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Early Pre-Plant applications in corn. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and corn injury to EPP herbicides. Corn was planted on June 28, 2016. Early pre-plant treatments were applied on June 16, 2016 at 8:00 AM with 74 F air, 71 F soil at a four inch depth, 57% RH, 25% cloud cover, 3-5 mph SE wind, and moist soil moisture. Weeds present at the time of EPP applications were: coxb 4-6" at 2-6/yd2, corw 2-4" at 2-4/ft2, rrpw 2-4" at 2-4/ft2, colq 2-4" at 2-4/ft2, yeft 3-5" at 8-10/ft2, wibw 2-4" at 1-2/yd2, wimu 2-4" at 1-2/ft2, and hans 2-4" at 1-2/yd2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 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 through 11002 TT nozzles for EPP at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Early Pre-Plant applications in corn (Zollinger, Wirth, Adams).

Treatment ¹	Rate (Product/A)	14 DAA							28 & 42 DAA								
		Corn		Yeft	Rrpw	Colq	Hans	Corw	Cocb	Corn		Yeft	Rrpw	Colq	Hans	Corw	Cocb
		-% inj-		-% control-----													
Rim+Trib+Dic +2,4-D Ester+COC	0.67oz+0.22oz+2.52oz +1pt+1pt	-	53	72	73	73	70	70	0	73	75	80	77	82	90		
Rim+Trib+Dic +2,4-D Ester+Ab Ex+AMS	0.67oz+0.22oz+2.52oz +1pt+32flob+2lb	-	99	99	99	99	99	99	0	99	99	99	99	99	99		
Rim+Trib+Dic +2,4-D Ester+COC	1oz+0.33oz+3.77oz +1pt+1pt	-	87	82	82	80	65	86	0	88	88	90	85	73	96		
Rim+Trib+Dic +2,4-D Ester+Ab Ex+AMS	1oz+0.33oz+3.77oz +1pt+32flob+2lb	-	99	99	99	99	99	99	0	92	99	99	99	99	99		
Rim+Thifen +2,4-D Ester+COC	0.67oz+0.16oz +1pt+1pt	-	67	82	82	82	53	83	0	65	82	82	82	53	95		
Rim+Thifen +2,4-D Ester+COC	1oz+0.25oz +1pt+1pt	-	65	82	82	82	55	82	0	67	95	95	95	48	95		
2,4-D Ester +Ab Ex+AMS	1pt +32flob+2lb	-	99	93	93	93	90	90	0	99	99	99	99	90	99		
Sharpen+MSO +Ab Ex+AMS	1flob+1pt +32flob+2lb	-	99	99	99	99	99	99	0	99	78	99	99	90	99		
Untreated Check		-	0	0	0	0	0	0	0	0	0	0	0	0	0		
LSD (0.05)		-	3	3	3	3	2	2	0	3	2	4	3	3	1		

¹Rim = Rimsulfuron, Trib = Tribenuron, Dic = Dicamba, Ab Ex = Abundit Extra, Thifen = Thifensulfuron

Acuron Flexi and other herbicide comparisons in corn. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and corn injury using Acuron Flexi and other herbicides. Corn was planted on May 17, 2016. PRE was applied on May 17, 2016 at 2:00 PM with 72 F air, 60 F soil at a four inch depth, 17% RH, 0% cloud cover, 0-3 mph NW wind, and adequate soil moisture. EPOST treatments were applied on June 16, 2016 at 8:00 AM with 74 F air, 71 F soil at a four inch depth, 57% RH, 25% cloud cover, 3-5 mph NE wind, and moist soil moisture. Weeds present at the time of EPOST applications were: cobb 5-7" at 4-8/ft2, corw 3-5" at 1-2/ft2, rrpw 2-4" at 4-6/ft2, colq 2-4" at 4-6/ft2, yeft 2-4" at 4-6/ft2, wibw 2-4" at 4-6/ft2, wimu 5-7" at 4-8/ft2, and hans 2-4" at 4-6/ft2. MPOST treatments were applied on July 21, 2015 at 11:00 AM with 85 F air, 74 F soil at a four inch depth, 13% RH, 0% cloud cover, 3.5-5 mph NW wind, and adequate soil moisture. Weeds present at the time of MPOST applications were: cobb 6-8" at 2/ft2, and yeft 2-4" at 3/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, 4.5% OM, and 7.7 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 through 11002 TT nozzles for PRE and EPOST and 17 gpa through 11001 TTI nozzles for the MPOST application, all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Acuron Flexi and other herbicide comparisons in corn (Zollinger, Wirth, Adams).

