

Evaluation of Difficult to Control Broadleaf Weeds with an HPPD Herbicide Based Program in Soybean in SE Minnesota in 2016.

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The objective of this trial was to evaluate weed control systems and crop response in soybeans that are tolerant to HPPD herbicides in southeastern Minnesota. The research site was a Lawler loam series with pH of 7.0, O.M. 2.2% and soil test P and K levels of 26 ppm and 132 ppm, respectively. In the spring the field was disked and field cultivated once prior to planting. The previous crop was corn. The soybean variety was an HPPD herbicide tolerant variety and was planted May 6, 2016 at a depth of 1.5 inches in 30-inch rows at a rate of 129,000 seeds per acre. A randomized complete block design was used with three replications. Preemergence (PRE) treatments were applied with a tractor-mounted sprayer delivering 15 gpa at 30 psi using TTI 11002 spray tips. Postemergence (POST) applications were applied at 15 gpa and 30 psi using TTI 11002 spray tips for systemic herbicides and TTIJ60 11002 spray tips for contact herbicides. Evaluations of the plots were made on June 6, 13, 20, 27 and July 8. Application dates, environmental conditions, and weed stages can be found in Table 1. Performance ratings for giant ragweed, common lambsquarters, and common waterhemp control and crop response can be found in Tables 2 through 6, respectively. Common lambsquarters, common waterhemp and grass control was excellent for all systems. Giant ragweed control was excellent for all systems except for Boundary preemergence, which provided 20% control. Crop response was observed with Flexstar GT at 40% (Treatment 8, June 20) and 60% (Treatment 3, June 27). Some crop response, 15%, occurred with A21472 (s-metolachlor and dicamba premix) (Treatment 5), June 27. Crop was destroyed on July 19, 2016 to comply with protocol requirements. *Note: Treatments included in this trial contain unregistered products.* (University of Minnesota Extension Regional Office, Rochester.)

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

Date	5/6	6/17	6/24
Treatment	PRE	POST I	POST II
Temperature (F)			
Air	87.9	72	69
Soil	66.4	73.4	65.1
Relative Humidity (%)	20	78	78
Wind (mph)	20	10	6
Soil Moisture	Normal	Normal	Normal
Soybean			
Stage		V4	V5
Height (inch)		9.0	10.8
Giant Ragweed			
Weed Density (ft ²)		0	
Height (inch)		7.6	2.4
Common Lambsquarter			
Weed Density (ft ²)		2.4	
Height (inch)		12.5	0
Common Waterhemp			
Weed Density (ft ²)		3.1	0.6
Height (inch)		9.5	
Grass			
Weed Density (ft ²)		10	3.8
Height (inch)		5.8	
Rainfall after each application (inch)			
Week 1	1.13	0.41	0.70
Week 2	0.32	0.7	1.61
Week 3	0.21	1.61	0.82

