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Soil-applied weed control in corn. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND, to evaluate weed efficacy to soil applied corn herbicides. DeKalb 'DKC 33-54' Roundup Ready corn was planted on April 28, 2010. PRE treatments were applied on April 29 at 7:55 am with 54 F air, 52 F soil at a four inch depth, 95% relative humidity, 100% cloud cover, 7 to 10 mph SE wind, dry soil surface and wet subsoil. Soil characteristics were: 27% sand, 53.6% silt, 19.3% clay, silt loam texture, 4.4% OM and 7.2 pH. POST treatments were applied on June 14 at 9:35 am with 62 F air, 66 F soil surface, 77% relative humidity, 100% cloud cover, 1 to 3 mph E wind, dry soil surface, moist subsoil, good crop vigor and no dew present to V5 (10 to 16 inch) corn. Weed species present at the time of POST applications were: 1 to 16 inch (0 to 40/ft²) common lambsquarters; 1 to 8 inch (0 to 15/ft²) yellow foxtail; 1 to 8 inch diameter (0 to 10/yd²) wild buckwheat; 1 to 4 inch (0 to 10/yd²) hairy nightshade; 1 to 6 inch (0 to 5/yd²) common ragweed; 2 to 6 leaf (0 to 5/yd²) common cocklebur; 1 to 16 inch (0 to 40/ft²) redroot pigweed; and 1 to 16 inch (<1/yd²) wild mustard. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

0% crop injury and 99% control of wild mustard (data not shown). 99% control of yellow foxtail on June 24, and July 8 (data not shown). Fierce is a premix of Valor + KIH-485 (pyoxasulfone), a new active ingredient similar to acetanilide herbicides (Lasso, Dual, etc.) PRE treatments contains high rates of atrazine generally gave the highest weed control. This research supports the use of a PRE followed by POST approach to weed control in conventional and RR crops. (Department of Plant Sciences, North Dakota State University, Fargo).

Table. Soil-applied weed control in corn (Zollinger, Ries, Kazmierczak).

Treatment ¹	Rate (product/A)	May 27 (28 DAT - PRE)				June 24				July 8					
		Yeff	Rpww	Colq	Wibw	Hans	Corw	Cocb	Yeff	Rpww	Colq	Wibw	Hans	Corw	Cocb
		----- % control -----				----- % control -----				----- % control -----					
PRE/POST															
Fierce/RUPM+Atrazine+AMS	3oz/22fl oz+0.56lb+2.5lb	96	83	77	60	70	43	7	99	99	82	99	80	99	99
Valor SX/RUPM+Atrazine+AMS	2oz/22fl oz+1.1lb+2.5lb	20	50	50	40	40	40	20	99	99	99	99	99	99	99
Bicep II Magnum+RUPM+AMS	1.5qt/22fl oz+2.5lb	99	99	99	90	75	77	67	99	99	99	99	99	99	99
Lexar/RUPM+AMS	1.5qt/22fl oz+2.5lb	83	99	99	99	80	99	72	99	99	99	99	99	99	99
Convus+Atrazine/RUPM+Atrazine	3fl oz+1.1lb/22fl oz+2.5lb	86	98	96	91	91	79	66	99	99	99	99	99	99	99
Fierce/RUPM+AMS	3oz/22fl oz+2.5lb	83	80	72	53	63	40	0	99	86	86	99	99	99	99
Integrity/RUPM+AMS	13fl oz/22fl oz+2.5lb	88	99	93	87	83	68	47	99	99	99	99	99	99	99
POST															
RUPM+AMS	22fl oz+2.5lb	-	-	-	-	-	-	-	93	72	73	73	73	95	83
LSD (0.05)		8	4	12	13	12	14	18	3	10	9	3	3	3	3
¹ RUPM = Roundup PowerMax.															

Balance Flexx in corn. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND, to evaluate weed efficacy in corn herbicide programs. Pioneer '39B23' Liberty Link/Roundup Ready corn was planted on April 28, 2010. PRE treatments were applied on April 29 at 8:15 am with 54 F air, 52 F soil at a four inch depth, 100% relative humidity, 100% cloud cover, 7 to 10 mph SE wind, damp soil surface and wet subsoil. Soil characteristics were: 27.5% sand, 51.4% silt, 21.1% clay, silt loam texture, 4.4% OM and 6.5 pH. EPOST treatments were applied on June 3 at 9:35 am with 72 F air, 82 F soil surface; 37% relative humidity, 0% cloud cover, 3 to 5 mph S wind, dry soil surface, moist subsoil, excellent crop vigor and no dew present to V3 (5 to 8 inch) corn. Weed species present at the time of EPOST applications were: 0.5 to 1 inch (3 to 5/yd²) redroot pigweed; 2 to 3 inch diameter (1/1yd²) wild buckwheat; 1 to 3 inch (1 to 5/ft²) common ragweed; 4 to 8 inch diameter (1 to 5/yd²) wild mustard; 3 to 5 inch (5 to 10/ft²) yellow foxtail; 1 to 2 inch (1 to 3/yd²) hairy nightshade; and 1 to 3 inch (1 to 3/yd²) marshelder. MPOST treatments were applied on June 9 at 10:15 am with 60 F air, 64 F soil surface, 82% relative humidity, 100% cloud cover, 12 to 15 mph NW wind, dry soil surface, moist subsoil, excellent crop vigor and no dew present to V4 (12 to 14 inch) corn. Weed species present at the time of MPOST applications were: 1 to 2 inch (1 to 2/1yd²) redroot pigweed; 2 to 4 inch (1 to 2/1yd²) wild buckwheat; 2 to 3 inch (1/1yd²) common ragweed; 1 to 2 inch (1 to 2/1yd²) wild mustard; 2 to 5 inch (5 to 10/ft²) yellow foxtail; 1 to 3 inch (1 to 5/1yd²) hairy nightshade; and 1 to 3 inch (1/1yd²) marshelder. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE, EPOST and MPOST treatments. The experiment had a randomized complete block design with three replicates per treatment.

No corn injury was observed at all evaluation dates (data not shown). PRE treatments controlled small-seed weeds. Most PRE/POST and EPOST treatments provided near complete weed control. This research supports the use of a PRE followed by POST approach to weed control in conventional and RR crops. (Department of Plant Sciences, North Dakota State University, Fargo).

Table. Balance Flexx in corn (Zollinger, Ries, Kazmierczak).

Treatment ¹	Rate (product/A)	35 DAT - PRE										June 16						
		Yeft	Wimu	Rrpw	Colq	Koch	Hans	Wibw	Corw	Yeft	Wimu	Rrpw	Colq	Koch	Hans	Wibw	Mael	Corw
		----- % control -----										----- % control -----						
PRE																		
Corvus+Atrazine	2.5oz+0.42lb	72	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
PRE/MPOST																		
Balance Flexx/Laudis+Atrazine+	3oz/3fl oz+0.42lb+																	
Soy-Stik+28%	1.25pt+1.5qt	50	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Balance Flexx/Laudis+Atrazine+RUPM+	3oz/3fl oz+0.42lb+22fl oz+																	
Destiny HC+AMS	1% v/v+8.5lb/100gal	50	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Balance Flexx/Laudis+Atrazine+RUPM+	3oz/3fl oz+0.42lb+11fl oz+																	
Destiny HC+AMS	1% v/v+8.5lb/100gal	50	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Balance Flexx/Laudis+Ignite+	3oz/3fl oz+22fl oz+																	
Atrazine+AMS	0.42lb+17lb/100gal	50	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Lumax/Lumax+R-11	1.5qt/1.5qt+0.25% v/v	83	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
EPOST																		
Laudis+Atrazine+Soy-Stik+28%	3fl oz+0.42lb+1.25pt+1.5qt																	
Laudis+Atrazine+Ignite+AMS	3fl oz+0.42lb+22fl oz+17lb/100gal																	
RUPM+Impact+Atrazine+	22fl oz+0.75fl oz+0.42lb+																	
Soy-Stik+AMS	1.25pt+8.5lb/100gal																	
RUPM+Impact+Atrazine+	22fl oz+0.5fl oz+0.42lb+																	
Soy-Stik+AMS	1.25pt+8.5lb/100gal																	
RUPM+Cadet+	22fl oz+0.5oz+																	
R-11+AMS	0.25% v/v+8.5lb/100gal																	
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		8	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
¹ RUPM = Roundup PowerMax.																		

Table cont. Balance Flexx in corn (Zollinger, Ries, Kazmierczak).

Treatment ¹	Rate (product/A)	June 23					July 7 and August 4													
		Yeft	Wimu Rrpw	Colg	Koch Hans	Wibw Mael	Corw	Yeft	Wimu Rrpw	Colg	Koch Hans	Wibw Mael	Corw							
		----- % control -----					----- % control -----													
<u>PRE</u>																				
Corvus+Atrazine	2.5oz+0.42lb	62	99	92	96	96	75	50	99	78	73	99	92	96	96	82	68	99	99	80
<u>PRE/MPOST</u>																				
Balance Flexx/Laudis+Atrazine+	3oz/3fl oz+0.42lb+																			
Soy-Stik+28%	1.25pt+1.5qt	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Balance Flexx/Laudis+Atrazine+RUPM+	3oz/3fl oz+0.42lb+22fl oz+																			
Destiny HC+AMS	1% v/v+8.5lb/100gal	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Balance Flexx/Laudis+Atrazine+RUPM+	3oz/3fl oz+0.42lb+11fl oz+																			
Destiny HC+AMS	1% v/v+8.5lb/100gal	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Balance Flexx/Laudis+Ignite+	3oz/3fl oz+22fl oz+																			
Atrazine+AMS	0.42lb+17lb/100gal	92	99	99	99	99	99	99	99	99	96	99	99	99	99	99	99	99	99	99
Lumax/Lumax+R-11	1.5qt/1.5qt+0.25% v/v	95	99	99	99	99	99	99	99	99	96	99	99	99	99	99	99	99	99	99
<u>EPOST</u>																				
Laudis+Atrazine+Soy-Stik+28%	3fl oz+0.42lb+1.25pt+1.5qt	99	99	98	98	99	99	99	99	99	88	99	98	99	99	99	99	99	99	99
Laudis+Atrazine+Ignite+AMS	3fl oz+0.42lb+22fl oz+17lb/100gal	75	99	99	99	99	99	99	99	99	87	99	99	99	99	99	99	99	99	99
RUPM+Impact+Atrazine+	22fl oz+0.75fl oz+0.42lb+																			
Soy-Stik+AMS	1.25pt+8.5lb/100gal	99	99	93	99	99	98	99	99	99	89	99	93	99	99	98	99	99	99	99
RUPM+Impact+Atrazine+	22fl oz+0.5fl oz+0.42lb+																			
Soy-Stik+AMS	1.25pt+8.5lb/100gal	99	99	86	99	99	99	99	99	99	87	99	86	99	99	99	99	99	99	99
RUPM+Cadet+	22fl oz+0.5oz+																			
R-11+AMS	0.25% v/v+8.5lb/100gal	84	99	75	77	75	75	60	99	68	84	99	76	78	77	77	63	99	99	72
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		8	NS	6	5	4	7	11	NS	5	6	NS	4	4	3	4	9	NS	3	3

¹RUPM = Roundup PowerMax.

Kixor in corn. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND, to evaluate weed efficacy to PRE/POST programs in corn. DeKalb 'DKC 33-54' Roundup Ready corn was planted on April 28, 2010. PRE treatments were applied on April 29 at 7:45 am with 54 F air, 52 F soil at a four inch depth, 95% relative humidity, 100% cloud cover, 7 to 12 mph SE wind, dry soil surface and wet subsoil. Soil characteristics were: 27% sand, 53.6% silt, 19.3% clay, silt loam texture, 4.4% OM and 7.2 pH. POST treatments were applied on June 14 at 9:25 am with 62 F air, 66 F soil surface, 77% relative humidity, 100% cloud cover, 1 to 3 mph E wind, dry soil surface, moist subsoil, excellent crop vigor and no dew present to V5 (12 to 14 inch) corn. Weed species present at the time of POST applications were: 1 to 12 inch (0 to 30/ft²) common lambsquarters; 1 to 5 inch (0 to 15/ft²) yellow foxtail; 1 to 4 inch (0 to 10/ft²) hairy nightshade; 2 to 4 inch (0 to 5/yd²) wild buckwheat; 1 to 12 inch (0 to 20/ft²) redroot pigweed; 1 to 8 inch (0 to 1/yd²) Kochia; 1 to 5 inch (0 to 5/yd²) common ragweed; and cotyledon to 6 inch (0 to 1/yd²) wild mustard. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

0% crop injury and 99% control of wild mustard (data not shown). Many PRE treatments gave near complete weed control. This research supports the use of a PRE followed by POST approach to weed control in conventional and RR crops. (Department of Plant Sciences, North Dakota State University, Fargo).

Table. Kixor in corn. (Zollinger, Ries, Kazmierczak).

Treatment ¹	Rate (product/A)	28 DAT - PRE						28 DAT - POST					
		Yeft	Rrpw	Colq	Wibw	Hans	Corw	Yeft	Rrpw	Colq	Wibw	Hans	Corw
		----- % control -----						----- % control -----					
PRE/POST													
Integrity/RUPM+R-11+AMS	13fl oz/22fl oz+0.25% v/v+17lb/100gal	94	99	87	99	99	99	99	99	99	99	99	99
Lumax/RUPM+R-11+AMS	2qt/22fl oz+0.25% v/v+17lb/100gal	99	99	99	99	99	99	99	99	99	99	99	99
Corvus/RUPM+R-11+AMS	5.6fl oz/22fl oz+0.25% v/v+17lb/100gal	96	99	99	99	77	53	99	99	99	99	99	99
Sharpen/RUPM+R-11+AMS	2.5fl oz/22fl oz+0.25% v/v+17lb/100gal	17	72	40	83	99	50	80	99	99	99	99	99
Harness Xtra/RUPM+R-11+AMS	1.5qt/22fl oz+0.25% v/v+17lb/100gal	96	99	96	99	86	82	94	99	99	99	99	99
Sharpen+Harness Xtra/ RUPM+R-11+AMS	2.5fl oz+1.5qt/ 22fl oz+0.25% v/v+17lb/100gal	99	99	99	99	99	99	99	99	99	99	99	99
SureStart/RUPM+R-11+AMS	1.75pt/22fl oz+0.25% v/v+17lb/100gal	87	93	73	83	62	40	78	99	99	99	99	99
Integrity/RUPM+Status+ R-11+AMS	13fl oz/22fl oz+2.5oz+ 0.25% v/v+17lb/100gal	96	99	91	99	99	99	99	99	99	99	99	99
Untreated		0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		5	6	12	15	8	9	9	NS	NS	NS	NS	NS

¹RUPM = Roundup PowerMax

Weed control with Kixor herbicide in corn, Carrington, 2010. (Greg Endres). The experiment was conducted at the NDSU Carrington Research Extension Center in cooperation with BASF. Experimental design was a randomized complete block with three replicates. The reduced-till trial was conducted on previous wheat ground with 61% crop residue present after planting. Spring soil analysis indicated 3.5% organic matter, 6.7 pH, 94 lb nitrate-N/A, 10 ppm phosphorus, 153 ppm potassium, and 0.69 ppm zinc. DeKalb 'DKC33-53' Roundup Ready corn was planted May 4 at a rate of 26,000 seeds/A. Herbicide treatments were applied with a hand-held boom sprayer delivering 11.5 gal/A at 35 psi through 8001 flat fan nozzles to the center 6.7 ft of 10- by 25-ft plots. PRE treatments were applied on May 5 with 38 F, 94% RH, 95% cloudy sky, and 10 mph wind to 1-inch tall common lambsquarters and wild buckwheat. Rainfall totaled 0.51" during two days following application of herbicides (NDAWN). POST treatments were applied on June 21 with 75 F, 72% RH, 65% cloudy sky, and 11 mph wind to V5 stage corn, 4-leaf to tillering green and yellow foxtail, and 2- to 5-inch tall common lambsquarters and wild buckwheat.

No crop response was noted. Visual evaluation of PRE herbicide performance in June (4 and 7 weeks after treatment) indicated excellent (91-99%) control of all weeds with Integrity and Sharpen plus Harness Xtra tank mixed with glyphosate (Table). Generally excellent (89-99%) control of common lambsquarters was achieved following POST treatments (glyphosate or glyphosate tank mixture) during the evaluation on July 28. Also, wild buckwheat control was good to excellent (86-96%) on July 28 with treatments that included Lumax, Harness Xtra, Sharpen plus Harness Xtra, and Integrity plus Status.