Table: Acuron Flexi and other nematicide comparisons in corn (Zollinger, Wu, Aduanis).																						
Treatment¹	Rate (Product/A)	14 DA PRE					PTP/28 DA PRE					42 & 56 DA PRE										
		Corn	Yeft	Rrpw	Colq	Hans	Corw	Cocb	Corn	Yeft	Rrpw	Colq	Hans	Corw	Cocb							
		-% inj-	-% control-					-% inj-	-% control-					-% inj-	-% control-							
(PRE) Acuron Flexi	2.25qt	0	99	99	99	99	99	28	0	99	99	99	99	99	97	0	99	99	99	99	99	97
(PRE) Acuron	3qt	0	99	99	99	99	99	37	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(PRE) Corvus	5.6flocz	0	99	99	99	99	99	37	0	99	99	99	99	99	42	0	99	99	99	99	95	83
(PRE) SureStart II	2.5pt	0	99	99	99	99	99	35	0	99	99	99	99	99	48	0	99	99	99	72	72	72
(PRE) Instigate	6oz	0	99	99	99	99	99	37	0	70	99	99	99	99	68	0	70	99	99	99	99	66
(PRE) Verdict	16flocz	0	99	99	99	99	99	88	0	99	99	99	99	99	96	0	99	99	99	99	99	96
(PRE) Resicore	3qt	0	99	99	99	99	99	20	0	99	99	99	99	99	93	0	99	99	99	99	99	95
(PRE) Acuron Flexi	1.125qt																					
(POST) Halex GT+Aatrex+NIS	3.6pt+8flocz+0.25%	0	99	99	99	99	99	20	0	99	99	99	99	99	77	0	99	99	99	99	99	99
(EPOST) Acuron Flexi+RUPM²	1.5qt+27flocz	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	99	99	99	99	99	99
(EPOST) Acuron+RUPM	2qt+27flocz	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	99	99	99	99	99	99
(EPOST) Halex GT+Aatrex+NIS	3.6pt+8flocz+0.25%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	99	99	99	99	99	99
(EPOST) RUPM+Aatrex	27flocz+8flocz	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	99	99	99	99	99	99
+Capreno	+3flocz	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	99	99	99	99	99	99
(EPOST) RUPM+Aatrex	27flocz+8flocz	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	99	99	99	99	99	99
+Armezon PRO	+20flocz	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	99	99	99	99	99	99
(EPOST) RUPM+Aatrex	27flocz+8flocz	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	99	99	99	99	82	85
+SureStart II	+1.75pt	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0	0
Untreated Check		.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0	0
LSD (0.05)		0	0	0	0	0	0	5	0	0	0	0	0	0	4	0	0	0	0	1	2	2

¹All POST and EPOST treatments contained Ammonium Sulfate at 8.5lb/100gal of water

²RUPM=Roundup Powermax

Liberty efficacy on glyphosate resistant waterhemp and other weeds. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Absaraka, ND to evaluate glyphosate resistant waterhemp and other weed control and corn injury to PRE and POST herbicides. RR/LL corn was planted on April 22, 2016. PRE treatments were applied on April 22, 2016 at 11:10 AM with 55 F air, 40 F soil at a four inch depth, 29% RH, 0% cloud cover, 2-6 mph SE wind, and moist soil moisture. POST treatments were applied on June 29, 2016 at 11:30 AM with 79 F air, 80 F soil at a four inch depth, 50% RH, 0% cloud cover, 5-7 mph N wind, and adequate soil moisture. Soil characteristics were: 49.2% sand, 31.8% silt, 19% clay, Loam, 3.4% OM, and 7.1 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 through 11002 TT nozzles for PRE and POST at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

The spring of 2016 was fairly dry which prevented waterhemp and other weeds from germinating prolifically. Along with the dry spring, Corvus and Atrazine provided great control of all species until corn was tall enough to shade out the smaller weeds. Liberty was still applied for crop injury ratings.

Table. Liberty efficacy on glyphosate resistant waterhemp and other weeds (Zollinger, Wirth, Adams).

Treatment ¹	Rate (Product/A)	Prior to POST and 14 DA POST				
		Corn	Wahe	Colq	Koch	Corw
		-% inj-	-----	% control-----		
(PRE)Corvus+Atrazine	4floz+16floz					
(POST) Liberty	22floz	0	98	99	99	98
(PRE)Corvus+Atrazine	4floz+16floz					
(POST) Liberty	29floz	0	98	99	99	98
(PRE)Corvus+Atrazine	4floz+16floz					
(POST) Liberty	36floz	0	98	99	99	99
(PRE)Corvus+Atrazine	4floz+16floz					
(POST) Liberty+Atrazine	22floz+16floz	0	98	99	99	99
(PRE)Corvus+Atrazine	4floz+16floz					
(POST) Liberty+Atrazine+Laudis	29floz+16floz+3floz	0	99	99	99	99
(PRE)Corvus+Atrazine	4floz+16floz					
(POST) Liberty+Atrazine	36floz+16floz	0	99	99	99	99
(PRE)Corvus+Atrazine	4floz+16floz					
(POST) Liberty+Laudis	22floz+3floz	0	98	99	99	99
(PRE)Corvus+Atrazine	4floz+16floz					
(POST) Liberty+Laudis	29floz+3floz	0	99	99	99	99
(PRE)Corvus+Atrazine	4floz+16floz					
(POST) Liberty+DiFlexx	22floz+10floz	0	98	99	99	99
(PRE)Corvus+Atrazine	4floz+16floz					
(POST) Liberty+DiFlexx	29floz+10floz	0	98	99	99	99
Untreated Check		0	0	0	0	0
LSD (0.05)		0	2	0	0	2

