybean at Rochester, MN in 2018. The primary weeds in corn were giant ragweed, common lambsquarters, tall waterhemp and grasses. In soybean, the main weeds were common lambsquarters, tall waterhemp, velvetleaf and grasses. The tall waterhemp population is resistant to SOA 2 at this site. All herbicide applications were made at 4 MPH with a tractor-mounted sprayer delivering 15 GPA at 40 PSI using 110015 TTI nozzles. Treatments were made according to label instructions and adequate rainfall was received after application. No postemergence herbicides were applied, highlighting which weeds each preemergence herbicide and its respective components controlled or failed to control.

Soybean Premix and Respective Components

Zidua Pro:	Pursuit	Sharpen	Zidua
Authority First:	First Rate	Spartan	
Warrant Ultra:	Warrant	Reflex	

Corn Premix and Respective Components

Acuron:	Callisto	Bicyclopyrone	Atrazine ₁	Dual ₂
Resicore:	Callisto	Stinger	Surpass ₂	

1 = Only represented in combination with other components
2 = Not represented in the trial








Zidua Pro components are SOA 2, 14 and 15 herbicides. The Pursuit (SOA 2) component is weak on waterhemp as expected due to resistance. But, it is very effective on other broadleaves and grasses. Sharpen (SOA 14) does not control grass. Zidua (SOA 15) provided good weed control, however there were velvetleaf and lambsquarters escapes.






Authority First contains SOA 2 and 14 herbicides. What was eye opening was how well these two components controlled weeds together compared to individually. Similarities were also observed with First Rate and Pursuit (SOA 2), both ineffective on waterhemp. By contrast, differences were observed among the SOA 14 components.





Warrant Ultra contains SOA 14 and 15 herbicides. Velvetleaf has become more prevalent in MN soybean fields. The components of Warrant Ultra illustrated a weakness in velvetleaf control, which offered an explanation as to why more velvetleaf is present.










The corn SOA demonstration project revealed that either Callisto or bicyclopyrone (both SOA 27) provided over 90% control of giant ragweed. However, Callisto was the key component for effective waterhemp control, providing excellent control of waterhemp, 99%, compared to only 60% for bicyclopyrone. This demonstration also provided a unique opportunity to see bicyclopyrone by itself and in combination with other herbicides. The addition of atrazine (SOA 5) or Callisto to bicyclopyrone improved waterhemp control to 81% and 97%, respectively. Stinger (SOA 4) soil applied was the weakest link, with about 35% control of giant ragweed, increasing to 93% with the addition of Callisto.




Summary

Approximately 100 farmers and agricultural professionals attended an educational field day in July and an additional 200 took the opportunity to look and learn about herbicide components and how they performed by touring throughout July and August in small groups. Overall impressions were very positive. Attendees found these demonstrations very valuable because they lacked knowledge, training and experience with individual SOA's performance in the field.