Table.												
Herbicide				Weed control (%) ¹								
Treatment ²		Rate	Timing ³	2-Jun			21-Jun			28-Jul		
No.		fl oz product/A		fota	colq	wibw.	fota	colq	wibw	fota	colq	wibw
1	untreated check	x	x	0	0	0	0	0	0	0	0	0
2	Integrity	13	PRE	91	98	96	75	96	73	70	89	75
3	Lumax	64	PRE	78	99	81	71	99	68	76	99	86
4	Harness Xtra	48	PRE	93	96	81	81	88	69	73	98	91
5	Sharpen	2.5	PRE	96	99	99	90	99	93	71	98	96
	Harness Xtra	48	PRE									
6	SureStart	28	PRE	73	95	74	67	78	65	70	95	75
7	Integrity	13	PRE	92	97	90	78	97	75	72	91	95
	Status	2.5 oz wt	POST									
C.V. (%)				3.5	2.6	11.8	7.3	7.5	7.0	3.5	3.3	9.6
LSD (0.05)				5	4	16	9	11	8	4	5	13
¹ fota=green and yellow foxtail; colq=common lambsquarters; wibw=wild buckwheat.												
² PRE and POST treatments include Roundup PowerMax (Monsanto) at 22 fl oz/A plus NIS (Preference, WinField Solutions) at 0.25% v/v plus AMS (N-Pak AMS Liquid, WinField Solutions) at 64 fl oz/A. Integrity and Sharpen treatments also include MSO (Destiny, WinField Solutions) at 1% v/v.												
³ PRE=May 5; POST=June 21.												

Laudis with adjuvant packages in corn. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND, to evaluate weed efficacy with Laudis and adjuvant types in corn. Pioneer '39B23' Liberty Link/Roundup Ready corn was planted on April 28, 2010. MPOST treatments were applied on June 9 at 10:45 am with 60 F air, 64 F soil surface, 82% relative humidity, 100% cloud cover, 12 to 15 mph NW wind, dry soil surface, moist subsoil, excellent crop vigor and no dew present to V3 to V4 (10 to 12 inch) corn. Soil characteristics were: 27% sand, 53.6% silt, 19.3% clay, silt loam texture, 4.4% OM and 7.2 pH. Weed species present at the time of MPOST applications were: 4 to 10 inch (5 to 30/ft²) common lambsquarters; 3 to 4 inch (5 to 15/ft²) yellow foxtail; 4 to 7 inch (5 to 10/ft²) common ragweed; 4 to 10 inch (1 to 10/ft²) kochia; 4 to 10 inch (5 to 15/ft²) redroot pigweed; 6 to 8 inch (1 to 5/ft²) common mustard; 3 to 4 inch (1 to 15/ft²) common mallow; 7 to 8 inch (1 to 5/ft²) common cocklebur; 5 to 6 inch (1 to 3/ft²) wild buckwheat; and 2 to 5 inch (1 to 10/ft²) hairy nightshade. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for MPOST treatments. The experiment had a randomized complete block design with three replicates per treatment.

0% injury observed (data not shown). 99% control of wild mustard, common lambsquarters, hairy nightshade, kochia, and wild buckwheat 14, 28, and 56 DAT (data not shown). At final evaluations, weed control was similar with most treatments. Yellow foxtail control was lower with Dyne-Amic, an MSO + organosilicone adjuvant, which results are similar to other adjuvant trials previously conducted. (Department of Plant Sciences, North Dakota State University, Fargo).

Table. Laudis with adjuvant packages in corn (Zollinger, Ries, Kazmierczak).

Treatment ¹	Rate (product/A)	14 DAT			28 and 56 DAT		
		Yeft	Rrpw	Corw	Yeft	Rrpw	Corw
		----- % control -----			----- % control -----		
Impact+Atrazine+MSO+AMS	3fl oz+0.42lb+1% v/v+8.5lb/100gal	83	68	99	82	62	99
Laudis+Atrazine+ MSO+AMS	3fl oz+0.42lb+ 1% v/v+8.5lb/100gal	90	86	99	90	86	99
MSO+WeatherGard Complete	1% v/v+2qt/100gal	78	72	77	85	98	96
Destiny HC+CANG+Interlock	0.5% v/v+5qt/100gal+4fl oz	87	85	99	87	85	99
Dyne-Amic+Request+Grounded	2qt/100gal+2qt/100gal+1qt/100gal	65	63	99	72	96	99
Sundance II+Array	1.5pt+9lb/100gal	82	80	99	80	96	99
Soy-Stik+Gardian Plus	1.5pt+2qt/100gal	89	86	99	92	96	99
SuperSpread MSO+Bronc EDT	1.5pt+2qt/100gal	85	86	99	95	97	99
Untreated		0	0	0	0	0	0
LSD (0.05)		7	7	2	7	5	1

¹MSO = MSO Concentrate with Leci-Tech from Loveland, CANG = Class Act NG.

Realm Q in corn. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND, to evaluate crop response and weed efficacy in corn from Realm Q herbicide. Pioneer '39B23' Liberty Link/Roundup Ready corn was planted on April 28, 2010. PRE treatments were applied on April 29, 2010 at 8:10 am with 54 F air, 52 F soil at a four inch depth, 95% relative humidity, 100% cloud cover, 7 to 10 mph SE wind, dry soil surface and wet subsoil. Soil characteristics were: 27% sand, 53.6% silt, 19.3% clay, silt loam texture, 4.4% OM and 7.2 pH. POST treatments were applied on June 3 at 10:00 am with 72 F air, 82 F soil surface, 37% relative humidity, 0% cloud cover, 3 to 5 mph S wind, dry soil surface, moist subsoil, good crop vigor and no dew present to V2 to V3 (5 to 6 inch) corn. Weed species present at the time of POST applications were: 1 to 3 inch (5 to 40/yard²) common ragweed; 2 to 3 inch (10 to 20/ft²) yellow foxtail; 1 inch (1 to 2/yard²) redroot pigweed; 0.5 to 1.5 inch (5 to 30/ft²) hairy nightshade; 1 to 3 inch (1 to 15/ft²) common lambsquarters; and 1 to 4 inch (<1/yard²) common cocklebur. Weed species in plots with PRE treatments were: 1 to 3 inch (0 to 5/yard²) common ragweed; 1 to 2 inch (5 to 10/ft²) yellow foxtail; 0.5 to 1 inch (0 to 10/yard²) hairy nightshade; 1 to 2 inch (1 to 2/yard²) common lambsquarters; and 1 to 2 inch (<1/yard²) common cocklebur. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

0% crop injury and 99% wild mustard control from all treatments (data not shown). Realm Q is a mixture of Resolve + Isoxadifen (safener) + Mesotrione 50WG. Yellow foxtail control was not greater than 86%. Treatments that provided the greatest control were those containing glyphosate or Ignite. The PRE followed by POST treatment of Resolve + Balance fb Realm Q + adjuvants also provided adequate weed control. (Department of Plant Sciences, North Dakota State University, Fargo).

Table. Realm Q in corn (Zollinger, Ries, Kazmierczak).

Treatment ¹	Rate (product/A)	14 DAT - POST					28 and 56 DAT - POST						
		Yeft	Rrpw	Colq	Hans	Koch	Conw	Yeft	Rrpw	Colq	Hans	Koch	Corw
		----- % control -----											
PRE/POST													
Cinch ATZ/Realm Q+Herbimax+AMS	1qt/4oz+1% v/v+2lb	87	99	99	60	57	30	83	99	99	73	77	47
Resolve+Balance WG/Realm Q+ Herbimax+AMS	1oz+0.5oz/4oz+ 1% v/v+2lb	83	99	99	95	99	99	77	99	99	95	99	99
POST													
Realm Q+Herbimax+AMS	4oz+1% v/v+2lb	37	99	75	50	40	25	37	94	78	50	40	38
Realm Q+BuccaneerPlus+AMS	4oz+1qt+2lb	99	99	93	93	99	91	86	94	91	90	96	90
Realm Q+Ignite+AMS	4oz+22fl oz+2lb	43	99	99	63	99	91	43	99	99	63	99	91
Realm Q+Atrazine+Herbimax+AMS	4oz+0.42lb+1% v/v+2lb	65	65	77	50	50	47	65	75	83	70	63	53
Steadfast+Isox+Meso+ Herbimax+AMS	0.75oz+0.125oz+1.25oz+ 1% v/v+2lb	63	99	72	47	43	43	67	99	77	57	53	43
LSD (0.05)		12	9	8	11	9	10	14	9	9	12	7	11

¹Realm Q = Resolve 25SG + Isoxadifen (safener) + Mesotrione 50 WG; Isox = Isoxadifen; Meso = Mesotrione 50WG.

Corn response to foliar fungicide and pre-harvest desiccant, Carrington, 2010.

(Greg Endres, Joel Ransom, and Paul Hendrickson)

Trial objectives are to measure potential yield increase with foliar-applied 'plant health' fungicide and explore potential for quicker seed dry-down and harvest using a pre-harvest desiccant. The conventional-till, dryland field trial was established at the NDSU Carrington Research Extension Center on a Heimdal-Emrick loam soil with soybean as the previous crop. Experimental design was a split plot [main plot=hybrids (2) and subplots=fungicide (2 trts) and desiccant (2 trts)] with four replications. Roundup Ready Peterson Farms Seed '21A78' [78-day relative maturity (RM)] and DeKalb 'DKC36-34' (86-day RM) were planted in 8-row plots with 30-ft depth and 30-inch row spacing on May 4. Plants emerged on May 24 and were thinned on June 14 for a targeted stand of 26,000 plants/A. Best management practices were used for corn production. Headline (pyraclostrobin) at 6 fl oz/A + Preference (NIS) at 0.25% v/v was applied with a tractor-mounted CO₂ sprayer with 80015 flat fan nozzles delivering 15 gal/A at 35 psi at the VT (tassel) stage on July 23 with 66 degrees F, 86% RH and 5 mph wind. Common leaf rust was visually evaluated on August 5 by examining ten ear leaves/plot. Gramoxone Inteon (paraquat) at 32 fl oz/A + Preference (NIS) at 0.25% v/v was applied on September 22 with 46 degrees F, 91% RH and 12 mph wind to the 78-day RM hybrid and on September 28 with 67 degrees F, 57% RH and 12 mph wind to the 86-day RM hybrid. Seed was sampled from the early-maturing hybrid on September 20 and moisture estimated at 39%. Seed was sampled from the late-maturing hybrid on September 27 and moisture estimated at 34%. Two hours of killing temperatures (26-28 degrees F) occurred on October 2. The trial was harvested with a plot combine on October 13.

The 86-day RM hybrid had greater yield but lower test weight and greater seed moisture compared to the 78-day RM hybrid (Table 1). Common leaf rust incidence was less with fungicide but severity was very low (0 to 5%) across the trial. Seed yield, moisture, protein and starch; and test weight were similar with fungicide compared to the untreated check. Seed moisture was similar between desiccant and untreated check. Factor interactions were statistically non-significant for leaf rust, test weight, and seed moisture, protein and starch (Table 2).

Table 1. Corn response to main factors, Carrington, 2010.

Treatment	Corn					
	Common leaf rust	Seed yield	Test weight	Seed moisture	Seed protein	Seed starch
Name	% incidence	bu/A	lb/bu	%		
<u>Hybrid:</u>						
PFS 21A78 (78 day RM)	40	157.0	58.5	15.5	9.2	69.9
DeKalb DKC36-34 (86 day RM)	50	187.7	56.5	16.1	8.7	70.5
LSD (0.05)	NS	11.4	0.6	0.4	0.2	NS
<u>Fungicide:</u>						
Headline	40	172.2	57.5	15.9	8.9	70.2
untreated check	60	172.5	57.5	15.8	9.0	70.2
LSD (0.05)	10	NS	NS	NS	NS	NS
<u>Desiccant:</u>						
paraquat	50	174.8	57.7	15.8	8.9	70.2
untreated check	50	169.9	57.3	15.8	8.9	70.3
LSD (0.05)	NS	NS	NS	NS	NS	NS
mean	5	172.4	57.5	15.8	8.9	70.2
CV (%)	30.6	9.0	1.5	3.8	3.3	0.8

Table 2. Corn response to factor interactions, Carrington, 2010.

Treatment		Corn					
		Common leaf rust	Seed yield	Test weight	Seed moisture	Seed protein	Seed starch
		% incidence	bu/A	lb/bu	%		
<u>Hybrid:</u>	<u>Fungicide:</u>						
PFS 21A78 (78 day RM)	Headline	30	162.5	58.7	15.4	9.2	69.8
DeKalb DKC36-34 (86 day RM)	Headline	40	181.9	56.3	16.3	8.6	70.7
PFS 21A78	untreated check	60	151.5	58.3	15.5	9.2	70.1
DeKalb DKC36-34	untreated check	60	193.6	56.7	16.0	8.8	70.4
LSD (0.05)		NS	16.2	NS	NS	NS	NS
<u>Hybrid:</u>	<u>Desiccant:</u>						
PFS 21A78	paraquat	40	165.2	58.8	15.4	9.2	70.0
DeKalb DKC36-34	paraquat	50	184.5	56.6	16.2	8.7	70.4
PFS 21A78	untreated check	50	148.8	58.2	15.6	9.2	69.8
DeKalb DKC36-34	untreated check	50	191.0	56.4	16.0	8.7	70.7
LSD (0.05)		NS	16.2	NS	NS	NS	NS
<u>Fungicide:</u>	<u>Desiccant:</u>						
Headline	paraquat	30	172.1	57.6	15.9	8.9	70.1
untreated check	paraquat	60	177.5	57.8	15.7	9.0	70.2
Headline	untreated check	40	172.2	57.4	15.8	8.9	70.4
untreated check	untreated check	60	167.6	57.2	15.8	9.0	70.2
LSD (0.05)		NS	NS	NS	NS	NS	NS
mean		5	172.4	57.5	15.8	8.9	70.2
CV (%)		30.6	9.0	1.5	3.8	3.3	0.8

Corn response to special product tank mixtures with glyphosate, Carrington, 2010.

(Greg Endres and Rick Glatt)

The field trial was conducted at the NDSU Carrington Research Extension Center in cooperation with Loveland Products to examine corn performance with nutritional product tank mixtures with glyphosate. Experimental design was a randomized complete block with three replications. The reduced-till trial was conducted on previous wheat ground with spring soil analysis: 3.5% organic matter, 6.7 pH, 94 lb/A nitrate-N, 10 ppm phosphorus, 153 ppm potassium, 16 lb/A chloride, 46 lb/A sulfur, 0.5 ppm boron, 0.69 ppm zinc, and other micronutrients at medium to high levels. DeKalb 'DKC33-53' Roundup Ready corn was planted May 4 at a targeted rate of 26,000 seeds/A in 30-inch rows. Glyphosate at 0.56 lb ae/A was applied across the trial on June 2. Treatments were applied with a CO₂-pressurized hand-boom sprayer delivering 12 gal/A at 35 psi with 8001 flat-fan nozzles on June 21 with 72 F, 81% RH, 6 mph wind, and 75% cloudy sky to 5-collar corn, 2- to 4-leaf grass weeds (yellow and green foxtail, and barnyardgrass) and 1- to 2-inch height annual broadleaf weeds (common lambsquarters, prostrate and redroot pigweed, and wild buckwheat). The trial was harvested with a plot combine on October 13.

Weed control with Makaze (3 lb ae/gal glyphosate-ipa; UAP) tank mixtures generally were similar (table). Corn silk date, seed yield and moisture, and test weight with Makaze tank mixtures were similar.

Table.										
Treatment ¹			Corn				Weed control (%) ²			
Name	Rate	Unit	Silk date	Seed yield	Test weight	Seed moisture	7/9		7/29	
			Jday	bu/A	lb/bu	%	grass	broadleaf	grass	broadleaf
Untreated check	x	x	208	132.7	53.7	15.9	0	0	0	0
LI6339	32	fl oz/a	208	134.2	53.9	15.4	72	83	67	75
WeatherGard	0.5	% v/v								
Makaze	32	fl oz/a								
Black Jack Zn	16	fl oz/a	208	131.2	53.3	16.3	79	91	68	74
Weathergard	0.5	% v/v								
Makaze	32	fl oz/a								
BoMnZn	10	fl oz/a	208	127.6	53.5	16.1	79	90	69	77
WeatherGard	0.5	% v/v								
Makaze	32	fl oz/a								
WeatherGard	0.5	% v/v	207	133.4	53.7	16.3	77	88	68	74
Makaze	32	fl oz/a								
C.V. (%)			0.3	8.1	1.8	3.9	6.4	5.6	3.1	2.5
LSD (0.05)			NS	NS	NS	NS	7	7	3	3
¹ NIS=Preference (WinField Solutions); AMS=N-Pak AMS Liquid (WinField Solutions).										
² Grass=yellow and green foxtail, and barnyardgrass; Broadleaf=common lambsquarters, prostrate and redroot pigweed, and wild buckwheat.										