¹All POST treatments contained Ammonium Sulfate at 3lb/100gal of water

ISK weed control programs in corn. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and corn injury to PRE, EPOST, and POST herbicides. RR/LL corn was planted on May 17, 2016. PRE treatments were applied on May 17, 2016 at 1:00 PM with 71 F air, 60 F soil at a four inch depth, 17% RH, 0% cloud cover, 2-4 mph NW wind, and adequate soil moisture. EPOST treatments were applied on June 16, 2016 at 8:00 AM with 74 F air, 71 F soil at a four inch depth, 57% RH, 25% cloud cover, 3-5 mph SE wind, and moist soil moisture. Weeds present at the time of EPOST applications were: coxb 5-7" at 4-8/ft2, hans 2-4" at 4-6/ft2, and wimu 5-7" at 4-8/ft2. POST treatments were applied on July 21, 2016 at 11:00 AM with 85 F air, 74 F soil at a four inch depth, 13% RH, 0% cloud cover, 3-3.5 mph NW wind, and adequate soil moisture. Weeds present at the time of POST applications were: coxb 6-8" at 5/ft2 and corw 6-8" at 10/ft2, colq 4-6" at 2/ft2, and rrpw 6-8" at 10/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Sandy Loam, 4.5% OM, and 7.7 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 through 11002 TT nozzles for PRE and EPOST while 11002 TTI nozzles were used for POST at the same gpa, all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. ISK weed control programs in corn (Zollinger, Wirth, Adams).

Treatment ¹	Rate (Product/A)	14 DA EPOST							28 & 42 DA EPOST						
		Corn			Yeft Rrpw Colq Hans Corw Cocb				Corn			Yeft Rrpw Colq Hans Corw Cocb			
		-% inj-			-% control-				-% inj-			-% control-			
(PRE) Dual II Magnum	1.5pt	0	99	99	50	0	0	0	0	80	80	20	0	0	0
(EPOST) Tolpyralate+Atrazine +MSO	1fhoz+1.75pt +0.5%v/v	0	99	99	99	99	99	90	0	99	99	99	99	99	93
(EPOST) Tolpyralate+Atrazine +MSO	1.375fhoz+1.75pt +0.5%v/v	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(EPOST) Tolpyralate+Atrazine +Dual II Magnum+MSO	1fhoz+1.75pt+2pt +0.5%v/v	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(EPOST) Tolpyralate+Atrazine +Surpass NXT+MSO	1fhoz+1.75pt +2.25pt+0.5%v/v	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(EPOST) Tolpyralate+Atrazine +Status+MSO	1fhoz+1.75pt +5oz+0.5%v/v	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(PRE) Dual II Magnum (POST) Tolpyralate+Atrazine +MSO	1.5pt 1fhoz+2pt +0.5%v/v	0	99	99	50	50	50	50	0	99	99	99	99	99	99
(PRE) Dual II Magnum (POST) Tolpyralate+Atrazine +MSO	1.5pt 1.375fhoz+2pt +0.5%v/v	0	99	99	50	50	50	50	0	99	99	99	99	99	99
(PRE) Dual II Magnum (POST) Tolpyralate+Atrazine +Dual II Magnum+MSO	1.5pt 1fhoz+1.75pt 2pt+0.5%v/v	0	99	99	50	50	50	50	0	99	99	99	99	99	99
(PRE) Dual II Magnum (POST) Tolpyralate+Atrazine +Surpass NXT+MSO	1.5pt 1fhoz+1.75pt +2.25pt+0.5%v/v	0	99	99	50	50	50	50	0	99	99	99	99	99	99
(PRE) Dual II Magnum (POST) Tolpyralate+Atrazine +RUPM ² +MSO	1.5pt 1.375fhoz+1.75pt 22fhoz+0.5%v/v	0	99	99	50	50	50	50	0	99	99	99	99	99	99
(PRE) Dual II Magnum (POST) Tolpyralate+Atrazine +Steadfast Q+MSO	1.5pt 1.375fhoz+1.75pt 1.5oz+0.5%v/v	0	99	99	50	50	50	50	0	99	99	99	99	99	99
(PRE) Dual II Magnum (POST) Callisto+Atrazine +COC	1.5pt 3fhoz+1.75pt +1%v/v	0	99	99	90	90	90	90	0	99	99	99	99	99	99
(PRE) Dual II Magnum (POST) Impact+Atrazine +MSO	1.5pt 1fhoz+1.75pt +0.5%v/v	0	99	99	50	90	90	90	0	99	99	99	99	99	99
Untreated Check		0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		0	0	0	0	0	0	0	0	0	0	0	0	0	1