Table 2. Giant ragweed control with HPPD (SOA 27) herbicide systems in HPPD tolerant soybean at Rochester, MN in 2016										
Pest Code Pest Name Rating Date				AMBTR						
				Giant ragweed						
No. Name				Rate	Appl	June 6	June 13	June 20	June 27	July 8
				Percent Control (%)						
1 UNTREATED CHECK						0 c	0 c	0 c	0 d	0 b
PRE 5/6/16 / POST I 6/17/16 (POSPOS - 2 to 3 inch weeds)										
8	SOA 5, 15 / 9, 14					17 b	20 b	94 b	99 a	99 a
	BOUNDARY	1.8	pt/a	A						
	N-PAK AMS	2.5	% v/v	B						
	FLEXSTAR GT	3.5	pt/a	B						
	MSO	1.0	% v/v	B						
PRE 5/6/16 / POST II 6/24/16 (POSPOS - 2 inch weeds)										
2	SOA 27, 15 / 9					98 a	97 a	98 a	98 bc	99 a
	CALLISTO	5	fl oz/a	A						
	DUAL MAGNUM	1.67	pt/a	A						
	N-PAK AMS	2.5	% v/v	C						
	ROUNDUP POWERMAX	26.6	fl oz/a	C						
3	SOA 27, 15 / 9, 14					98 a	97 a	98 a	99 a	99 a
	CALLISTO	5	fl oz/a	A						
	DUAL MAGNUM	1.67	pt/a	A						
	N-PAK AMS	2.5	% v/v	C						
	FLEXSTAR GT	3.5	pt/a	C						
	MSO	1.0	% v/v	C						
4	SOA 27, 15 / 9, 4					98 a	97 a	98 a	98 c	99 a
	CALLISTO	5	fl oz/a	A						
	DUAL MAGNUM	1.67	pt/a	A						
	AG13063	1.0	% v/v	C						
	ROUNDUP POWERMAX	26.6	fl oz/a	C						
	CLARITY	16	fl oz/a	C						
5	SOA 27, 15 / 9, 4, 15					98 a	98 a	98 a	99 ab	99 a
	CALLISTO	5	fl oz/a	A						
	DUAL MAGNUM	1.67	pt/a	A						
	AG13063	1.0	% v/v	C						
	ROUNDUP POWERMAX	26.6	fl oz/a	C						
	A21472	3.53	pt/a	C						
6	SOA 27, 15, 14 / 9					98 a	98 a	98 a	99 ab	99 a
	CALLISTO	5	fl oz/a	A						
	DUAL MAGNUM	1.67	pt/a	A						
	REFLEX	16	fl oz/a	A						
	N-PAK AMS	2.5	% v/v	C						
	ROUNDUP POWERMAX	26.6	fl oz/a	C						
7	SOA 27, 15, 5 / 9					98 a	97 a	97 a	98 bc	99 a
	CALLISTO	5	fl oz/a	A						
	DUAL MAGNUM	1.67	pt/a	A						
	TRICOR	5.3	oz wt/a	A						
	N-PAK AMS	2.5	% v/v	C						
	ROUNDUP POWERMAX	26.6	fl oz/a	C						
LSD P=.10						10	9	2	1	.

Table 3. Common lambsquarters control with HPPD (SOA 27) herbicide systems in HPPD tolerant soybean at Rochester, MN in 2016.

Pest Code				CHEAL									
				Common lambsquarters									
Pest Name													
Rating Date				June-6		June-13		June-20		June-27		July-8	
No. Name	Rate	Appl		Percent Control (%)									
1	UNTREATED CHECK			0	c	0	c	0	c	0	b	0	c
PRE 5/6/16 / POST I 6/17/16 (POSPOS - 2 to 3 inch weeds)													
8	SOA 5, 15 / 9, 14			98	b	89	b	98	b	99	a	99	a
	BOUNDARY	1.8	pt/a	A									
	N-PAK AMS	2.5	% v/v	B									
	FLEXSTAR GT	3.5	pt/a	B									
	MSO	1.0	% v/v	B									
PRE 5/6/16 / POST II 6/24/16 (POSPOS - 2 inch weeds)													
2	SOA 27, 15 / 9			99	a	99	a	99	a	99	a	99	b
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	N-PAK AMS	2.5	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
3	SOA 27, 15 / 9, 14			99	a	99	a	99	a	99	a	99	a
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	N-PAK AMS	2.5	% v/v	C									
	FLEXSTAR GT	3.5	pt/a	C									
	MSO	1.0	% v/v	C									
4	SOA 27, 15 / 9, 4			99	a	99	a	99	a	99	a	99	a
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	AG13063	1.0	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
	CLARITY	16	fl oz/a	C									
5	SOA 27, 15 / 9, 4, 15			99	a	99	a	99	a	99	a	99	a
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	AG13063	1.0	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
	A21472	3.53	pt/a	C									
6	SOA 27, 15, 14 / 9			99	a	99	a	99	a	99	a	99	a
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	REFLEX	16	fl oz/a	A									
	N-PAK AMS	2.5	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
7	SOA 27, 15, 5 / 9			99	a	99	a	99	a	99	a	99	a
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	TRICOR	5.3	oz wt/a	A									
	N-PAK AMS	2.5	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
LSD P=.10				0.5		5		1		.		0.3	