Corn response to nitrogen and timing of weed control, Carrington, 2010.

(Greg Endres, Rick Glatt, and Dave Franzen)

Trial objective was to determine the combination of soil N and timing of weed control to economically increase corn yield and quality. The dryland field trial was established at the NDSU Carrington Research Extension Center on a conventionally-tilled Heimdal-Emrick loam soil. Experimental design was split plot [main plot=N (3 treatments targeted at 50, 100, 150 lb soil N/acre) and subplots=timing of weed control (4 treatments targeted at PRE=initial season, early POST=2- to 4-inch weed height, late POST=8- to 12-inch weed height, and untreated check)] with four replications. Spring soil analysis indicated 25 lb nitrate-N/A, 9 ppm phosphorus, 182 ppm potassium, 0.97 ppm zinc, 4.2% organic matter, and 6.1 pH. Nitrogen as urea (46-0-0) was applied and incorporated on April 27 at 25, 75, and 125 lb nitrate-N/A to low-, medium-, and high-N plots, respectively. DeKalb Roundup Ready 'DKC33-53' (83-day relative maturity) was planted at 26,000 seeds/A in 30-inch row spacing on May 4. Starter liquid fertilizer 10-34-0 was in-furrow applied at 5 gal/A. Herbicides were applied using a CO₂ hand-boom sprayer with 8001 flat fan nozzles delivering 12 gal/A at 35 psi. SureStart (acetochlor&clopyralid&flumetsulam&dichlormid safener) at 28 fl oz/A was PRE applied on May 5 with 38 degrees F, 94% RH, and 10 mph wind to a moist soil surface. Corn emerged on May 23. Cornerstone Plus (3 lb ae/gal glyphosate) at 32 fl oz/A + AMS (N-Pak) at 64 fl oz/A were applied POST. POST1 was applied to the PRE and early POST plots on June 7 with 77 degrees F, 31% RH, and 10 mph wind to 4-collar stage corn. POST2 was applied to the early and late POST plots on June 28 with 61 degrees F, 81% RH, and 6 mph wind to 6- to 7-collar corn. A second application of glyphosate was not required for the late POST treatments due to low weed density and large corn. Table 1 lists weed species, size, and density during application of POST herbicides. The trial was hand harvested on October 8 and ears threshed with a plot combine on October 29.

Table 1.

Species ¹	Weed			
	POST1		POST2	
	Size (inches in height)	Density (plt/ft ²)	Size (inches in height)	Density (plt/ft ²)
Annual grass	1 to 4	31	2 to 18	21
Common lambsquarters	1 to 4	13	2 to 15	12
Prostrate and redroot pigweed	1 to 3	1	1 to 6	4

¹Annual grass= barnyardgrass, green and yellow foxtail, and volunteer wheat.

Leaf tissue analysis for samples taken on June 30 from the high N and initial-season weed control treatments indicated high levels of N (data not shown). The basal stalk nitrate test indicated nitrate-N levels were optimum (700 to 2000 ppm = yield was not limited by a shortage of N) for the medium and high N treatments (Table 2). Among soil N levels, plant height and chlorosis, and silk dates generally were similar. Seed yield and moisture tended to increase with higher N levels. High N reduced test weight compared to low N.

Corn plants with PRE or early-POST weed control were generally taller and green compared to the late-POST weed control or untreated check. Silk dates were delayed as weed control was delayed. Nitrate-N levels indicated by the basal stalk test were optimum among timings of weed control. Initial-season and early-POST weed control resulted in greater seed yield and test weight compared to the late-POST weed control or untreated check. Also, seed moisture was less with

timely weed control. No statistically significant interactions were present for corn seed yield and moisture, and test weight among N levels and timing for control of weeds.

Table 2. Corn response to N and timing of weed control, Carrington, 2010.										
Treatment	Plant ¹							Seed		
Factor	Height (inches)		Chlorosis (0-9)			Silk date	Basal stalk nitrate-N	Yield bu/A	Test weight lb/bu	Moisture %
	25-Jun	23-Jul	25-Jun	23-Jul	9-Aug	Jday	ppm			
soil N level (lb/A)										
50	16	54	3.5	3	3	210	NA	82.7	53.0	17.2
100	16	56	4	3	2.5	210	1179	92.3	52.6	17.5
150	15	54	4	3	2.5	209	1379	91.9	52.1	17.8
LSD (0.05)	NS	NS	NS	NS	0.5	NS	172	NS	0.7	NS
Weed control ²										
untreated check	14	32	6	6.5	6.5	NA	NA	12.2	51.3	19.1
PRE/POST1	20	73	1	1	1.5	207	1157	123.0	54.2	15.8
POST1/POST2	15	69	2.5	1.5	1	208	1420	130.7	53.4	16.8
POST2	14	45	5.5	3.5	1	213	1261	89.9	51.4	18.3
LSD (0.05)	2	5	0.5	0.5	0.5	1	199	13.6	0.8	1.1
mean	16	55	4	3	2.5	210	1279	89.0	52.6	17.5
CV (%)	11.1	9.7	18.1	15.8	23.3	0.5	16.2	19.5	1.6	6.7
¹ Chlorosis: 0=dark green, 9=yellow; Basal stalk nitrate-N samples taken on October 6.										
² PRE=May 5; POST1=June 7; POST2=June 28.										

PRE weed control in soybean. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND, to evaluate weed efficacy from labeled and experimental soybean PRE herbicides. Asgrow 'AG0730' Roundup Ready soybean was planted on May 27, 2010 followed by the application of PRE treatments at 9:15 am with 73 F air, 59 F soil at a four inch depth, 40% relative humidity, 75% cloud cover, 5 to 10 mph SE wind, dry soil surface, and wet subsoil. Soil characteristics were: 27.5% sand, 51.4% silt, 21.1% clay, silt loam texture, 4.4% OM, and 6.5 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles. The experiment had a randomized complete block design with three replicates per treatment.

0% injury observed at all ratings, and 99% control of wild mustard at 28 and 49 DAT (data not shown). Alert is generic Command (clomazone) and Dawn is generic Reflex (fomesafen). Alert is especially effective on velvetleaf but poor on other species. Alert + Dawn resulted in greater weed control than either herbicide applied alone but lack of activating rain after application prevented full activation of both herbicides. (Department of Plant Sciences, North Dakota State University, Fargo).

Table. PRE weed control in soybean (Zollinger, Ries, Kazmierczak).

Treatment ¹	Rate (product/A)	14 DAT - PRE						28 and 49 DAT - PRE				
		Yeft	Wimu	Rrpw	Colq	Hans	Corw	Yeft	Rrpw	Colq	Hans	Corw
		----- % control -----						----- % control -----				
Alert	16fl oz	40	40	20	18	27	10	38	22	20	25	13
Alert	21.3fl oz	53	47	32	31	32	28	53	32	32	32	28
Alert	32fl oz	63	53	27	37	47	28	63	32	38	48	30
Alert	42.7fl oz	82	72	57	53	62	48	82	52	53	62	48
CHA-019	21.3fl oz	70	73	37	47	47	38	70	37	47	47	37
CHA-019	32fl oz	78	75	43	52	52	37	78	43	52	52	37
CHA-021	32fl oz	72	75	43	52	52	37	72	43	52	52	38
CHA-021	48fl oz	72	85	63	53	58	38	72	70	63	62	38
Alert+Dawn	21.3fl oz+16fl oz	72	99	38	40	38	38	72	38	40	38	38
Alert+Dawn	21.3fl oz+24fl oz	70	99	60	58	48	38	70	60	58	48	38
Alert+Dawn	32fl oz+16fl oz	82	99	57	60	48	38	82	57	60	48	38
Alert+Dawn	32fl oz+24fl oz	78	99	66	63	53	42	78	63	63	53	42
Metribuzin	12fl oz	30	99	57	62	52	48	30	57	62	52	48
Dawn	24fl oz	30	99	57	62	52	48	30	57	62	52	48
Command	21.3fl oz	67	48	18	28	28	23	67	18	28	28	23
LSD (0.05)		6	5	9	8	6	5	6	7	7	6	5

¹CHA-019 and CHA-021 = proprietary products from Cheminova.

Residual weed control in soybean. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. Two experiments were conducted near Buffalo and Prosper, ND, to evaluate crop response and weed efficacy to residual soybean herbicides. At Buffalo, Pioneer '91M51' Roundup Ready soybean was planted on May 4, 2010. PRE treatments were applied on May 6 at 9:00 am with 45 F air, 45 F soil at a four inch depth, 82% relative humidity, 100% cloud cover, 1 to 3 mph NE wind, damp soil surface, and wet subsoil. Soil characteristics were: 36.3% sand, 40.8% silt, 22.8% clay, loam texture, 4.5% OM, and 6.7 pH.

At Prosper, Asgrow 'AG0730' Roundup Ready soybean was planted on May 27, 2010 followed by the application of PRE treatments at 10:00 am with 73 F air, 59 F soil at a four inch depth, 40% relative humidity, 75% cloud cover, 8 to 12 mph SE wind, dry soil surface, and wet subsoil. Soil characteristics were: 27.5% sand, 51.4% silt, 21.1% clay, silt loam texture, 4.4% OM, and 6.5 pH.

Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles. The experiment had a randomized complete block design with three replicates per treatment.

No soybean injury observed at Buffalo and Prosper (data not shown).

Fierce is pre-mix of Valor + KIH-485 (pyroxasulfone). Pyroxasulfone is a herbicide similar to acetanilide herbicides (Lasso, Dual, etc.) but is more active at lower ai rates, and controls a wider spectrum of broadleaf weeds. At Buffalo, most treatments except Prowl gave near complete weed control but weed control at Prosper was lower due to insufficient activating rain soon after application. (Department of Plant Sciences, North Dakota State University, Fargo).

Table 1. Residual weed control in soybean, **Buffalo** (Zollinger, Ries, Kazmierczak).

Treatment	Rate (product/A)	14, 28, 35, 42, and 49 DAT - PRE						
		Rrpw	Colq	Ebns	Koch	Biww	Smwe	Mael
		----- % control -----						
Valor	2oz	99	99	99	99	99	99	99
Gangster FirstRate+Gangster Valor	0.5oz+2oz	99	99	99	99	99	99	99
Authority First	3.2fl oz	99	99	99	99	99	99	99
Authority First	5fl oz	99	99	99	99	99	99	99
Optill	2oz	99	99	99	99	99	99	99
Prowl H ₂ O	2.5pt	50	70	30	27	25	42	0
Prefix	2pt	99	99	99	99	99	99	99
Fierce	2.5oz	99	99	99	99	99	99	99
Fierce	3oz	99	99	99	99	99	99	99
Fierce	3.75oz	99	99	99	99	99	99	99
Untreated		0	0	0	0	0	0	0
LSD (0.05)		1	1	1	2	2	1	1

Table 2. Residual weed control in soybean, **Prosper** (Zollinger, Ries, Kazmierczak).

Treatment	Rate (product/A)	14 DAT - PRE				28, 35, 42, and 56 DAT - PRE			
		Rrpw	Colq	Hans	Corw	Rrpw	Colq	Hans	Corw
		----- % control -----				----- % control -----			
Valor	2oz	70	80	68	20	72	82	73	20
Gangster FirstRate+Gangster Valor	0.5oz+2oz	70	73	62	47	70	73	62	47
Authority First	3.2fl oz	20	20	20	13	50	50	47	28
Authority First	5fl oz	50	50	50	35	73	73	50	35
Optill	2oz	67	20	37	20	67	53	40	30
Prowl H ₂ O	2.5pt	47	47	25	0	40	82	20	0
Prefix	2pt	87	20	20	22	83	20	20	22
Fierce	2.5oz	73	58	58	28	67	72	70	32
Fierce	3oz	82	70	70	43	90	73	90	40
Fierce	3.75oz	88	73	87	32	92	87	92	78
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		6	12	10	5	6	8	4	7

PRE weed control in soybean. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. Two experiments were conducted near Buffalo and Prosper, ND, to evaluate crop response and weed efficacy. At Buffalo, Asgrow 'AG0730' Roundup Ready soybean was planted on May 24, 2010. PRE treatments were applied on May 26, 2010 at 8:30 am with 67 F air, 58 F soil at a four inch depth, 35% relative humidity, 0% cloud cover, 3 to 7 mph W wind, dry soil surface and wet subsoil. Soil characteristics were: 34% sand, 48.2% silt, 17.8% clay, loam texture, 3.4% OM and 8.0 pH. POST treatments were applied on June 29 at 2:10 pm with 76 F air, 88 F soil surface, 25% relative humidity, 0% cloud cover, 1 to 5 mph NE wind, dry soil surface, moist subsoil, and no dew present to V3 to V4 (6 to 10 inch) soybean. Weed species present at the time of POST applications were: 2 to 4 inch (0 to 2/yd²) redroot pigweed; 3 to 12 inch (0 to 20/yd²) common lambsquarters; and 1 to 12 inch diameter (0 to 5/yd²) prostrate pigweed. Other weed species present at low populations were: easternblack nightshade, kochia, biennial wormwood, smartweed, marshelder, and dandelion.

At Prosper, Asgrow 'AG0730' Roundup Ready soybean was planted on May 27, 2010 followed by the application of PRE treatments at 10:30 am with 73 F air, 59 F soil at a four inch depth, 40% relative humidity, 10% cloud cover, 8 to 12 mph SE wind, dry soil surface and moist subsoil. Soil characteristics were: 26.6% sand, 49.8% silt, 23.6% clay, loam texture, 4.5% OM and 5.6 pH. POST treatments were applied on June 23 at 9:00 am with 66 F air, 69 F soil surface, 99% relative humidity, 100% cloud cover, 8 to 12 mph N wind, dry soil surface, moist subsoil, excellent crop vigor and no dew present to V2 to V3 soybean. Weed species present at the time of POST applications were: 2 to 4 inch (3 to 5/yd²) common lambsquarters; cotyledon to 4 inch (5 to 20/ft²) hairy nightshade; 2 to 7 inch (3 to 5/yd²) yellow foxtail; cotyledon to 6 inch (5 to 25/ft²) redroot pigweed; and 2 to 4 inch (1 to 3/yd²) common ragweed.

All treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for POST treatments. The experiments had a randomized complete block design with three replicates per treatment.

At Buffalo, 14 DAT, there was 99% control of redroot pigweed, prostrate pigweed, common lambsquarters, easternblack nightshade, kochia, biennial wormwood, smartweed, marshelder, and dandelion (data not shown).

At Prosper, 0% crop injury and 99% control of wild mustard was observed from all treatments and ratings timings (data not shown). 0% control of yellow foxtail from PRE treatments, although 99% control of yellow foxtail was observed 14 and 28 DAT after POST applications for all treatments (data not shown).

Matador is a premix of Dual, Sencor, and Pursuit. The soybeans injured at Buffalo are thought to result from lighter textured soil and Sencor activity in a high soil pH at Buffalo. Weed control was greater in the lighter soil of Buffalo than the heavier soil at Prosper. Insufficient activating rain at Prosper may also be a cause of lower weed control. (Department of Plant Sciences, North Dakota State University, Fargo).

Table 1. PRE weed control in soybean, **Buffalo** (Zollinger, Ries, Kazmierczak).

Treatment	Rate (product/A)	33 DAT - PRE		33 DAT - PRE						14 DAT			
		Soyb - % injury -	% injury -	Rpww	Colq	Ebns	Koch	Biww	Smwe	Mael	Dali	Soyb	Yield
PRE/POST													
Matador/Makaze+Weathergard Complete	4pt/1qt+0.5% v/v	35		99	99	93	99	99	99	99	99	37	29.7
Spartan+FirstRate/Makaze+Weathergard Complete	4fl oz+0.3oz/1qt+0.5% v/v	2		93	93	96	99	99	99	99	99	3	35.7
Sharpen/Makaze+Weathergard Complete	1fl oz/1qt+0.5% v/v	0		30	30	30	73	43	50	70	60	7	33.0
Spartan+Pursuit/Makaze+Weathergard Complete	5fl oz+2fl oz/1qt+0.5% v/v	3		98	94	86	99	99	96	99	99	3	37.5
LSD (0.05)		8		15	14	14	3	6	5	2	6	3	7.8

Table 2. PRE weed control in soybean, **Prosper** (Zollinger, Ries, Kazmierczak).