¹All EPOST and POST treatments include 28% UAN at 2.5% v/v

²RUPM=Roundup Powermax

PRE and POST corn application programs. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and corn injury to PRE, EPOST, and LPOST herbicides. RR/LL corn was planted on May 17, 2016. PRE treatments were applied on May 17, 2016 at 1:00 PM with 72 F air, 60 F soil at a four inch depth, 17% RH, 0% cloud cover, 2-4 mph NW wind, and adequate soil moisture. EPOST treatments were applied on June 13, 2016 at 12:30 PM with 81.8 F air, 75 F soil at a four inch depth, 20% RH, 25% cloud cover, 4-6 mph NW wind, and adequate soil moisture. Weeds present at the time of EPOST applications were: cocb 3-7" at 4-6/ft2, corw 1-3" at 1-3/yd2, rrpw 1-3" at 1-3/yd2, colq 1-3" at 1-3/yd2, yeft 3-4" at 6-8/ft2, wibw 1-3" at 1-2/yd2, wimu 2-4" at 2-4/yd2, and hans 1-3" at 1-2/yd2. LPOST treatments were applied on June 28, 2016 at 1:00 PM with 75 F air, 73 F soil at a four inch depth, 40% RH, 0% cloud cover, 1-3 mph N wind, and adequate soil moisture. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 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 through 11002 TT nozzles for PRE, EPOST and LPOST, all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. PRE and POST corn application programs (Zollinger, Wirth, Adams).

Treatment ¹	Rate (Product/A)	Prior to POST							28, 42, & 56 DA POST						
		Corn	Yeft	Rrpw	Colq	Hans	Corw	Cocb	Corn	Yeft	Rrpw	Colq	Hans	Corw	Cocb
		-% inj-	-----	% control	-----	-----	-----	-----	-% inj-	-----	% control	-----	-----	-----	-----
(PRE) Anthem Maxx+Atrazine	4flobz+0.83lb														
(LPOST) RUPM ²	32flobz	0	73	99	99	99	95	33	0	99	99	99	99	95	99
(PRE) Anthem Maxx	4flobz														
(EPOST) Solstice+Atrazine	2.5flobz+0.83lb	0	75	99	99	99	99	25	0	70	99	99	99	99	99
+RUPM+COC	+32flobz+0.5%v/v														
(PRE) Anthem Maxx+Atrazine	4flobz+1.11lb														
(EPOST) Solstice+Atrazine	2.5flobz+0.56lb	0	73	99	99	99	92	33	0	82	99	99	99	95	99
+RUPM+COC	+32flobz+0.5%v/v														
(PRE) Anthem Maxx+Atrazine	4flobz+0.83lb														
+Balance Flexx	+2flobz	0	99	99	99	99	99	75	0	99	99	99	99	99	99
(EPOST) RUPM	32flobz														
(PRE) Acuron	2.5qt														
(LPOST) RUPM	32flobz	0	99	99	99	99	99	92	0	99	99	99	99	99	99
(PRE) Corvus+Atrazine	5.6flobz+0.83lb														
(LPOST) RUPM	32flobz	0	99	99	99	99	99	96	0	99	99	99	99	99	99
(EPOST) Halex GT+NIS	3.6pt+0.25%v/v	0	0	0	0	0	0	0	0	70	95	85	91	80	99
(EPOST) Solstice+Atrazine	3.15flobz+1.11lb														
+RUPM+COC	32flobz+0.5%v/v	0	0	0	0	0	0	0	0	62	99	99	99	85	99
(EPOST) Solstice+Anthem Maxx	2.5flobz+2flobz														
+RUPM+COC	+32flobz+0.5%v/v	0	0	0	0	0	0	0	0	72	82	83	85	75	99
(EPOST) Solstice+Anthem Maxx	2.5flobz+2flobz														
+Atrazine+RUPM	0.56lb+32flobz	0	0	0	0	0	0	0	0	70	99	99	99	85	99
+COC	+0.5%v/v														
(PRE) Anthem Maxx	4flobz														
+Balance Flexx	+3flobz	0	99	99	99	99	99	57	0	99	99	99	99	99	99
(LPOST) RUPM	32flobz														
(PRE) SureStart II	2pt														
(LPOST) Durango	1qt	0	99	99	99	99	99	75	0	99	99	99	99	99	99
(PRE) Surpass NXT	2pt														
(LPOST) Durango+WideMatch	1qt+1pt	0	99	99	99	99	99	75	0	99	99	99	99	99	99
(PRE) SureStart II	2pt														
(LPOST) Durango+Atrazine	1qt+0.56lb	0	99	99	99	99	99	75	0	99	99	99	99	99	99
(PRE) SureStart II	2pt														
(LPOST) Durango+SureStart II	1qt+1pt	0	99	99	99	99	99	73	0	99	99	99	99	99	99
(PRE) Resicore	2.75qt														
(LPOST) Durango	1qt	0	99	99	99	99	99	99	0	99	99	99	99	99	99
LSD (0.05)		0	2	0	0	0	2	3	0	2	1	1	0	2	0