Table 4. Common waterhemp control with HPPD (SOA 27) herbicide systems in HPPD tolerant soybean at Rochester, MN in 2016.													
Pest Code Pest Name Rating Date				AMATA									
				Common waterhemp									
				June-6		June 13		June-20	June-27	July-8			
No. Name	Rate	Appl	Percent Control (%)										
1	UNTREATED CHECK			0	c	0	c	0	c	0	b	0	c
PRE 5/6/16 / POST I 6/17/16 (POSPOS – 2 to 3 inch weeds)													
8	SOA 5, 15 / 9, 14			98	b	90	b	99	a	99	a	99	a
	BOUNDARY	1.8	pt/a	A									
	N-PAK AMS	2.5	% v/v	B									
	FLEXSTAR GT	3.5	pt/a	B									
	MSO	1.0	% v/v	B									
PRE 5/6/16 / POST II 6/24/16 (POSPOS - 2 inch weeds)													
2	SOA 27, 15 / 9			99	a	99	a	99	a	99	a	99	a
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	N-PAK AMS	2.5	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
3	SOA 27, 15 / 9, 14			99	a	99	a	99	ab	99	a	99	a
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	N-PAK AMS	2.5	% v/v	C									
	FLEXSTAR GT	3.5	pt/a	C									
	MSO	1.0	% v/v	C									
4	SOA 27, 15 / 9, 4			99	a	99	a	98	b	99	a	99	a
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	AG13063	1.0	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
	CLARITY	16	fl oz/a	C									
5	SOA 27, 15 / 9, 4, 15			99	a	99	a	99	a	99	a	99	a
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	AG13063	1.0	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
	A21472	3.53	pt/a	C									
6	SOA 27, 15, 14 / 9			99	a	99	a	99	a	99	a	99	a
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	REFLEX	16	fl oz/a	A									
	N-PAK AMS	2.5	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
7	SOA 27, 15, 5 / 9			99	a	99	a	99	a	99	a	99	b
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	TRICOR	5.3	oz wt/a	A									
	N-PAK AMS	2.5	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
LSD P=.10				1		4		0.4				0.3	

Table 5. Grass control with HPPD (SOA 27) herbicide systems in HPPD tolerant soybean at Rochester, MN in 2016.