Treatment	Rate (product/A)	27 DAT - PRE		14 and 28 DAT - POST						Soyb			
		Rpww	Colq	Hans	Corw	Rpww	Colq	Hans	Corw	Yield	Yield		
PRE/POST													
Matador/Makaze+Weathergard Complete	4pt/1qt+0.5% v/v	87	77	57	50	97	94	96	87	39.8			
Spartan+FirstRate/Makaze+Weathergard Complete	4fl oz+0.3oz/1qt+0.5% v/v	57	50	37	23	99	96	95	99	36.6			
Sharpen/Makaze+Weathergard Complete	1fl oz/1qt+0.5% v/v	20	20	20	20	73	73	73	90	33.9			
Spartan+Pursuit/Makaze+Weathergard Complete	5fl oz+2fl oz/1qt+0.5% v/v	78	70	43	40	97	90	85	80	38.9			
LSD (0.05)		10	11	4	6	4	9	7	13	5.8			

Soybean weed control with Sharpen, Carrington, 2010. (Greg Endres and Rick Glatt). The trial was conducted in cooperation with BASF to evaluate weed control and soybean response with soil-applied Sharpen. Experimental design was a randomized complete block with three replicates. The field trial was established on a Heimdal-Emirck loam soil with 3.9% organic matter, 5.9 pH, 38 lb N/A, 10 ppm P, and 187 ppm K. Crop residue measured using the line-transect method was 75% on May 20. Dairyland Seed RR '0401' inoculated soybean was direct-seeded at about 200,000 seeds/A into wheat stubble in 30-inch rows on May 19. Herbicide treatments were applied with a CO₂-hand-boom plot sprayer delivering 10 gal/A at 35 psi through 8001 flat-fan nozzles. PRE treatments were applied on May 20 with 70 F, 42% RH, no wind, clear sky, and dry soil surface to 5-leaf (tillering) volunteer wheat, 1- to 2-inch tall fairy candelabra, 3- to 6-inch tall flixweed, 1- to 2-inch tall common lambsquarters, and 1- to 2-inch tall wild buckwheat. Average plant density (ft²) in untreated plots on June 20: volunteer wheat=1, common lambsquarters=12, and wild buckwheat=3. Rainfall totaled 1.1 inches during 4 d after application of herbicides. POST glyphosate was applied on July 1 with 87 F, 55% RH, 2 mph wind, and 50% clear sky to 2- to 10-inch tall green and yellow foxtail, and 2- to 15-inch tall common lambsquarters. The trial was harvested with a plot combine on October 4.

Volunteer wheat control when visually evaluated 1 wk after application (WAA) was excellent with all herbicide treatments (Table). Broadleaf weed control, including wild buckwheat, was generally excellent (89-96%) 1 WAA with Sharpen. Foxtail control was excellent (93-96%) with Sharpen plus Extreme or pendimethalin and wild buckwheat control was good to excellent (86-94%) with Sharpen about 3 WAA. Common lambsquarters control was 85-91% with Sharpen plus Extreme or pendimethalin about 6 WAA (before POST application of glyphosate). No soybean response to herbicides was observed. Seed yield increased with herbicides compared to the untreated check and tended to be highest with Sharpen treatments.

Table.		Weed control ¹												Soybean				
Treatment ²	Herbicide	5/27						6/8						7/30	Seed yield			
		Vowh	Faca	Flwe	Colq	Wibw	Fota	Colq	Wibw	Fota	Colq	Fota	Colq					
	Rate fl oz product/	Timing ³	%												bu/A			
Untreated check	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.8
Glyphosate	32	PRE	97	78	81	86	75	57	77	77	77	77	77	77	77	77	77	28.7
Glyt + 2,4-De	32+16	PRE	96	90	89	93	80	55	90	62	0	74	97	97	97	97	97	23.8
Sharpen + glyt	1+32	PRE	98	93	96	90	89	72	87	86	0	75	96	96	98	98	98	30.8
Sharpen + Extreme	1+36	PRE	96	93	95	91	90	96	91	94	95	91	97	99	99	99	99	31.6
Sharpen + pendamethalin+ glyt	1+41.6+32	PRE	97	95	95	91	93	93	91	86	72	85	97	98	98	98	98	30.7
C.V. (%)			1	3	3	4	6	11	7	5	2	5	1	1	1	1	1	19.6
LSD (0.05)			2	5	4	6	7	12	9	6	1	6	1	1	1	1	1	9.3

¹Vowh=volunteer wheat; Faca=fairy candelabra; Flwe=flixweed; Colq=Common lambsquarters; Wibw=wild buckwheat; Fota=green and yellow foxtail.

²Glyphosate=Roundup Original (Monsanto); Sharpen=safinacil (BASF); Extreme=glyphosate&imazethapyr (BASF); pendamethalin=ProwlH2O (BASF). Glyphosate and glyphosate + 2,4-De includes tank mixture of NIS=Preference (Winfield Solutions) at 0.25% v/v and AMS=N-Pak (Agri-Solutions) at 64 fl oz/A. All other treatments include tank mixture of MSO=Destiny (Winfield Solutions) at 1% v/v and AMS at 64 fl oz/A. Glyphosate (RU Original) at 32 fl oz/A + NIS + AMS was applied on July 1 across all plots except the untreated check.

³PRE=May 20.

Weed management in soybean. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND, to evaluate crop response and weed efficacy to chemical control options and application timings. Asgrow 'AG0730' Roundup Ready soybean was planted on May 27, 2010 followed by the application of PRE treatments at 9:45 am with 73 F air, 59 F soil at a four inch depth, 40% relative humidity, 75% cloud cover, 5 to 10 mph SE wind, dry soil surface and wet subsoil. Soil characteristics were: 27.5% sand, 51.4% silt, 21.1% clay, silt loam texture, 4.4% OM and 6.5 pH. EPOST treatments were applied on June 23 at 8:25 am with 66 F air, 69 F soil surface, 99% relative humidity, 100% cloud cover, 5 to 10 mph N wind, dry soil surface, moist subsoil, excellent crop vigor and no dew present to V2 to V3 (4 to 6 inch) soybean. Weed species present at the time of EPOST applications were: 1 to 4 inch (1 to 2/yd²) common lambsquarters; 2 to 10 inch (tillering, 1 to 5/yd²) yellow foxtail; cotyledon to 3 inch (1 to 5/yd²) hairy nightshade; cotyledon to 4 inch (1 to 5/yd²) redroot pigweed; and 2 to 6 inch (1 to 3/yd²) common ragweed. Weed species in plots with PRE treatments were: 1 to 3 inch (1 to 2/yd²) common lambsquarters; 3 to 6 inch (1 to 5/yd²) yellow foxtail; cotyledon to 2 inch (1 to 2/yd²) hairy nightshade; cotyledon to 1 inch (1 to 2/ft²) redroot pigweed; and 1 to 3 inch (1 to 2/yd²) common ragweed. POST treatments were applied on July 25 at 10:30 am with 74 F air, 74 F soil surface, 55% relative humidity, 50% cloud cover, 5 to 8 mph N wind, dry soil surface, moist subsoil, excellent crop vigor and no dew present to R1 soybean. Weed species present at the time of POST applications were: 3 to 8 inch (1 to 2/yd²) common lambsquarters; 5 to 12 inch (tillering, 1 to 3/yd²) yellow foxtail; 1 to 4 inch (1 to 3/yd²) hairy nightshade; 1 to 6 inch (1 to 5/yd²) redroot pigweed; 4 to 12 inch (blooming, 1/yd²) wild mustard; and 1 to 6 inch (1 to 3/yd²) common ragweed. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

This study shows that a mono-herbicide (glyphosate) even applied twice sequentially does not provide complete, broad-spectrum weed control. This study supports the use of a PRE followed by POST approach to weed control using herbicides with different modes of action. Warrant is an encapsulated acetochlor formulation different than Degree. Acetochlor is not labeled for PRE application in soybean and will injure soybean if applied PRE. Warrant applied with glyphosate in an EPOST application timing is safe to soybean and acts as a residual herbicide to control flushes of weeds after weed kill from glyphosate. This study shows residual herbicides applied PRE or with glyphosate can result in near complete weed control. 0% injury was observed for all treatments. (Department of Plant Sciences, North Dakota State University, Fargo).

Table. Weed management in soybean (Zollinger, Rtes, Kazmierczak).

Treatment ¹	Rate (product/A)	July 7 and July 21					August 4						
		Yeft	Wimu	Ripw	Colq	Hans	Corw	Yeft	Wimu	Ripw	Colq	Hans	Corw
----- % control -----													
<u>PRE/EPOST</u>													
Optill/RUPM+Warrant+Class Act NG	2oz/22fl oz+3pt+2.5% v/v	99	99	96	98	92	93	99	99	98	98	96	96
Optill/RUPM+Class Act NG	2oz/22fl oz+2.5% v/v	99	99	57	57	57	53	99	99	77	73	73	60
Valor/RUPM+Warrant+Class Act NG	2oz/22fl oz+3pt+2.5% v/v	99	99	99	95	98	99	99	99	99	95	98	99
Valor/RUPM+Class Act NG	2oz/22fl oz+2.5% v/v	53	53	53	53	53	50	70	67	75	67	73	63
<u>EPOST</u>													
Extreme+Class Act NG	1.5qt+2.5% v/v	97	99	98	99	98	98	98	99	98	99	98	98
RUPM+Dual II Magnum+Class Act NG	22fl oz+1.18pt+2.5% v/v	99	99	99	88	94	99	99	99	99	91	94	99
RUPM+Warrant+Class Act NG	22fl oz+3pt+2.5% v/v	99	99	95	95	91	90	99	99	96	95	88	80
<u>EPOST/POST</u>													
RUPM+Class Act NG+RUPM+Class Act NG	22fl oz+2.5% v/v/22fl oz+2.5% v/v	93	99	80	80	79	70	93	99	92	82	78	62
<u>POST</u>													
RUPM+Class Act NG	22fl oz+2.5% v/v							82	68	65	57	62	52
<u>LSD (0.05)</u>													
		10	9	12	14	16	13	3	4	5	7	8	5

¹RUPM = Roundup PowerMax.

Kixor in soybean. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. An experiment was conducted near Buffalo, ND, to evaluate crop response and weed control from residual products in soybean. Burndown treatments were applied on May 24 at 10:00 am with 69 F air, 60 F soil surface, 80% relative humidity, 85% cloud cover, 6 to 12 mph SE wind, wet soil surface, and wet subsoil. Soil characteristics were: 34% sand, 48.2% silt, 17.8% clay, loam texture, 3.4% OM, and 8.0 pH. Weed species present at time of burndown application were: 1 to 3 inch (1 to 20/yd²) common lambsquarters; and 2 to 6 inch (1 to 5/yd²) erect knotweed. Asgrow 'AG0703' Roundup Ready soybean was planted on June 3, 2010. POST treatments were applied on July 13 at 11:00 am with 70 F air, 74 F soil surface, 90% relative humidity, 60% cloud cover, 8 to 12 mph SE wind, wet soil surface, excellent crop vigor, and no dew present to V8 to R1 (12 to 18 inch) soybean. Weed species present at time of POST application were: 6 to 16 inch (1 to 7/yd²) common lambsquarters; and 6 to 16 inch (1 to 7/yd²) redroot pigweed. Very light populations of prostrate pigweed, shepherdspurse, easternblack nightshade, kochia, marshelder, prostrate knotweed, biennial wormwood, smartweed, and dandelion was also observed. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for burndown applications and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for POST applications. The experiment had a randomized complete block design with three replicates per treatment.

All burndown treatments gave 99% control of all weed species listed in the table and 0% soybean injury, 10 and 16 DAT (data not shown). All POST treatments gave 0% crop injury at all POST ratings (data not shown). All POST treatments gave 99% control of prostrate pigweed, shepherdspurse, marshelder, and biennial wormwood 5 DAT (data not shown). All POST treatments gave 99% control of all weed species listed in the table at 47 and 60 DAT (data not shown). This study shows that a mono-herbicide (glyphosate) even applied twice sequentially does not provide complete, broad-spectrum weed control. This study support the use of a PRE followed by POST approach to weed control using herbicides with different modes of action. (Department of Plant Sciences, North Dakota State University, Fargo).

Treatment ¹	Rate (product/A)	5 DAT - POST					33 DAT - POST													
		Rpww	Colq	Ebns	Koch	Knwe	Smwe	Dali	Rpww	Prpw	Colq	Shpu	Ebns	Koch	Knwe	Blww	Smwe	Mael	Dali	
		----- % control -----					----- % control -----													
Burndown/																				
POST																				
RUO+R-11+AMS/	1qt+0.25% v/v+17lb/100gal/																			
RUO+R-11+AMS	1qt+0.25% v/v+17lb/100gal	72	68	67	92	78	75	65	43	72	53	77	68	72	73	70	75	78	67	
RUO+2,4-D Ester+R-11+AMS/	1qt+1pt+0.25% v/v+17lb/100gal/																			
RUO+R-11+AMS	1qt+0.25% v/v+17lb/100gal	99	99	99	99	99	99	99	70	70	55	70	77	77	83	73	73	73	72	
Sharpen+RUO+MSO+AMS/	1fl oz+1qt+1% v/v+17lb/100gal/																			
RUO+R-11+AMS	1qt+0.25% v/v+17lb/100gal	99	99	99	99	99	99	99	89	89	83	89	99	99	93	98	99	99	99	
Optill+RUO+MSO+AMS/	2oz+1qt+1% v/v+17lb/100gal/																			
RUO+R-11+AMS	1qt+0.25% v/v+17lb/100gal	99	99	99	99	99	99	99	99	99	98	99	99	99	98	99	99	99	99	
Sharpen+Extreme+MSO+AMS/	1fl oz+2.25pt+1% v/v+17lb/100gal/																			
RUO+R-11+AMS	1qt+0.25% v/v+17lb/100gal	99	99	99	99	99	99	99	98	99	94	98	99	99	96	99	99	99	99	
Sharpen+Prowl H ₂ O+RUO+MSO+AMS/	1fl oz+2.6pt+1qt+1% v/v+17lb/100gal/																			
RUO+R-11+AMS	1qt+0.25% v/v+17lb/100gal	99	99	99	99	99	99	99	95	99	98	99	99	99	96	99	99	99	99	
LSD (0.05)		2	2	2	2	4	4	4	9	8	12	10	6	6	8	5	5	6	5	

¹RUO = Roundup Original; MSO = Soy-Stik.

Sharpen followed by PPO-inhibiting herbicides and glyphosate in Roundup Ready soybean, Hutchinson, MN, 2010.

(Stachler) 'Asgrow A1230' soybean at 140,000 seeds per acre was seeded April 23 in six row plots 25 feet long in a cooperators field having glyphosate resistant giant ragweed. Preemergence treatments were applied April 23. Postemergence treatments were applied June 2. All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles to the center four rows of six row plots. Sharpen was included with the Postemergence treatments to simulate a burndown application. Sharpen IS NOT labeled for Postemergence soybean applications, but was included to gather weed control data. Soybean injury was evaluated June 2, June 9, June 24 and July 13. Giant ragweed and common lambsquarters control were evaluated June 2, June 24 and July 13. Ten giant ragweed plants were flagged in treatments 1 through 4 prior to the first postemergence application. Flagged plants were evaluated for mortality June 24 and July 13. Study designed as randomized complete block with four replications. All other evaluations are a visual estimate of percent weed control or percent soybean injury in the treated plot compared to the adjacent untreated strips and plots.

Table. Application information.