¹All EPOST and LPOST treatments contained Ammonium Sulfate at 8.5lb/100gal of water

²RUPM=Roundup Powermax

Bayer weed control programs in corn. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and corn injury to PRE and POST herbicides. Corn was planted on May 17, 2016 at 2:00 PM with 72 F air, 60 F soil at a four inch depth, 17% RH, 0% cloud cover, 0-3 mph NW wind, and adequate soil moisture. MPOST treatments were applied on June 13, 2016 at 12:00 PM with 82 F air, 75 F soil at a four inch depth, 17% RH, 0% cloud cover, 4-6 mph NW wind, and adequate soil moisture. Weeds present at the time of MPOST applications were: coxb 4-6" at 4-6/ft2, corw 1-3" at 8-10/ft2, rrpw 1-3" at 2-3/ft2, colq 1-3" at 1-2/ft2, yeft 1-4" at 4-8/ft2, wibw 1-3" at 1-2/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 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 through 11002 TT nozzles for PRE and MPOST, both at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Bayer weed control programs in corn (Zollinger, Wirth, Adams).

Water Defect: Weed Control Program in Corn (Seeding) - 2007/2008																
Treatment ¹	Rate (Product/A)	Prior to POST					28 DA POST					56 DA POST				
		Corn	Yeft	Rrpw	Colq	Hans	Corw	Cocb	-% inj-	Corn	Yeft	Rrpw	Colq	Hans	Corw	Cocb
(PRE) Corvus+Atrazine	5.6flox+24flox	0	99	99	99	99	99	78	0	99	99	99	99	99	99	83
(PRE) Corvus	4flox															
(POST) Laudis+RUPM ² +DiFlexx	3flox+22flox+8flox	0	99	99	99	99	99	55	0	99	99	99	99	99	99	99
+Atrazine+MSO	+16flox+1%v/v															
(POST) Capreno+RUPM	3flox+22flox															
+Atrazine+COC	+16flox+1%v/v	0	0	0	0	0	0	0	0	99	99	99	99	99	99	95
(POST) Capreno+RUPM+DiFlexx	3flox+22flox+8flox															
+Atrazine+COC	+16flox+1%v/v	0	0	0	0	0	0	0	0	99	99	99	99	99	99	95
(POST) Laudis+RUPM	3flox+22flox															
+Atrazine+MSO	+16flox+1%v/v	0	0	0	0	0	0	0	0	99	99	99	99	99	99	96
(POST) Laudis+RUPM+DiFlexx	3flox+22flox+8flox															
+Atrazine+MSO	+16flox+1%v/v	0	0	0	0	0	0	0	0	99	99	99	99	99	99	99
(POST) Status+RUPM+Atrazine	3.5oz+22flox+16flox	0	0	0	0	0	0	0	0	99	99	99	99	99	99	95
(PRE) Lumax EZ	64flox	0	99	99	99	99	99	91	0	99	99	99	99	99	99	94
Untreated Check		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SD (0.05)		0	0	0	0	0	0	4	0	0	0	0	0	0	0	2

¹All POST treatments contained Ammonium Sulfate at 8.5lb/100gal of water

²RUPM=Roundup Powermax

DiFlexx Duo efficacy on multiple weeds in corn. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and corn injury to POST herbicides. RR/LL corn was planted on May 17, 2016. POST treatments were applied on June 21, 2016 at 11:00 AM with 85 F air, 74 F soil at a four inch depth, 13% RH, 0% cloud cover, 3.5-5 mph NW wind, and adequate soil moisture. Weeds present at the time of POST applications were: coxb 6-8" at 1/yd2, corw 6-8" at 3/yd2, colq 4-6" at 2//ft2, and rrpw 6-8" at 20/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 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 through 11002 TTI nozzles for POST at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. DiFlexx Duo efficacy on multiple weeds in corn (Zollinger, Wirth, Adams).