Pest Name					Grass species									
					June-6		June 13		June-20		June-27		July-8	
Rating Date					Percent Control (%)									
No.	Name	Rate	Appl											
1	UNTREATED CHECK			0	c	0	d	0	c	0	b	0	c	
PRE 5/6/16 / POST I 6/17/16 (POSPOS - 2 to 3 inch weeds)														
8	SOA 5, 15 / 9, 14			99	a	93	bc	99	a	99	a	98	b	
	BOUNDARY	1.8	pt/a	A										
	N-PAK AMS	2.5	% v/v	B										
	FLEXSTAR GT	3.5	pt/a	B										
	MSO	1.0	% v/v	B										
PRE 5/6/16 / POST II 6/24/16 (POSPOS - 2 inch weeds)														
2	SOA 27, 15 / 9			96	b	93	c	86	b	98	a	99	a	
	CALLISTO	5	fl oz/a	A										
	DUAL MAGNUM	1.67	pt/a	A										
	N-PAK AMS	2.5	% v/v	C										
	ROUNDUP POWERMAX	26.6	fl oz/a	C										
3	SOA 27, 15 / 9, 14			99	a	99	ab	99	a	99	a	99	a	
	CALLISTO	5	fl oz/a	A										
	DUAL MAGNUM	1.67	pt/a	A										
	N-PAK AMS	2.5	% v/v	C										
	FLEXSTAR GT	3.5	pt/a	C										
	MSO	1.0	% v/v	C										
4	SOA 27, 15 / 9, 4			99	a	99	ab	98	a	99	a	99	a	
	CALLISTO	5	fl oz/a	A										
	DUAL MAGNUM	1.67	pt/a	A										
	AG13063	1.0	% v/v	C										
	ROUNDUP POWERMAX	26.6	fl oz/a	C										
	CLARITY	16	fl oz/a	C										
5	SOA 27, 15 / 9, 4, 15			99	a	99	a	99	a	99	a	99	a	
	CALLISTO	5	fl oz/a	A										
	DUAL MAGNUM	1.67	pt/a	A										
	AG13063	1.0	% v/v	C										
	ROUNDUP POWERMAX	26.6	fl oz/a	C										
	A21472	3.53	pt/a	C										
6	SOA 27, 15, 14 / 9			99	a	99	a	99	a	99	a	99	a	
	CALLISTO	5	fl oz/a	A										
	DUAL MAGNUM	1.67	pt/a	A										
	REFLEX	16	fl oz/a	A										
	N-PAK AMS	2.5	% v/v	C										
	ROUNDUP POWERMAX	26.6	fl oz/a	C										
7	SOA 27, 15, 5 / 9			98	ab	98	abc	98	a	99	a	99	a	
	CALLISTO	5	fl oz/a	A										
	DUAL MAGNUM	1.67	pt/a	A										
	TRICOR	5.3	oz wt/a	A										
	N-PAK AMS	2.5	% v/v	C										
	ROUNDUP POWERMAX	26.6	fl oz/a	C										
LSD P=.10				3	6	11	1	1						

Table 6. HPPD tolerant soybean response to HPPD (SOA 27) herbicide systems at Rochester, MN in 2016.

Rating Date				Crop Response									
				June-6	June-13	June-20	June-27	July-8					
No.	Name	Rate	Appl	Percent Injury(%)									
1	UNTREATED CHECK			0	b	0	-	0	b	0	e	0	c
PRE 5/6/16 / POST I 6/17/16 (POSPOS - 2 to 3 inch weeds)													
8	SOA 5, 15 / 9, 14			10	a	0	-	40	a	27	b	7	b
	BOUNDARY	1.8	pt/a	A									
	N-PAK AMS	2.5	% v/v	B									
	FLEXSTAR GT	3.5	pt/a	B									
	MSO	1.0	% v/v	B									
PRE 5/6/16 / POST II 6/24/16 (POSPOS - 2 inch weeds)s													
2	SOA 27, 15 / 9			10	a	0	-	0	b	0	e	0	c
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	N-PAK AMS	2.5	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
3	SOA 27, 15 / 9, 14			10	a	0	-	0	b	60	a	20	a
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	N-PAK AMS	2.5	% v/v	C									
	FLEXSTAR GT	3.5	pt/a	C									
	MSO	1.0	% v/v	C									
4	SOA 27, 15 / 9, 4			10	a	0	-	0	b	7	d	0	c
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	AG13063	1.0	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
	CLARITY	16	fl oz/a	C									
5	SOA 27, 15 / 9, 4, 15			10	a	0	-	0	b	15	c	8	b
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	AG13063	1.0	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
	A21472	3.53	pt/a	C									
6	SOA 27, 15, 14 / 9			10	a	0	-	0	b	0	e	0	c
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	REFLEX	16	fl oz/a	A									
	N-PAK AMS	2.5	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
7	SOA 27, 15, 5 / 9			10	a	0	-	0	b	0	e	0	c
	CALLISTO	5	fl oz/a	A									
	DUAL MAGNUM	1.67	pt/a	A									
	TRICOR	5.3	oz wt/a	A									
	N-PAK AMS	2.5	% v/v	C									
	ROUNDUP POWERMAX	26.6	fl oz/a	C									
LSD P=.10										2		3	