Date of Application	April 23	June 2	June 24
Time of Day	4:00 pm	5:00 pm	7:00 pm
Air Temperature (°F)	68	75	77
Relative Humidity (%)	37	36	68
Soil Temp. (°F at 6")	51	63	72
Wind Velocity (mph)	19	3	2
Cloud Cover (%)	100	5	5
Soil Moisture	fair	good	good
Soybean Stage (range/avg.)	Preemergence	2-2.5 trif/2 trifoliolate	5-6 trif/7" tall(beginning bloom)
Giant Ragweed (range/avg.) Trt. 1	Preemergence	2-5.5 N/3 N; 0.5-2.5"/1.5"	3-8.5N/5N; 2.5-7.75"/3"
Giant Ragweed (avg. density) Trt. 1	Preemergence	13/M ²	8/M ²
Lambsquarters (range/avg.) Trt. 1	Preemergence	3-13 lf/5lf; 0.25-2.5"/1"	2-6 lf/4 lf; 0.5-1"/0.75"
Lambsquarters (avg. density) Trt. 1	Preemergence	7/M ²	5/M ²

Summary: Sharpen (1 fl oz/A) caused 17% injury of 'Asgrow A1230' soybean across all treatments on June 2nd, the first postemergence application. Injury was greatest in areas of the study with the lowest organic matter content (data not shown). Sharpen (1 fl oz/A) controlled 47 and 50% of giant ragweed and lambsquarters across all treatments on June 2nd.

Soybean injury ranged from 0 to 90% on June 9th. Sharpen IS NOT LABELED for postemergence soybean applications, therefore it controlled the majority of soybeans. Sharpen was applied postemergence to soybean to simulate a burndown application, gain additional weed control data, and test for PPO-resistance in the field. Treatments containing Cobra and/or Basagran caused the greatest soybean injury (40 to 45%) on June 9th. Soybean injury declined over time, although it was still quite severe on June 24th. Soybean injury on July 13th and beyond was negligible.

Roundup PowerMAX (32 fl oz/A) controlled 73% giant ragweed with 17% mortality of flagged plants on June 24th after the first Roundup PowerMAX application. Roundup PowerMAX controlled 79% giant ragweed with 19% mortality of flagged plants on July 13th after the second glyphosate application, indicating the presence of a glyphosate-resistant biotype in the population.

Giant ragweed control ranged from 96 to 100% on June 24th for all treatments containing a PPO-inhibiting herbicide. Giant ragweed control increased slightly and was nearly complete for all treatments containing a PPO-inhibiting herbicide after the Roundup PowerMAX application, on July 13th. Only the treatment with Cobra plus Select allowed the presence of any surviving flagged plants and it was small.

Lambsquarters control was nearly perfect for all treatments after the initial postemergence application, except for Cobra plus Select. The Roundup PowerMAX applied in the June 24th application controlled lambsquarters in all treatments on July 13th.

The only way to effectively control glyphosate-resistant giant ragweed in Roundup Ready soybean is to apply a preemergence herbicide with the greatest efficacy on giant ragweed and follow with Flexstar or Cobra mixed with glyphosate to 2 to 4" giant ragweed and follow with glyphosate to reduce any late-emerging weeds.

Table. Sharpen followed by PPO-inhibiting herbicides and glyphosate in Roundup Ready soybean, Hutchinson, MN, 2010.
(Stachler)

Treatment ¹	Rate product/A	Date of Applic.	June 2			June 9
			Soyb Inju	Girw Cntl	Colq Cntl	Soyb Inju
			----- % -----			
Sharpen	1 floz	April 23				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	17	49	51	0
Sharpen	1 floz	April 23				
Flexstar+Select Max+Destiny HC+AMS	1 pt + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	16	46	49	27
Sharpen	1 floz	April 23				
Cobra+Select Max+Destiny HC+AMS	12.5 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	18	49	53	43
Sharpen	1 floz	April 23				
Sharpen+Select Max+Destiny HC+AMS	1 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	18	48	49	90
Sharpen	1 floz	April 23				
Flexstar+RUPowerMAX+DestinyHC+AMS	1 pt + 32 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	16	44	50	33
Sharpen	1 floz	April 23				
Cobra+RUPowerMAX+Destiny HC+AMS	12.5 floz + 32 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	19	44	48	45
Sharpen	1 floz	April 23				
Sharpen+RUPowerMAX+Destiny HC+AMS	1 floz + 32 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	18	50	50	90
Sharpen	1 floz	April 23				
Basagran+Flexstar+Select MAX+Destiny HC+AMS	1 pt + 1 pt + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	19	46	48	44
Sharpen	1 floz	April 23				
Basagran+Cobra+Select MAX+Destiny HC+AMS	1 pt + 8 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	16	49	53	40
Sharpen	1 floz	April 23				
Basagran+Cobra+Resource+Select MAX + Destiny HC+AMS	1 pt + 8 floz + 2 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	14	49	50	45
LSD (5%)			NS	NS	NS	8

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX, Destiny HC=high surfactant methylated seed oil from Winfield Solutions.

Table continued on next page.

Table. Sharpen followed by PPO-inhibiting herbicides and glyphosate in Roundup Ready soybean, Hutchinson, MN, 2010.
(continued)

Treatment ¹	Rate product/A	Date of Applic.	June 24			
			Soyb Inju	Girw Cntl	Colq Cntl	Girw Mort ²
			----- % -----			
Sharpen	1 floz	April 23				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	0	73	93	17
Sharpen	1 floz	April 23				
Flexstar+Select Max+Destiny HC+AMS	1 pt + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	12	100	97	100
Sharpen	1 floz	April 23				
Cobra+Select Max+Destiny HC+AMS	12.5 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	24	96	71	98
Sharpen	1 floz	April 23				
Sharpen+Select Max+Destiny HC+AMS	1 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	95	98	99	100
Sharpen	1 floz	April 23				
Flexstar+RUPowerMAX+DestinyHC+AMS	1 pt + 32 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	15	99	100	--
Sharpen	1 floz	April 23				
Cobra+RUPowerMAX+Destiny HC+AMS	12.5 floz + 32 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	31	97	100	--
Sharpen	1 floz	April 23				
Sharpen+RUPowerMAX+Destiny HC+AMS	1 floz + 32 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	94	99	100	--
Sharpen	1 floz	April 23				
Basagran+Flexstar+Select MAX+Destiny HC+AMS	1 pt + 1 pt + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	28	100	100	--
Sharpen	1 floz	April 23				
Basagran+Cobra+Select MAX+Destiny HC+AMS	1 pt + 8 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	27	100	90	--
Sharpen	1 floz	April 23				
Basagran+Cobra+Resource+Select MAX + Destiny HC+AMS	1 pt + 8 floz + 2 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	29	100	94	--
LSD (5%)			7	4	7	22

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX, Destiny HC=high surfactant methylated seed oil from Winfield Solutions; ²Mort=mortality.

Table continued on next page.

Table. Sharpen followed by PPO-inhibiting herbicides and glyphosate in Roundup Ready soybean, Hutchinson, MN, 2010.
(continued)

Treatment ¹	Rate product/A	Date of Applic.	July 13			
			Soyb Inju	Girw Cntl	Colq Cntl	Girw Mort ²
			----- % -----			
Sharpen	1 floz	April 23				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	0	79	100	19
Sharpen	1 floz	April 23				
Flexstar+Select Max+Destiny HC+AMS	1 pt + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	3	99	100	100
Sharpen	1 floz	April 23				
Cobra+Select Max+Destiny HC+AMS	12.5 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	4	97	100	98
Sharpen	1 floz	April 23				
Sharpen+Select Max+Destiny HC+AMS	1 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	93	99	100	100
Sharpen	1 floz	April 23				
Flexstar+RUPowerMAX+DestinyHC+AMS	1 pt + 32 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	2	100	100	---
Sharpen	1 floz	April 23				
Cobra+RUPowerMAX+Destiny HC+AMS	12.5 floz + 32 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	8	98	100	---
Sharpen	1 floz	April 23				
Sharpen+RUPowerMAX+Destiny HC+AMS	1 floz + 32 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	93	99	100	---
Sharpen	1 floz	April 23				
Basagran+Flexstar+Select MAX+Destiny HC+AMS	1 pt + 1 pt + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	13	100	100	---
Sharpen	1 floz	April 23				
Basagran+Cobra+Select MAX+Destiny HC+AMS	1 pt + 8 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	8	100	100	---
Sharpen	1 floz	April 23				
Basagran+Cobra+Resource+Select MAX + Destiny HC+AMS	1 pt + 8 floz + 2 floz + 9 floz + 1.4 pt + 3.5% v/v	June 2				
RUPowerMAX+AMS	32 floz + 3.5% v/v	June 24	10	100	100	---
LSD (5%)			6	4	NS	20

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX, Destiny HC=high surfactant methylated seed oil from Winfield Solutions; ²Mort=mortality.

Soybean weed control with selected glyphosate products, Carrington, 2010. (Greg Endres)

A field study was conducted at the NDSU Carrington Research Extension Center in cooperation with Loveland Products to examine weed control and soybean performance with various glyphosate products. Experimental design was a randomized complete block with three replications. Inoculated Dairyland Seed 'DSR0401' Roundup Ready soybean was direct-planted in wheat stubble at 200,000 seeds/A in 30-inch rows on May 19. Treatments were applied with a CO₂-pressurized hand-boom sprayer delivering 10 gal/A at 35 psi with 8001 flat-fan nozzles. Initial treatments were applied to unifoliate- to first trifoliate (V1) soybean on June 14 with 68 F, 50% RH, 9 mph wind, 50% clear sky to headed volunteer wheat, 3- to 4-leaf yellow and green foxtail, 1- to 15-inch tall common lambsquarters, 4- to 14-inch tall horseweed, and 3- to 5-inch tall wild buckwheat. Early flower (R1) soybean treatments were applied on July 9 with 83 F, 39% RH, 8 mph wind, and 75% clear sky to tillering (4- to 6-inch tall) yellow and green foxtail, 1- to 8-inch tall common lambsquarters, and vining wild buckwheat. The trial was harvested with a plot combine on October 4.

Weed control generally was similar among glyphosate treatments (Tables 1 and 2). No crop response was observed from herbicide treatments when visually evaluated on June 28 and July 27 (data not shown). Physiological maturity (PM) and seed yield were similar among treatments.

Treatment					Weed control (%) ¹									
No.	Name	Rate	Unit	Timing	28-Jun					9-Jul				
					vowh	fota	howe	colq	wibw	vowh	fota	howe	colq	wibw
1	LI6285	32	fl oz/a	V1	99	93	96	93	75	99	73	99	78	73
	Weathergard Complete	0.5	%v/v	V1										
	Makaze	32	fl oz/a	R1										
	Weathergard Complete	0.5	%v/v	R1										
2	RU PowerMax	22	fl oz/a	V1	99	92	91	97	80	99	73	96	85	73
	Weathergard Complete	0.5	%v/v	V1										
	RU PowerMax	22	fl oz/a	R1										
	Weathergard Complete	0.50	%v/v	R1										
3	Mad Dog Plus	32	fl oz/a	V1	99	92	91	88	73	99	72	96	80	70
	Weathergard Complete	0.5	%v/v	V1										
	Mad Dog Plus	32	fl oz/a	R1										
	Weathergard Complete	0.50	%v/v	R1										
4	RU WeatherMax	22	fl oz/a	V1	99	93	92	98	77	99	74	93	91	73
	Weathergard Complete	0.5	%v/v	V1										
	RU WeatherMax	22	fl oz/a	R1										
	Weathergard Complete	0.50	%v/v	R1										
5	Makaze	32	fl oz/a	V1	99	94	90	95	83	99	73	95	88	80
	Weathergard Complete	0.5	%v/v	V1										
	Makaze	32	fl oz/a	R1										
	Weathergard Complete	0.50	%v/v	R1										
C.V. (%)					0	2.3	4.6	3.0	7.8	0	4.1	3.6	8.7	10.6
LSD (0.05)					NS	NS	NS	5	NS	NS	NS	NS	NS	

¹vowh=volunteer wheat; fota=green and yellow foxtail; howe=horseweed; colq=common lambsquarters; wibw=wild buckwheat.

Table 2. Weed control after V1 and R1 application of glyphosate, and soybean response.												
Treatment					Weed control (%) ¹						Soybean	
No.	Name	Rate	Unit	Timing	27-Jul			5-Aug			PM	Yield
					fota	colq	wibw	fota	colq	wibw	Jday	bu/A
1	LI6285	32	fl oz/a	V1	95	96	82	94	95	83	264	32.1
	Weathergard Complete	0.5	%v/v	V1								
	Makaze	32	fl oz/a	R1								
	Weathergard Complete	0.5	%v/v	R1								
2	RU PowerMax	22	fl oz/a	V1	95	96	81	94	96	84	264	34.2
	Weathergard Complete	0.5	%v/v	V1								
	RU PowerMax	22	fl oz/a	R1								
	Weathergard Complete	0.50	%v/v	R1								
3	Mad Dog Plus	32	fl oz/a	V1	94	95	82	93	95	80	263	35.6
	Weathergard Complete	0.5	%v/v	V1								
	Mad Dog Plus	32	fl oz/a	R1								
	Weathergard Complete	0.50	%v/v	R1								
4	RU WeatherMax	22	fl oz/a	V1	95	96	83	92	95	81	264	35.8
	Weathergard Complete	0.5	%v/v	V1								
	RU WeatherMax	22	fl oz/a	R1								
	Weathergard Complete	0.50	%v/v	R1								
5	Makaze	32	fl oz/a	V1	94	97	85	92	95	86	264	36.1
	Weathergard Complete	0.5	%v/v	V1								
	Makaze	32	fl oz/a	R1								
	Weathergard Complete	0.50	%v/v	R1								
C.V. (%)					1.2	0.8	2.6	3.1	1.7	3.8	0.5	7.1
LSD (0.05)					NS	NS	NS	NS	NS	NS	NS	NS

¹fota=green and yellow foxtail; colq=common lambsquarters; wibw=wild buckwheat.

Flexstar GT 3.5 (new formulation) efficacy and crop tolerance in RR soybean, Hutchinson, MN, 2010.

(Stachler) 'Asgrow A1230' soybean at 140,000 seeds per acre was seeded in six row plots 25 feet long April 23 in a cooperator's field having glyphosate resistant giant ragweed. Treatments were applied 5:00 pm June 2 when the air temperature was 75F, relative humidity was 36%, six inch soil temperature was 63F, wind velocity was 3 mph, cloud cover was 5%, soil moisture was good, soybean were at the 2 to 3 trifoliolate stage of growth with the majority at stage 2 trifoliolate stage, giant ragweed was in the cotyledon to 6 node stage (0.5 to 7 inches tall) with the majority in the 4 node stage (3.4 inches tall) and common lambsquarters was in the cotyledon to 14 leaf stage (0.25 to 3 inches tall) with the majority in the 6 leaf stage (1.125 inches tall). Giant ragweed density was 53 plants per M². Common lambsquarters density was 59 plants per M². All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles to the center four rows of six row plots. Soybean injury was evaluated June 9, June 21 and June 29. Giant ragweed and common lambsquarters control were evaluated June 21, June 29 and July 7. Study designed as randomized complete block with four replications. All evaluations are a visual estimate of percent weed control or percent soybean injury in the treated plot compared to the adjacent untreated strips and plots.

Table. Flexstar GT 3.5 (new formulation) efficacy and crop tolerance in RR soybean, Hutchinson, MN, 2010. (Stachler)

Treatment ¹	Rate product/A	June 9	June 21		
		Soyb Inju	Soyb Inju	Girw Cntl	Colq Cntl
		----- % -----			
Untreated Check	---	0	0	0	0
Touchdown Total+AMS	30.7 floz + 2.5% v/v	0	0	58	99
Flexstar+Touchdown. Total+MSO+AMS	1.06 pt + 30.7 floz + 1% v/v + 2.5% v/v	23	13	94	99
Flexstar GT+MSO+AMS	3 pt + 1% v/v + 2.5% v/v	19	16	96	99
Flexstar GT+MSO+AMS	4.53 pt + 1% v/v + 2.5% v/v	27	18	98	99
Flexstar GT 3.5+AMS	3.53 pt + 2.5% v/v	7	12	79	99
Flexstar GT 3.5+AMS	5.3 pt + 2.5% v/v	6	9	91	99
Flexstar GT 3.5+MSO+AMS	3.53 pt + 1% v/v + 2.5% v/v	17	9	98	99
Flexstar GT 3.5+MSO+AMS	5.3 pt + 1% v/v + 2.5% v/v	24	18	99	99
Flexstar GT 3.5+MSO+28%N	3.53 pt + 1% v/v + 2.5% v/v	22	13	96	99
Flexstar GT 3.5+MSO+28%N	5.3 pt + 1% v/v + 2.5% v/v	29	20	99	99
Flexstar GT 3.5+COC+AMS	3.53 pt + 1% v/v + 2.5% v/v	15	13	96	99
Flexstar GT 3.5+COC+AMS	5.3 pt + 1% v/v + 2.5% v/v	18	15	96	99
Flexstar GT 3.5+COC+28%N	3.53 pt + 1% v/v + 2.5% v/v	19	13	89	99
Flexstar GT 3.5+COC+28%N	5.3 pt + 1% v/v + 2.5% v/v	19	14	98	99
Cobra+RUPowerMAX+COC+AMS	10 floz + 28.4 floz + 1% v/v + 2.5% v/v	35	26	90	99
Flexstar GT 3.5+MSO	3.53 pt + 1% v/v	23	19	98	99
LSD (5%)		6	9	5	1

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX, COC=Premium COC from West Central, 28%N=28% urea ammonium nitrate, MSO=Leci-Tech methylated seed oil from Loveland.