Treatment ¹	Rate (Product/A)	7 DAA							14, 28, & 42 DAA						
		Corn	Yeft	Rrpw	Colq	Hans	Corw	Cocb	Corn	Yeft	Rrpw	Colq	Hans	Corw	Cocb
		-% inj-	-----% control-----						-% inj-	-----% control-----					
DiFlexx Duo+Atrazine+COC	24floz+16floz+1%v/v	0	50	50	50	50	50	50	0	99	89	99	99	99	99
DiFlexx Duo+Atrazine+COC	32floz+16floz+1%v/v	0	50	50	50	50	50	50	0	99	88	99	99	99	99
DiFlexx Duo+Atrazine+RUPM ²	32floz+16floz+32floz	0	50	50	50	50	50	50	0	99	99	99	99	99	99
DiFlexx Duo+Atrazine+Liberty	32floz+16floz+22floz	0	70	70	70	70	70	70	0	99	99	99	99	99	99
Capreno+Atrazine+RUPM	3floz+16floz+32floz	0	50	50	50	50	50	50	0	90	99	99	99	99	99
Halex GT+Atrazine +NIS	57floz+16floz +0.25%v/v	0	50	50	50	50	50	50	0	84	99	99	99	99	99
Armezon+Atrazine +Outlook+NIS	0.57floz+16floz +14floz+0.25%v/v	0	20	20	20	20	20	20	0	30	30	30	30	30	30
Armezon+Atrazine +Status+NIS	0.57floz+16floz +3oz+0.25%v/v	0	30	30	30	30	30	30	0	99	60	99	99	85	99
Armezon+Atrazine +Outlook+RUPM	0.57floz+16floz 14floz+32floz	0	50	50	50	50	50	50	0	99	99	99	99	99	99
Armezon+Atrazine +Status+RUPM	0.57floz+16floz +3oz+32floz	0	50	50	50	50	50	50	0	99	89	99	99	99	99
Untreated Check		0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		0	0	0	0	0	0	0	0	2	1	0	0	3	0

¹All POST treatments contained Ammonium Sulfate at 8.5lb/100gal of water

²RUPM=Roundup Powermax

Corn weed control with single- versus double-pass herbicide application, Carrington, 2016. Greg Endres and Mike Ostlie. The trial was conducted at the NDSU Carrington Research Extension Center in cooperation with BASF to evaluate corn weed control with selected PRE or POST herbicides versus PRE plus POST herbicides. Experimental design was a randomized complete block with three replicates. The field trial was established on a conventionally-tilled Heimdal-Emrick loam soil with final preplant tillage on April 21. Dekalb 'DKC33-78 RIB' was planted on May 6 in 30-inch rows with very light and scattered weed density. Herbicide treatments were applied with a hand-held boom sprayer delivering 12 gal/A at 35 psi through 8001 flat fan nozzles to the center 6.7 ft of 10- by 30-ft plots. PRE treatments were applied on May 7 with 60 F, 29% RH, and 5 MPH wind. Following PRE herbicide application, rainfall totaled 0.2 inches during May 9-10 and 0.7 inches during May 22-25. POST 1 treatments were applied on May 26 with 75 F, 49% RH, and 2 mph wind to 2-leaf (V2) stage corn, 3- to 4-leaf yellow foxtail, 1- to 3-inch tall common lambsquarters, 0.5- to 1-inch tall redroot and prostrate pigweed, and 0.5- to 1-inch tall wild buckwheat. POST 2 treatments were applied on June 7 with 82 F, 31% RH, and 2 mph wind to 3- to 4-leaf (V3-4) stage corn, 3- to 4-leaf and tillering yellow foxtail, 1- to 4-inch tall common lambsquarters, 0.5- to 3-inch tall redroot and prostrate pigweed, and 2-inch tall wild buckwheat. The trial was not harvested due to variable plant stand, and hail (July 9) and deer-feeding damage.

No corn response was noted during visual evaluation of weed control. With the exception of SureStart, PRE herbicides provided good (80-87%) control of yellow foxtail and generally good to excellent control of common lambsquarters and pigweed about 3 weeks after application (Table). Also, Acuron (treatment 9) provided excellent (93-98%) control of broadleaf weeds. PRE Verdict followed by POST Status or ArmezonPro plus Atrazine and Roundup PowerMax (treatments 3 and 4), or ArmezonPro plus Atrazine and Roundup PowerMax (treatment 5) provided excellent (94-99%) control of all weeds when evaluated on June 21.