Experiment continued on next page.

Table. Flexstar GT (new formulation) efficacy and crop tolerance in Roundup Ready soybean, Hutchinson, MN, 2010.
(continued)

Treatment ¹	Rate product/A	June 29			July 7	
		Soyb Inju	Girw Cntl	Colq Cntl	Girw Cntl	Colq Cntl
		----- % -----				
Untreated Check	---	0	0	0	0	0
Touchdown Total+AMS	30.7 floz + 2.5% v/v	0	61	97	53	96
Flexstar+Touchdown. Total+MSO+AMS	1.06 pt + 30.7 floz + 1% v/v + 2.5% v/v	9	94	100	89	100
Flexstar GT+MSO+AMS	3 pt + 1% v/v + 2.5% v/v	11	96	100	93	100
Flexstar GT+MSO+AMS	4.53 pt + 1% v/v + 2.5% v/v	15	99	100	97	100
Flexstar GT 3.5+AMS	3.53 pt + 2.5% v/v	11	80	100	72	100
Flexstar GT 3.5+AMS	5.3 pt + 2.5% v/v	3	89	99	91	99
Flexstar GT 3.5+MSO+AMS	3.53 pt + 1% v/v + 2.5% v/v	7	99	98	99	97
Flexstar GT 3.5+MSO+AMS	5.3 pt + 1% v/v + 2.5% v/v	13	99	99	99	98
Flexstar GT 3.5+MSO+28%N	3.53 pt + 1% v/v + 2.5% v/v	9	96	98	97	98
Flexstar GT 3.5+MSO+28%N	5.3 pt + 1% v/v + 2.5% v/v	15	100	100	100	99
Flexstar GT 3.5+COC+AMS	3.53 pt + 1% v/v + 2.5% v/v	9	96	99	91	99
Flexstar GT 3.5+COC+AMS	5.3 pt + 1% v/v + 2.5% v/v	5	97	100	96	100
Flexstar GT 3.5+COC+28%N	3.53 pt + 1% v/v + 2.5% v/v	8	87	100	83	98
Flexstar GT 3.5+COC+28%N	5.3 pt + 1% v/v + 2.5% v/v	9	99	100	96	100
Cobra+RUPowerMAX+COC+AMS	10 floz + 28.4 floz + 1%v/v + 2.5%v/v	18	88	99	71	98
Flexstar GT 3.5+MSO	3.53 pt + 1% v/v	13	98	98	95	96
LSD (5%)		8	7	2	6	3

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX, COC=Premium COC from West Central, 28%N=28% urea ammonium nitrate, MSO=Leci-Tech methylated seed oil from Loveland.

Summary: On June 9th, soybean injury was greatest with Cobra and usually the 5.3 pt/A rate of Flexstar GT. Soybean injury decreased over time, although it was still noticeable on June 29th. Little soybean injury was observed on July 7th (data not shown). Methylated seed oil (MSO) enhanced soybean injury.

Touchdown Total (glyphosate) at 30.7 fl oz/A controlled only 58 and 53% giant ragweed and 0 and 8% of ten flagged (prior to application) giant ragweed plants on June 21st and July 7th, respectively, indicating the presence of glyphosate-resistant giant ragweed in the population.

Antagonism of giant ragweed was observed on July 7th with Touchdown mixed with Flexstar compared to Flexstar GT 3.5 at 3.53 pt/A with similar adjuvants. Giant ragweed control was usually improved when Flexstar GT 3.5 was applied at the high rate. Methylated seed oil plus AMS mixed with Flexstar GT 3.5 usually maximized and improved giant ragweed control compared to COC plus AMS or 28%N. When Flexstar GT 3.5 was mixed with COC, the addition of AMS improved giant ragweed control compared to mixing with 28%N. Giant ragweed control with Cobra plus Roundup PowerMAX decreased over time and was the least effective treatment on July 7th.

Sharpen tank-mixtures in Roundup Ready soybean, Hutchinson, MN, 2010. (Stachler) Soybean at 140,000 seeds per acre was seeded in six row plots 25 feet long April 23. ‘Northrup King S08-C3’ soybean was planted in rows 1-3 and ‘Pioneer 90M80’ soybean was planted in rows 4-6 in a cooperator’s field having glyphosate resistant giant ragweed. Preemergence treatments were applied April 23. Postemergence treatments were applied May 18 and June 9. The study was designed as a randomized complete block having four replications. All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles to the center four rows of six row plots. Soybean injury was evaluated June 9 and June 24. Giant ragweed and common lambsquarters control were evaluated June 9 and July 21. All evaluations are a visual estimate of percent weed control or percent soybean injury in the treated plot compared to the adjacent untreated strips and plots.

Table. Application information.

Date of Application	April 23	May 18	June 9
Time of Day	4:00 pm	5:17 pm	5:30 pm
Air Temperature (°F)	68	78	70
Relative Humidity (%)	37	13	50
Soil Temp. (°F at 6")	51	73	64
Wind Velocity (mph)	19	8	11
Cloud Cover (%)	100	20	15
Soil Moisture	Fair	Good	Good
Soybean Stage (range/avg.)	Preemergence	Emer-Unif/Unifol	3-4 trif/3.5 trif
Giant Ragweed (range/avg.) Trt. 21	Preemergence	Cot-2N/1N; 0.25-1.5"/1"	1-5 Node/3N; 0.5-6"/2.5"
Giant Ragweed (avg. density) Trt. 21	Preemergence	35/M ²	40/M ²
Com. Lambsqtrs (range/avg.) Trt. 21	Preemergence	not recorded	4-7 lf/6 lf; 0.5-1"/1"
Com. Lambsqtrs (avg. density) Trt. 21	Preemergence	not recorded	3/M ²

Summary:

Sharpen (2 fl oz/A) plus Prefix (2 pt/A), Fierce (3 oz/A), or Valor (2.5 oz/A) caused the greatest soybean injury, although minimal and declined with time. Soybean injury was similar for the two soybean varieties at this location.

Roundup PowerMAX (32 fl oz/A) followed by Roundup PowerMAX caused 47% mortality of giant ragweed plants flagged at the initial application and controlled only 71% of giant ragweed on July 21st, confirming resistance in giant ragweed to glyphosate. Fierce (3.0 oz/A) plus FirstRate (0.15 oz/A) and Sharpen (2.0 fl oz/A) plus Prefix controlled the most giant ragweed and provided effective lambsquarters control on June 9th at the time of the Roundup PowerMAX application. Sharpen (1 fl oz/A) plus Prefix, Sharpen (2.0 fl oz/A) plus Valor or Command 3 ME controlled greater than 90% giant ragweed at the time of the Roundup PowerMAX application. On July 21st, Prefix (2.0 pt/A) plus Sharpen (1.0 or 2.0 fl oz/A) followed by Roundup PowerMAX controlled the most giant ragweed and provided nearly perfect lambsquarters control. Other treatments controlling 90% or greater giant ragweed on July 21st includes Fierce (3.0 oz/A) plus FirstRate, Sharpen (1 fl oz/A) plus Fierce (3.0 oz/A), and Sharpen (2.0 fl oz/A) plus Command 3ME, Fierce (3.0 oz/A), Prowl (2.1 pt/A), or Valor followed by Roundup PowerMAX. Increasing the rate of Sharpen from 1 fl oz/A to 2.0 fl oz/A improved giant ragweed control on June 9th, but not on July 21st after the Roundup PowerMAX application. Increasing the rate of Fierce from 3.0 oz/A to 3.75 oz/A improved giant ragweed control at both evaluation times. Tank-mixtures with Sharpen certainly improve weed control at the time of the postemergence herbicide application and may continue to improve control after this point in time. Unfortunately at this time, the Sharpen label prohibits tank-mixtures of Sharpen with other PPO-inhibiting herbicides (such as Fierce, Prefix, and Valor) and does not allow the 2 fl oz/A rate to be applied. Therefore no currently labeled preemergence herbicide or combination applied in this study will effectively control glyphosate-resistant giant ragweed with glyphosate applied alone. All treatments effectively controlled lambsquarters, although control was reduced with Roundup PowerMAX followed by Roundup PowerMAX and Sharpen (1.0 fl oz/A) plus Outlook (12 fl oz/A) followed by Roundup PowerMAX.

Experiment continued on next page.

Table. Sharpen tank-mixtures in Roundup Ready soybean, Hutchinson, MN, 2010. (Stachler)

Treatment ¹	Rate product/A	Date of Applic.	June 9				June 24		July 21	
			NK ² Inju	Pion ³ Inju	Girw Cntl	Colq Cntl	NK Inju	Pion Inju	Girw Cntl	Colq Cntl
----- % -----										
Sharpen	1 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	2	45	58	1	1	78	97
Sharpen	2 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	3	3	80	84	3	3	83	99
Sharpen+Valor SX	1 oz + 2.5 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	1	2	74	94	2	3	75	100
Sharpen+Prowl H2O	1 oz + 2.1 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	6	2	56	94	3	6	78	99
Sharpen+Outlook	1 oz + 12 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	3	82	88	2	5	65	96
Sharpen+Fierce	1 oz + 3 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	5	85	98	2	3	90	100
Sharpen+Prefix	1 oz + 2 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	5	92	96	0	1	98	98
Sharpen+Dimetric	1 oz + 5.33 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	1	55	92	2	1	80	98
Sharpen+Command 3 ME	1 oz + 2.67 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	2	63	98	3	6	83	100
Sharpen+Valor SX	2 oz + 2.5 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	7	7	91	98	1	2	92	100
Sharpen+Prowl H2O	2 oz + 2.1 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	4	2	87	95	2	3	94	99
Sharpen+Outlook	2 oz + 12 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	3	84	86	2	5	86	98
Sharpen+Fierce	2 oz + 3 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	5	7	78	98	3	5	93	100
Sharpen+Prefix	2 oz + 2 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	7	8	96	96	1	3	99	100
Sharpen+Dimetric	2 oz + 5.33 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	3	6	85	87	2	5	88	98
Sharpen+Command 3 ME	2 oz + 2.67 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	1	3	91	99	2	2	97	100
Sharpen+Dimetric + Command 3 ME	1 oz + 5.33 oz + 2.67 pt	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	3	73	98	2	3	88	100
Fierce	3 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	2	4	28	86	2	4	63	100
Fierce	3.75 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	1	0	50	97	1	2	77	100
Fierce+FirstRate	3 oz + 0.15 oz	April 23								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	1	0	97	98	2	4	93	100
RUPowerMAX+AMS	32 oz + 2.5% v/v	May 18								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 9	1	1	57	84	0	0	71	96
Untreated Check	0		0	0	0	0	0	0	0	0
LSD (5%)			4	5	17	9	3	5	11	3

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX; ²NK=Northrup King S08-C3; ³Pion=Pioneer 90M80.

Sharpen tank-mixtures in Roundup Ready soybean, Hector, MN, 2010. (Stachler) Soybean at 140,000 seeds per acre was seeded in six row plots 30 feet long May 10. 'Pioneer 90M80' soybean was planted in rows 1-3 and 'Northrup King S08-C3' soybean was planted in rows 4-6 in a cooperator's field having glyphosate resistant waterhemp. Preemergence treatments were applied May 10. Postemergence treatments were applied June 1 and June 18. The study was designed as a randomized complete block having four replications. All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles to the center four rows of six row plots. Soybean injury was evaluated June 18 and July 2. Waterhemp control was evaluated June 18, July 2, July 16 and July 28. All evaluations are a visual estimate of percent weed control or percent soybean injury in the treated plot compared to the adjacent untreated strips and plots.

Table. Application information.

Date of Application	May 10	June 1	June 18
Time of Day	2:00 pm	11:30 am	4:30 pm
Air Temperature (°F)	55	72	82
Relative Humidity (%)	54	90	35
Soil Temp. (°F at 6")	41	64	64
Wind Velocity (mph)	10	6	11
Cloud Cover (%)	100	95	0
Soil Moisture	Good	Good	Good
Soybean Stage (range/Avg)	Preemergence	Unifol-1 Trif/1 Trifol	2-3.5 trif/3 trif
Waterhemp (range/Avg) Trt. 21	Preemergence	Cot-6 lf/4 lf; 0.125-1"/0.5"	Cot-15 lf/10 lf; 0.125-8.5"/3.75"
Waterhemp (avg. density) Trt. 21	Preemergence	58/M ²	160/M ²

Summary:

Sharpen (2 fl oz/A) plus Dimetric (5.33 oz/A) and Sharpen (2 fl oz/A) plus Valor (2.5 oz/A) caused the greatest soybean injury on June 18th. Injury was slightly greater for the Northrup King variety on June 18th. Fierce (3.0 oz/A) plus/minus FirstRate (0.15 oz/A) and Sharpen (1.0 fl oz/A) plus Prefix (2.0 pt/A) or Outlook (12 fl oz/A) caused the greatest soybean injury on July 2nd, especially to the Northrup King variety. On July 2nd the Northrup King soybean variety had nearly twice the amount of injury for most herbicide combinations compared to the Pioneer variety. Injury increased over time due to a high percentage of the study being located in an area of the field with severe iron chlorosis. The combination of preemergence herbicides and iron chlorosis can severely stunt soybean throughout the growing season. Slight injury was observed on July 2nd from most herbicide treatments in areas of the study in which iron chlorosis was not present or limited.

On July 28th, Roundup PowerMAX (32 fl oz/A) followed by Roundup PowerMAX caused 57% mortality of waterhemp plants flagged at time of initial application and controlled 45% of waterhemp, confirming presence of glyphosate-resistant waterhemp at this site. Sharpen (1 or 2 fl oz/A) plus Prefix and Sharpen (2 fl oz/A) plus Outlook (12 fl oz/A) controlled the most waterhemp on June 18th at the time of the Roundup PowerMAX application to all treatments. In addition, Sharpen (1.0 fl oz/A) plus Fierce (3.0 oz/A) or Outlook, Sharpen (2.0 fl oz/A) plus Fierce (3.0 oz/A) or Valor, Fierce (3.75 oz/A) and Fierce (3.0 oz/A) plus FirstRate controlled 90% or greater waterhemp on June 18th. Sharpen (1.0 fl oz/A) plus Prefix followed by Roundup PowerMAX controlled the most waterhemp on July 28th. In addition, Sharpen (2.0 fl oz/A) plus Fierce (3.0 oz/A) or Prefix, Fierce (3.75 oz/A), and Fierce (3.0 oz/A) plus FirstRate followed by Roundup PowerMAX controlled 90% or greater waterhemp. Increasing the rate of Fierce and Sharpen improved waterhemp control at the time of the Roundup PowerMAX application, but when followed with glyphosate control was not always improved at the later evaluations. Tank-mixing Command 3ME with Sharpen reduced waterhemp control on July 28th compared to Sharpen alone. No preemergence herbicide or combination tested in this trial that is currently labeled controlled enough glyphosate-resistant waterhemp to rely upon a single postemergence glyphosate application to improve control.

Experiment continued on next page.

Table. Sharpen tank-mixtures in Roundup Ready soybean, Hector, MN, 2010. (Stachler)

Treatment ¹	Rate product/A	Date of Applic.	June 18			July 2			July 16	July 28
			Pion ² Inju	NK ³ Inju	Wahe Cntl	Pion Inju	NK Inju	Wahe Cntl	Wahe Cntl	Wahe Cntl
----- % -----										
Sharpen	1 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	0	0	32	6	17	76	70	57
Sharpen	2 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	7	7	77	7	11	78	77	68
Sharpen+Valor SX	1 oz + 2.5 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	6	11	83	7	17	89	86	79
Sharpen+Prowl H2O	1 oz + 2.1 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	3	6	58	8	17	73	72	68
Sharpen+Outlook	1 oz + 12 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	7	8	94	17	30	95	85	84
Sharpen+Fierce	1 oz + 3 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	10	11	95	12	22	98	90	89
Sharpen+Prefix	1 oz + 2 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	7	9	98	15	33	100	96	96
Sharpen+Dimetric	1 oz + 5.33 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	12	13	84	10	20	88	78	75
Sharpen+Command 3 ME	1 oz + 2.67 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	4	5	47	7	17	71	66	42
Sharpen+Valor SX	2 oz + 2.5 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	12	16	90	8	12	92	88	85
Sharpen+Prowl H2O	2 oz + 2.1 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	3	4	74	7	13	82	85	82
Sharpen+Outlook	2 oz + 12 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	8	10	98	19	27	100	94	86
Sharpen+Fierce	2 oz + 3 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	7	7	96	23	27	99	95	90
Sharpen+Prefix	2 oz + 2 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	6	11	98	7	15	99	97	93
Sharpen+Dimetric	2 oz + 5.33 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	15	20	81	12	22	88	83	73
Sharpen+Command 3 ME	2 oz + 2.67 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	6	9	65	7	12	75	70	57
Sharpen+Dimetric + Command 3 ME	1 oz + 5.33 oz + 2.67 pt	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	5	5	87	8	10	89	90	85
Fierce	3 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	12	14	82	17	33	90	89	84
Fierce	3.75 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	7	12	91	12	27	98	94	93
Fierce+FirstRate	3 oz + 0.15 oz	May 10								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	11	15	95	18	33	96	92	90
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 1								
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 18	0	0	23	0	0	57	57	45
Untreated Check	0		0	0	0	0	0	0	0	0
LSD (5%)			6	7	8	7	11	9	6	11

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX; ²Pion=Pioneer 90M80; ³NK=Northrup King S08-C3.

Sharpen tank-mixtures in Roundup Ready soybean, Mayville, ND, 2010. (Stachler) Soybean at 204,000 seeds per acre was seeded in six row plots 25 feet long May 12. ‘Pioneer 90M80’ soybean was planted in rows 1-3 and ‘Northrup King S08-C3’ soybean was planted in rows 4-6 in a cooperators field having glyphosate resistant common ragweed. Preemergence treatments were applied May 12. Postemergence treatments were applied June 4 and June 16. The study was designed as a randomized complete block having four replications. All treatments were applied in 17 gpa water at 40 psi through XR8002 nozzles to the center four rows of six row plots. Soybean injury was evaluated June 16 and June 30. Common ragweed, common lambsquarters and pigweed (mostly redroot, but some prostrate) control were evaluated June 16, June 30, July 15 and July 26. Annual grass control was evaluated June 16. All evaluations are a visual estimate of percent weed control or percent soybean injury in the treated plot compared to the adjacent untreated strips and plots.

Table. Application information.

Date of Application	May 12	June 4	June 16
Time of Day	7:15 pm	11:30 am	3:00 pm
Air Temperature (°F)	52	73	78
Relative Humidity (%)	68	32	57
Soil Temp. (°F at 6")	43	59	66
Wind Velocity (mph)	6	14	8
Cloud Cover (%)	100	5	50
Soil Moisture	Good	Good	Good
Soybean Stage (range/Avg)	Preemergence	1-1.5 trif/1 trifoliolate	2-3.5 trif/2.5 trifoliolate
Com. Ragweed (range/Avg) Trt. 21	Preemergence	Cot-3.5 N/2 Node; 0.125-2.5"/0.75"	Cot-4 N/2.5 N; 0.25-1.75"/0.75"
Com. Ragweed (avg. density) Trt. 21	Preemergence	116/M ²	43/M ²
Com. Lambsqtrs (range/Avg) Trt. 21	Preemergence	Cot-10 lf/7 lf; 0.75"-1.25"/1.25"	Cot-6 lf/2 leaf; 0.125-1"/0.5"
Com. Lambsqtrs (avg. density) Trt. 21	Preemergence	341/M ²	17/M ²
Pigweed (range/Avg) Trt. 21	Preemergence	Cot-8 lf/5 leaf; 0.75"-1.25"/1"	Cot-2 leaf/cot; 0.125"-0.5"/0.33"
Pigweed (avg. density) Trt. 21	Preemergence	313/M ²	7/M ²
Annual Grass (range/Avg) Trt. 21	Preemergence	Not recorded	1 leaf; 0.25"
Annual Grass (avg. density) Trt. 21	Preemergence	Not recorded	1/M ²

Summary:

Fierce alone or mixed with Sharpen or FirstRate caused the greatest soybean injury on June 16th. The Northrup King variety usually had an elevated level of injury compared to the Pioneer variety. Soybean injury declined over time for nearly all herbicides and herbicide combinations and was negligible or non-existent beyond June 30th, except the combination of Sharpen plus Prowl. Severe stem cracking was the most frequent injury symptom observed with the Prowl treatments, supporting the label restriction of not applying Prowl preemergence to soybean.

Roundup PowerMAX (32 fl oz/A) followed by Roundup PowerMAX caused 85% mortality of common ragweed plants flagged as survivors after the initial application and controlled 85% common ragweed on July 26th, somewhat confirming glyphosate-resistant common ragweed at this site. Sharpen (2.0 fl oz/A) plus Command 3ME (2.67 pt/A) or Valor (2.5 oz/A) controlled the most glyphosate-resistant common ragweed on June 16th at the time of the Roundup PowerMAX application. In addition, Sharpen (1.0 fl oz/A) plus Fierce (3.0 oz/A), Sharpen (2.0 fl oz/A) plus Outlook (12 fl oz/A) or Fierce (3.0 oz/A), Sharpen (1.0 fl oz/A) plus Dimetric (5.33 oz/A) plus Command 3ME, and Fierce (3.0 oz/A) plus/minus FirstRate controlled 90% or greater common ragweed. All of these herbicides and combinations controlled greater than 92% lambsquarters and pigweed, except for the pigweed with the Command treatments.

Sharpen (2.0 fl oz/A) plus Command or Valor followed by Roundup PowerMAX controlled the most glyphosate-resistant common ragweed on July 26th. In addition, Sharpen (1.0 fl oz/A) + Command or Fierce (3.0 oz/A), Sharpen (2.0 fl oz/A) plus Dimetric (5.33 oz/A) or Fierce (3.0 oz/A) or Outlook or (1.5 pt/A), and Sharpen (1.0 fl oz/A) plus Command plus Dimetric followed by Roundup PowerMAX controlled greater than 91% of common ragweed and greater than 92% lambsquarters and pigweed, with some exceptions. Of the treatments tested, only Sharpen (1.0 fl oz/A) plus Command or Dimetric plus Command can legally be applied to soybeans today and followed with a single glyphosate application to provide effective control of glyphosate-resistant common ragweed, lambsquarters, and pigweed.

Table. Sharpen tank-mixtures in Roundup Ready soybean, Mayville, ND, 2010. (Stachler)

Treatment ¹	Rate product/A	Date of Applic.	June 16					
			Pion ² Inju	NK ³ Inju	Corw Cntl	Colq Cntl	Pigw Cntl	Grass Cntl
			----- % -----					
Sharpen	1 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	1	2	61	76	71	0
Sharpen	2 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	4	83	94	90	0
Sharpen+Valor SX	1 oz + 2.5 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	9	13	88	94	98	63
Sharpen+Prowl H2O	1 oz + 2.1 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	10	13	70	95	92	83
Sharpen+Outlook	1 oz + 12 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	7	68	83	89	88
Sharpen+Fierce	1 oz + 3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	19	21	94	97	99	82
Sharpen+Prefix	1 oz + 2 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	6	8	80	81	91	81
Sharpen+Dimetric	1 oz + 5.33 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	4	80	92	89	60
Sharpen+Command 3 ME	1 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	3	84	92	80	95
Sharpen+Valor SX	2 oz + 2.5 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	11	15	95	98	99	79
Sharpen+Prowl H2O	2 oz + 2.1 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	11	14	76	96	93	80
Sharpen+Outlook	2 oz + 12 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	6	8	93	95	98	82
Sharpen+Fierce	2 oz + 3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	16	19	93	98	99	84
Sharpen+Prefix	2 oz + 2 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	6	87	85	92	76
Sharpen+Dimetric	2 oz + 5.33 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	4	4	89	95	98	71
Sharpen+Command 3 ME	2 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	7	97	97	91	99
Sharpen+Dimetric + Command 3 ME	1 oz + 5.33 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	10	93	95	92	89
Fierce	3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	18	20	91	93	99	97
Fierce	3.75 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	26	25	89	95	99	89
Fierce+FirstRate	3 oz + 0.15 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	16	19	92	95	99	93
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 4						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	0	0	86	96	98	99
Untreated Check	0		0	0	0	0	0	0
LSD (5%)			4	4	7	7	7	18

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX; ²Pion=Pioneer 90M80; ³NK=Northrup King S08-C3.

Table continued on next page.

Table. Sharpen tank-mixtures in Roundup Ready soybean, Mayville, ND, 2010. (continued)

Treatment ¹	Rate product/A	Date of Applic.	June 30					
			Pion ² Inju	NK ³ Inju	Corw Cntl	Colq Cntl	Pigw Cntl	
			----- % -----					
Sharpen	1 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	7	75	93	97	
Sharpen	2 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	3	91	97	99	
Sharpen+Valor SX	1 oz + 2.5 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	8	8	91	100	100	
Sharpen+Prowl H2O	1 oz + 2.1 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	38	36	74	97	97	
Sharpen+Outlook	1 oz + 12 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	5	78	97	100	
Sharpen+Fierce	1 oz + 3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	10	9	96	100	100	
Sharpen+Prefix	1 oz + 2 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	3	90	99	100	
Sharpen+Dimetric	1 oz + 5.33 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	3	92	98	100	
Sharpen+Command 3 ME	1 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	3	3	93	99	99	
Sharpen+Valor SX	2 oz + 2.5 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	7	6	98	100	100	
Sharpen+Prowl H2O	2 oz + 2.1 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	34	30	81	98	100	
Sharpen+Outlook	2 oz + 12 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	7	96	99	100	
Sharpen+Fierce	2 oz + 3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	8	8	95	100	100	
Sharpen+Prefix	2 oz + 2 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	4	5	94	98	100	
Sharpen+Dimetric	2 oz + 5.33 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	7	4	94	95	98	
Sharpen+Command 3 ME	2 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	2	2	99	100	100	
Sharpen+Dimetric + Command 3 ME	1 oz + 5.33 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	5	5	96	98	99	
Fierce	3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	15	13	93	100	100	
Fierce	3.75 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	15	13	95	100	100	
Fierce+FirstRate	3 oz + 0.15 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	6	5	95	100	100	
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 4						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	0	0	90	88	91	
Untreated Check	0		0	0	0	0	0	
LSD (5%)			6	7	6	3	2	

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX; ²Pion=Pioneer 90M80; ³NK=Northrup King S08-C3.

Table continued on next page.

Table. Sharpen tank-mixtures in Roundup Ready soybean, Mayville, ND, 2010. (continued)

Treatment ¹	Rate product/A	Date of Applic.	July 15			July 26		
			Corw Cntl	Colq Cntl	Pigw Cntl	Corw Cntl	Colq Cntl	Pigw Cntl
			----- % -----					
Sharpen	1 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	81	84	90	77	75	86
Sharpen	2 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	89	93	96	89	87	93
Sharpen+Valor SX	1 oz + 2.5 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	90	99	100	91	98	99
Sharpen+Prowl H2O	1 oz + 2.1 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	70	88	88	65	84	86
Sharpen+Outlook	1 oz + 12 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	81	94	100	80	89	100
Sharpen+Fierce	1 oz + 3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	95	99	100	94	98	100
Sharpen+Prefix	1 oz + 2 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	89	96	100	90	93	99
Sharpen+Dimetric	1 oz + 5.33 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	88	95	99	91	91	96
Sharpen+Command 3 ME	1 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	91	93	94	93	94	92
Sharpen+Valor SX	2 oz + 2.5 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	98	100	100	98	99	100
Sharpen+Prowl H2O	2 oz + 2.1 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	82	93	95	80	87	92
Sharpen+Outlook	2 oz + 12 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	94	94	99	94	90	98
Sharpen+Fierce	2 oz + 3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	96	100	100	95	99	100
Sharpen+Prefix	2 oz + 2 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	91	96	100	93	96	100
Sharpen+Dimetric	2 oz + 5.33 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	93	91	98	92	87	96
Sharpen+Command 3 ME	2 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	98	95	98	98	94	95
Sharpen+Dimetric + Command 3 ME	1 oz + 5.33 oz + 2.67 pt	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	95	95	95	94	91	92
Fierce	3 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	90	98	100	88	93	100
Fierce	3.75 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	92	99	100	90	98	99
Fierce+FirstRate	3 oz + 0.15 oz	May 12						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	92	100	100	90	100	100
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 4						
RUPowerMAX+AMS	32 oz + 2.5% v/v	June 16	90	81	81	85	70	73
Untreated Check	0		0	0	0	0	0	0
LSD (5%)			6	6	6	7	8	8

¹AMS=N-Pak AMS (liquid ammonium sulfate from Winfield Solutions), RUPowerMAX=Roundup PowerMAX.

Micro-rate validation in soybean. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND, to validate 2 versions (8.5 and 17 gpa) of a micro-rate program for use in soybean. Asgrow 'AG0730' Roundup Ready soybean was planted on May 27, 2010. 1 to 2 inch weed treatments were applied on June 14 at 10:15 am with 62 F air, 66 F soil surface, 77% relative humidity, 100% cloud cover, 1 to 5 mph NE wind, dry soil surface, moist subsoil, excellent crop vigor, and no dew present to unifoliolate soybean. Weed species at time of 1 to 2 inch weed application were: 1 to 3 inch (1 to 10/ft²) common lambsquarters; 1 to 2 inch (5 to 40/ft²) hairy nightshade; 1 to 6 inch (1 to 15/ft²) yellow foxtail; 1 to 3 inch (1 to 15/yd²) redroot pigweed; 1 to 4 inch (1 to 3/yd²) common ragweed, and 1 to 3 leaf (0 to 5/yd²) common cocklebur.

2 to 3 inch weed treatments were applied on June 21 at 9:05 am with 73 F air, 82 F soil surface, 78% relative humidity, 100% cloud cover, 1 to 8 mph SW wind, moist soil surface, wet subsoil, good crop vigor, and dew present to V1 to V2 soybean. Weed species at time of 2 to 3 inch weed application were: 1 to 4 inch (1 to 10/ft²) common lambsquarters; 1 to 5 inch (5 to 40/ft²) hairy nightshade; 3 to 8 inch (1 to 2 tillers, 1 to 15/ft²) yellow foxtail; 1 to 6 inch (1 to 15/yd²) redroot pigweed; 1 to 6 inch (1 to 3/yd²) common ragweed; and 3 to 10 inch (0 to 10/yd²) common cocklebur.

3 to 4 inch weed treatments were applied on June 23 at 8:40 am with 66 F air, 69 F soil surface, 99% relative humidity, 100% cloud cover, 5 to 10 mph N wind, dry soil surface, moist subsoil, good crop vigor, and no dew present to V2 to V3 soybean. Weed species at time of 3 to 4 inch weed application were: 3 to 6 inch (1 to 3/yd²) common lambsquarters; cotyledon to 5 inch (5 to 25/ft²) hairy nightshade; 4 to 8 inch, tillering (1 to 10/ft²) yellow foxtail; cotyledon to 7 inch (5 to 40/ft²) redroot pigweed; 2 to 5 inch (1 to 3/yd²) common ragweed; and 4 to 10 inch (0 to 10/yd²) common cocklebur.

1 to 2 inch fb 10DAA treatments were applied on June 23 at 8:50 am with 66 F air, 69 F soil surface, 99% relative humidity, 100% cloud cover, 5 to 10 mph N wind, dry soil surface, moist subsoil, good crop vigor and no dew present to V1 to V2 soybean. Weed species present at the time of 1 to 2 inch fb 10DAA applications were: cotyledon (<1/yd²) common lambsquarters; cotyledon (1 to 10/yd²) hairy nightshade; 1 inch (1 to 5/yd²) yellow foxtail; cotyledon (1 to 2/yd²) redroot pigweed; cotyledon (1 to 3/yd²) common ragweed; and cotyledon (<1/yd²) common cocklebur.