Table.														
Herbicide				Weed control (%) ¹										
Treatment ²		Rate	Timing ³	26-May			7-Jun				21-Jun			
No.		fl oz product/A		yefo	cola	piwe	yefo	colq	piwe	wibw	yefo	colq	piwe	wibw
1	untreated check	x	x	0	0	0	0	0	0	0	0	0	0	0
2	Verdict	18	PRE											
	Atrazine 4L	12		86	87	97	84	80	92	63	71	70	75	39
3	Verdict	13	PRE	81	85	90								
	Status	4 oz wt	POST2											
	Roundup PowerMax	22												
	AMS	8.5 lb/100 gal					76	74	78	88	97	97	94	98
	Verdict	10		PRE	81	83	84							
4	ArmezonPro	18	POST1											
	Atrazine 4L	12												
	Roundup PowerMax	22												
	AMS	8.5 lb/100 gal		x	x	x	99	99	99	99	97	99	98	99
5	ArmezonPro	18	POST1											
	Atrazine 4L	12												
	Roundup PowerMax	22												
	AMS	8.5 lb/100 gal		x	x	x	98	99	99	97	95	96	95	89
6	ArmezonPro	18	PRE											
Atrazine 4L	12	80		73	84	80	69	81	55	71	66	71	57	
7	ArmezonPro	18	PRE											
	Sharpen	2												
	Atrazine 4L	12		82	89	95	79	73	94	83	67	69	77	83
	Capreno													
8	Atrazine 4L	12	POST1											
	Roundup PowerMax	22												
	AMS	8.5 lb/100 gal		x	x	x	97	98	99	99	79	83	75	99
	Acuron	80		PRE	87	93	98	86	83	99	75	73	79	93
10	DiFlexx	10	POST1											
	Laudis	2.5												
	Roundup PowerMax	22												
	MSO	1% v/v												
	AMS	8.5 lb/100 gal		x	x	x	90	98	98	88	68	81	73	83
11	SureStart	32	PRE	77	68	79	81	63	92	58	48	37	72	27
12	Halex GT	57.6	POST1											
	NIS	0.25% v/v												
	AMS	8.5 lb/100 gal		x	x	x	98	97	98	86	87	80	85	80
C.V. (%)				14.4	9.8	8.7	9.62	8.21	4.05	19.9	17.8	16.6	4.9	17.5
LSD (0.05)				18	12	12	13	11	6	25	21	20	6	20
¹ yefo=yellow foxtail; colq=common lambsquarters; piwe=prostrate and redroot pigweed; wibw=wild buckwheat.														
² MSO=methylated seed oil; NIS=Preference (Winfield).														
³ PRE=May 7; POST1=May 26; POST2=June 7.														

Weed Control in 2,4-D-resistant corn. Howatt, Roach, and Harrington. 'TMF03K57' corn was seeded near Fargo on May 20. Pre-emergence treatments were applied May 20 with 72°F, 39% relative humidity, 65% cloud cover, 9 mph wind velocity at 165°, and dry topsoil at 68°F. Treatments (V2) were applied to V3 to V4 corn, 4 to 6 leaf yellow foxtail, 4 leaf redroot pigweed and common lambsquarters, 2 to 6 leaf wild mustard and common mallow, and 2 leaf Venice mallow on June 16 with 65°F, 90% relative humidity, clear sky, 4 to 8 mph wind velocity at 90°, and dry topsoil at 62°F. Treatments (V4) were applied to V5 to V6 corn, 4 to 8 inch tall yellow foxtail, 4 to 6 inch redroot pigweed, 2 to 4 inch common lambsquarters and Venice mallow, 3 to 5 inch wild mustard and 6 to 10 inch common mallow on June 25 with 73°F, 40% relative humidity, clear sky, 1 to 2 mph wind velocity at 45°, and dry topsoil at 71°F. All treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 AIXR nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Stage	June 16					
			corn	yft	rrpw	colq	wimu	coma
	oz/A		%	%	%	%	%	%
Acet&Clpy&Flms/Glyt-dma+AMS-L	25/16+2.5%	PRE/V4	0	98	99	99	98	97
Acet&Clpy&Flms/Glyt&2,4-D+AMS-L	25/23.4+2.5%	PRE/V4	0	96	98	99	99	97
Acet&Clpy&Flms/Glyt&2,4-D+AMS-L	25/31.2+2.5%	PRE/V4	0	97	99	99	99	98
Acetochlor+Atrazine 4L/Glyt+AMS-L	31+6/16+2.5%	PRE/V4	0	97	98	99	91	86
Untreated Check	0		0	0	0	0	0	0
Acet&Clpy&Flms+Glyt-dma+AMS-L	16.7+16+2.5%	V2	0	0	0	0	0	0
Acet&Clpy&Flms+Glyt&2,4-D+AMS-L	16.7+23.4+2.5%	V2	0	0	0	0	0	0
Acet&Clpy&Flms+Glyt&2,4-D+AMS-L	16.7+31.2+2.5%	V2	0	0	0	0	0	0
Mest&Glyt&Meto+NIS+AMS-L	31.6+0.25%+2.5%	V2	0	0	0	0	0	0
CV			0	2	1	0	3	4
LSD P=.05				1	1		2	2

Treatment	Rate	Stage	June 16	June 23				
			verna	corn	yft	rrpw	colq	wimu
	oz/A		%	%	%	%	%	%
Acet&Clpy&Flms/Glyt-dma+AMS-L	25/16+2.5%	PRE/V4	96	0	93	97	99	99
Acet&Clpy&Flms/Glyt&2,4-D+AMS-L	25/23.4+2.5%	PRE/V4	97	0	92	97	99	99
Acet&Clpy&Flms/Glyt&2,4-D+AMS-L	25/31.2+2.5%	PRE/V4	98	0	93	96	99	99
Acetochlor+Atrazine 4L/Glyt+AMS-L	31+6/16+2.5%	PRE/V4	89	0	96	98	99	93
Untreated Check	0		0	0	0	0	0	0
Acet&Clpy&Flms+Glyt-dma+AMS-L	16.7+16+2.5%	V2	0	0	99	99	99	99
Acet&Clpy&Flms+Glyt&2,4-D+AMS-L	16.7+23.4+2.5%	V2	0	0	99	99	99	99
Acet&Clpy&Flms+Glyt&2,4-D+AMS-L	16.7+31.2+2.5%	V2	0	0	99	99	99	99
Mest&Glyt&Meto+NIS+AMS-L	31.6+0.25%+2.5%	V2	0	0	99	99	99	98
CV			2	0	2	1	0	1
LSD P=.05			1		3	2		2