2 to 3 inch fb 10DAA treatments were applied on June 30 at 3:55 pm with 78 F air, 91 F soil surface, 25% relative humidity, 0% cloud cover, 1 to 3 mph NE wind, dry soil surface, moist subsoil, good crop vigor and no dew present to V5 to V6 soybean. Weed species present at the time of 2 to 3 inch fb 10DAA applications were: emergence to 2 inch (1 to 5/yd²) common lambsquarters; emergence to 2 inch (5 to 15/yd²) hairy nightshade; emergence to 2 inch (3 to 5/yd²) yellow foxtail; emergence to 2 inch (1 to 5/yd²) redroot pigweed; emergence to 1 inch (0 to 2/yd²) common ragweed; and cotyledon to 2 leaf (1 to 2/yd²) common cocklebur.

3 to 4 inch fb 10DAA treatments were applied on July 3 at 1:00 pm with 83 F air, 87 F soil surface, 36% relative humidity, 100% cloud cover, 3 to 5 mph SE wind, dry soil surface, moist subsoil, excellent crop vigor and no dew present to V7, 12 inch soybean. Weed species present at the time of 3 to 4 inch fb 10 DAA applications were: emergence to 3 inch (1 to 3/yd²) common lambsquarters; emergence to 3 inch (3 to 10/yd²) hairy nightshade; emergence to 4 inch (1 to 5/yd²) yellow foxtail; emergence to 4 inch (1 to 5/yd²) redroot pigweed; emergence to 2 inch (1/yd²) common ragweed; and cotyledon to 4 leaf (1/yd²) common cocklebur.

Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles and 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for all applications. The experiment had a randomized complete block design with three replicates per treatment.

Data shown in table below was averaged over all species in studies.

The micro-rate program was originally developed in sugarbeet by combining five registered sugarbeet herbicides, reducing the rate of each herbicide by 66 to 75% of the labeled rate, adding MSO adjuvant, and applying this tank-mixture three to five times every five to seven days until lay-by. A micro-rate program was developed in North Dakota for use in conventional corn and dry bean except conventional herbicides rates were reduced 25 to 50% and treatments were applied once or twice. Up to 200,000 acres of conventional soybeans are grown in North Dakota and a conventional micro-rate herbicide program may improve weed control over current programs. Two soybean micro-rate programs are described below. FirstRate was substituted for Flexstar for increase control of large-seeded broadleaf weeds like common ragweed and common cocklebur. The micro-rate treatments with fomesafen and cloransulam were applied at 8.5 and 17 gpa as preliminary research showed improved weed control from increasing spray volume (increase spray volume by 8 to 10 gpa for every 3 inches of weed height). Weed control was 99% 14 days after A and B applications (DAA) and 60 to 99% weed control from C application treatments. Ample rain after application caused new flushes of weeds in all plots. By 28 days after the first micro-rate application composite weed control from A, B, and C treatments was less than 50%, 60%, and 65%, respectively. However, 28 days after the second sequential applications (canopy closure) weed control in A, B, and C plots was 98%, 78%, and 68%, respectively. Replacing fomesafen with cloransulam resulted in less common ragweed control but composite weed control was similar to control from micro-rate treatments with fomesafen. Applying micro-rate treatments at 17 gpa compared to 8.5 gpa generally resulted in a 10 percentage point increase in weed control but an increase of 30 percentage points was observed in some treatments. Application of the micro-rate program to small weeds in soybean provided excellent season-long control of a wide spectrum of weeds. (Dept of Plant Sciences, North Dakota State University, Fargo).

Micro-rate with Flexstar

Rezult B	0.5 pt/A
Rezult G	0.5 pt/A
Raptor	1 fl oz/A
Flexstar	4 fl oz/A
Select	2 fl oz/A
MSO	1.25 pt/A

Micro-rate with FirstRate

Result B	0.5 pt/A
Result G	0.5 pt/A
Raptor	1 fl oz/A
FirstRate	0.1 oz/A
Select	2 fl oz/A
MSO	1.25 pt/A

Application stage:

1 to 3 inch = A
2 to 4 inch = B
3 to 6 inch = C
10 days after A = D
10 days after B = E
10 days after C = F

		<u>14 DAA</u>		<u>Mid-season</u>	
		<u>8.5 gpa</u>	<u>17 gpa</u>	<u>8.5 gpa</u>	<u>17 gpa</u>
Micro-rate with	A	99	99	45	48
Flexstar	B	99	99	55	56
	C	60	72	60	65
	D	98	98	98	98
	E	78	85	78	85
	F	68	76	78	86

		<u>14 DAA</u>		<u>Mid-season</u>	
		<u>8.5 gpa</u>	<u>17 gpa</u>	<u>8.5 gpa</u>	<u>17 gpa</u>
Multi-rate with	A	99	99	34	62
FirstRate	B	99	99	53	63
	C	50	65	55	70
	D	98	98	86	91
	E	65	75	85	96
	F	<u>55</u>	<u>67</u>	<u>72</u>	<u>82</u>
LSD (0.05)		7	8	7	8

Herbicide resistant soybean system comparison. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. An experiment was conducted near Buffalo, ND, to evaluate crop yield and weed efficacy to three herbicide resistant soybean types. Optimum GAT 'CEK-10-151', Asgrow 'AG0230' Roundup Ready, and 'ML0864' LibertyLink soybean was planted on May 24, 2010. Each soybean type was planted in a block 30 feet (10 feet wide/treatment) by 120 feet. PRE treatments were applied on May 26 at 8:45 am with 66 F air, 58 F soil at a four inch depth, 35% relative humidity, 0% cloud cover, 3 to 7 W wind, dry soil surface and wet subsoil. Soil characteristics were: 34% sand, 48.2% silt, 14.8% clay, silt loam texture, 3.4% OM and 8.0 pH. EPOST treatments were applied on June 24 at 8:40 am with 72 F air, 78 F soil surface, 76% relative humidity, 25% cloud cover, 4 to 8 mph W wind, dry soil surface, moist subsoil, excellent crop vigor and no dew present to V2 to V3 soybean varieties. Weed species present at the time of EPOST applications were: 2 to 4 inch (0 to 1/yd²) common lambsquarters; and 2 to 4 inch (0 to 1/yd²) redroot pigweed. POST treatments were applied on July 7 at 5:00 pm with 70 F air, 70 F soil surface, 82% relative humidity, 100% cloud cover, 5 to 8 mph SE wind, dry soil surface, moist subsoil, excellent crop vigor and no dew present to V5 to V6 soybean. Weed species present at the time of POST applications were: 2 to 8 inch (0 to 1/yd²) common lambsquarters; and 3 to 8 inch (0 to 1/yd²) redroot pigweed. Other weed species present at very low populations were: prostrate pigweed, easternblack nightshade, kochia, biennial wormwood, smartweed, common cocklebur, and dandelion. Treatments were applied to the entire 10 by 40 foot plots with a backpack-type plot sprayer with a 10 foot boom delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE, EPOST and POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

No soybean variety injury observed (data not shown). The purpose of this study was to compare weed control systems in three different seed technologies: Optimum GAT, Roundup Ready and LibertyLink. Caution should be made comparing yield as not all varieties may not have been adapted for this region. There was variability in weed control up to June 23 but control was near complete after the POST applications were made. These data support using a PRE followed POST herbicide application program for weed control. (Department of Plant Sciences, North Dakota State University, Fargo).

Table. Herbicide resistant soybean system comparison (Zollinger, Ries, Kazmierczak).

Treatment ¹	Rate (product/A)	June 14 and 23										
		Rrpw	Prpw	Colq	Ebns	Koch	Biww	Smwe	Coch	Dall		
----- % control -----												
<u>Optimum GAT soybean</u>												
<u>PRE/POST</u>												
Valor SX/RUPM+ABS+AMS	2oz/22fl oz+0.5oz+8.5lb/100gal	80	83	80	99	99	99	99	99	99	99	50
Valor SX+Harmony GT+Classic/ RUPM+ABS+AMS	2oz+0.5oz+0.3oz/ 22fl oz+0.5oz+8.5lb/100gal	99	99	99	99	99	99	99	99	99	99	99
<u>EPOST/POST</u>												
RUPM+ABS+AMS /RUPM+AMS	22fl oz+0.5oz+8.5lb/100gal/ 22fl oz+8.5lb/100gal	-	-	-	-	-	-	-	-	-	-	-
<u>Roundup Ready soybean</u>												
<u>PRE/POST</u>												
Intro/RUPM+AMS	2qt/22fl oz+8.5lb/100gal	72	72	72	43	47	43	47	47	43	47	23
Authority First/RUPM+AMS	4oz/22fl oz+8.5lb/100gal	99	99	99	99	99	99	99	99	99	99	99
<u>EPOST/POST</u>												
RUPM+AMS/RUPM+AMS	22fl oz+8.5lb/100gal/22fl oz+8.5lb/100gal	-	-	-	-	-	-	-	-	-	-	-
<u>LibertyLink soybean</u>												
<u>PRE/POST</u>												
Authority First/Ignite+AMS	4oz/22fl oz+8.5lb/100gal	99	99	99	99	99	99	99	99	99	99	99
Outlook/Ignite+AMS	20fl oz/22fl oz+8.5lb/100gal	72	72	72	77	33	43	47	47	43	47	23
<u>EPOST/POST</u>												
Ignite+AMS/Ignite+AMS	22fl oz+8.5lb/100gal/22fl oz+8.5lb/100gal	-	-	-	-	-	-	-	-	-	-	-
LSD (0.05)		8	4	5	5	7	6	6	6	6	6	8

¹RUPM = Roundup PowerMax; ABS = Affinity Broadspec.

Table cont. Herbicide resistant soybean system comparison (Zollinger, Ries, Kazmierczak).

Treatment ¹	Rate (product/A)	July 7, 21, and August 18										Soybean					
		Rrpw	Prpw	Colq	Ebns	Koch	Biww	Smwe	Coch	Dall	Yield	test wt					
		----- % control -----										- bu/A -	- lbs/bu -				
Optimum GAT soybean																	
<u>PRE/POST</u>																	
Valor SX/RUPM+AFBS+AMS	2oz/22fl oz+0.5oz+8.5lb/100gal	99	99	96	99	99	99	99	99	99	99	99	99	99	57.8	57	
Valor SX+Harmony GT+Classic/ RUPM+ABS+AMS	2oz+0.5oz+0.3oz/ 22fl oz+0.5oz+8.5lb/100gal	99	99	85	99	99	99	99	99	99	99	99	99	99	57.6	57	
<u>EPOST/POST</u>																	
RUPM+ABS+AMS /RUPM+AMS	22fl oz+0.5oz+8.5lb/100gal/ 22fl oz+8.5lb/100gal	99	99	99	99	99	99	99	99	99	99	99	99	99	62.0	57	
Roundup Ready soybean																	
<u>PRE/POST</u>																	
Intro/RUPM+AMS	2qt/22fl oz+8.5lb/100gal	87	92	73	99	99	99	99	99	99	99	99	99	99	67.3	58	
Authority First/RUPM+AMS	4oz/22fl oz+8.5lb/100gal	99	99	99	99	99	99	99	99	99	99	99	99	99	67.9	58	
<u>EPOST/POST</u>																	
RUPM+AMS/RUPM+AMS	22fl oz+8.5lb/100gal/22fl oz+8.5lb/100gal	99	99	99	99	99	99	99	99	99	99	99	99	99	67.1	58	
LibertyLink soybean																	
<u>PRE/POST</u>																	
Authority First/Ignite+AMS	4oz/22fl oz+8.5lb/100gal	99	99	98	99	99	99	99	99	99	99	99	99	99	63.8	58	
Outlook/Ignite+AMS	20fl oz/22fl oz+8.5lb/100gal	78	80	82	99	99	99	99	99	99	99	99	99	99	59.3	59	
<u>EPOST/POST</u>																	
Ignite+AMS/Ignite+AMS	22fl oz+8.5lb/100gal/22fl oz+8.5lb/100gal	88	85	87	99	99	99	99	99	99	99	99	99	99	65.6	58	
LSD (0.05)		5	2	6	NS	NS	NS	5	NS	3	6	5	1				

¹RUPM = Roundup PowerMax; ABS = Affinity Broadspec.

Stinger rates and adjuvants on volunteer soybean. Zollinger, Richard K., Angela J. Kazmierczak. A greenhouse study was conducted to evaluate soybean injury from Stinger rates applied with a crop oil concentrate or a methylated seed oil. Soybean was planted in cones and grown to the first trifoliolate when applications were then made on June 4, 2010 at 9:00 am, using a greenhouse spray chamber delivering 10 gpa at 40 psi through a 650046 nozzle. The experiment had a randomized complete design with four replicates per treatment.

Many fields have volunteer Roundup Ready soybean. Growers have asked how much Stinger (clopyralid) does it take to “really” control soybean with no regrowth. By 10 days following application, no differences in treatments could be determined. An overall control rating of 70% was recorded but all growth had ceased and no plants resumed growth from buds in leaf axils. On June 18, no regrowth had occurred. Only 3 or 4 fl oz/A rate with MSO caused plants to completely desiccate. In all other treatments, the growing points appeared dead but the leaves maintained their normal green color with no phytotoxicity showing. So, how dead do you need the plants to be? How much money are you willing to spend to “kill” soybean by using Stinger (clopyralid)? From this data, the 1 fl oz/A rate stopped plants from continuing to grow after application but did not cause “crispy” dead plants. Only the higher rates with the more aggressive MSO adjuvant “killed” soybean plants. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. Stinger rates and adjuvants on volunteer soybean (Zollinger and Kazmierczak).

Treatment	Rate (product/A)	10 DAT		14 DAT		14 DAT - Unifoliolate	
		COC ¹	MSO ²	COC	MSO	COC	MSO
		-- % death --		-- % death --		-- % death --	
Stinger	1fl oz	70	70	70	70	12	10
Stinger	2fl oz	70	70	70	70	23	15
Stinger	3fl oz	70	70	80	80	57	67
Stinger	4fl oz	70	70	80	80	65	93
LSD (0.05)		NS	NS	5	5	9	9

¹COC = crop oil concentrate applied at 1 qt/A.

²MSO = methylated seed oil applied at 1 pt/A.

KIH-485 (pyroxasulfone) carryover to rotational crops. Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak. An experiment was conducted near Alice, ND, to evaluate crop response in the fall and the following year to fall applications of KIH-485. 'Dilse'Durum, '50 Calibur' Roundup Ready canola, and 'Ameristand 403T' alfalfa was planted on June 1, 2009 followed by PRE applications at 5:10 pm with 75 F air, 67 F soil at a four inch depth, 17% relative humidity, 45% clouds, 4 to 8 mph W wind, dry soil surface, and moist subsoil. Soil characteristics were: 40.4% sand, 40.5% silt, 19.1% clay, loam texture, 3.9% OM, and 7.9 pH. Treatments were applied to the entire 6.7 feet of the 20 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles. The experiment had a randomized complete block design with three replicates per treatment. A fall rating was taken before the first frost. The entire plot area was then lightly disced to prepare the soil for planting in 2010. On April 21, 2010, 'Dilse'Durum, '50 Calibur' Roundup Ready canola, 'and Ameristand 403T' alfalfa was replanted in the study area.

Fall planted alfalfa showed injury only at 5.6 oz, while canola and durum showed injury at all rates used. Crops showed either no or slight injury when planted approximately 12 months after application. (Department of Plant Sciences, North Dakota State University, Fargo).

Table. KIH-485 (pyroxasulfone) carryover to rotational crops (Zollinger, Ries, Kazmierczak).

Treatment	Rate (product/A)	28-Sep-09		19-May-10		3-Jun-10		10-Jun-10		17-Jun-10							
		Alfalfa	Canola	Durum	Alfalfa	Canola	Durum	Alfalfa	Canola	Durum	Alfalfa	Canola	Durum				
KIH-485	1.4oz	0	7	12	0	0	0	0	0	0	0	0					
KIH-485	2.8oz	0	17	42	0	0	0	7	0	0	7	0					
KIH-485	5.6oz	52	73	67	0	0	8	8	8	5	8	0					
Dual II-Magnum	2.66pt	0	3	3	0	0	0	0	0	0	0	0					
Untreated		0	0	0	0	0	0	0	0	0	0	0					
LSD (0.05)		6	8	11	NS	NS	NS	2	NS	3	1	NS	NS	3	NS	NS	2