Pre-emergence herbicides did not cause injury to corn whether applied pre-emergence or post emergence to corn. Pre-emergence herbicides applied pre to weed establishment provided excellent control of all weed species present. Minor weed presence at post emergence application was sparse and vigor was poor because of herbicide symptoms. Weeds remaining at post emergence application were easily controlled by all herbicide treatments. Only common mallow remained for evaluation on June 30. Atrazine was not as effective as clopyralid and flumetsulam to support pre-emergence control with acetochlor, and without 2,4-D to support control with glyphosate post emergence, common mallow control was 92% while other herbicide treatments provided 97 to 98% control.

Treatment	Rate	Stage	June 23		June 30			
			coma	vema	corn	yft	rrpw	colq
	oz/A		%	%	%	%	%	%
Acet&Clpy&Flms/Glyt-dma+AMS-L	25/16+2.5%	PRE/V4	94	93	0	99	99	99
Acet&Clpy&Flms/Glyt&2,4-D+AMS-L	25/23.4+2.5%	PRE/V4	94	94	0	98	99	99
Acet&Clpy&Flms/Glyt&2,4-D+AMS-L	25/31.2+2.5%	PRE/V4	95	94	0	99	99	99
Acetochlor+Atrazine 4L/Glyt+AMS-L	31+6/16+2.5%	PRE/V4	91	80	0	99	99	99
Untreated Check	0		0	0	0	0	0	0
Acet&Clpy&Flms+Glyt-dma+AMS-L	16.7+16+2.5%	V2	93	93	0	99	99	99
Acet&Clpy&Flms+Glyt&2,4-D+AMS-L	16.7+23.4+2.5%	V2	86	88	0	99	99	99
Acet&Clpy&Flms+Glyt&2,4-D+AMS-L	16.7+31.2+2.5%	V2	89	87	0	99	99	99
Mest&Glyt&Meto+NIS+AMS-L	31.6+0.25%+2.5%	V2	88	87	0	99	99	99
CV			2	4	0	1	0	0
LSD P=.05			3	5	.	1	.	.

Treatment	Rate	Stage	June 30		
			wimu	coma	vema
	oz/A		%	%	%
Acet&Clpy&Flms/Glyt-dma+AMS-L	25/16+2.5%	PRE/V4	99	97	99
Acet&Clpy&Flms/Glyt&2,4-D+AMS-L	25/23.4+2.5%	PRE/V4	99	98	99
Acet&Clpy&Flms/Glyt&2,4-D+AMS-L	25/31.2+2.5%	PRE/V4	99	98	98
Acetochlor+Atrazine 4L/Glyt+AMS-L	31+6/16+2.5%	PRE/V4	99	92	97
Untreated Check	0		0	0	0
Acet&Clpy&Flms+Glyt-dma+AMS-L	16.7+16+2.5%	V2	99	97	99
Acet&Clpy&Flms+Glyt&2,4-D+AMS-L	16.7+23.4+2.5%	V2	99	97	98
Acet&Clpy&Flms+Glyt&2,4-D+AMS-L	16.7+31.2+2.5%	V2	99	98	99
Mest&Glyt&Meto+NIS+AMS-L	31.6+0.25%+2.5%	V2	99	97	99
CV			0	3	2
LSD P=.05			.	4	2

Glufosinate application parameters seed Liberty Link Corn/cross-seed with quinoa and amaranth.

Howatt, Roach, Ciernea, Harrington. Peterson Farm '98E84' glufosinate-resistant corn and amaranth were cross seeded near Fargo on May 12. Treatments were applied to V5 corn, 4 to 8 inch tall pigweed, 4 to 6 leaf Venice mallow, flowering wild mustard, and 4 to 8 inch common lambsquarters on June 22 with 70°F, 69% relative humidity, 10% cloud cover, 1 to 2 mph wind velocity at 180°, and tacky topsoil at 70°F. Treatments were applied with a sprayer mounted on a 4-wheel all-terrain vehicle delivering 17 or 5 gpa at 40 psi through 11003 TT nozzles (A) at 5 mph or AI 8002 nozzles (B) at 12 mph, as indicated in the tables, to a 7 foot wide area the length 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Other weeds, such as common mallow, emerged after control by herbicide treatments. Soil residual activity was evaluated and labeled as weeds.

Treatment	Rate	Spray volume	Speed	Equip code	June 30					July 6	
					corn	wimu	rrpw	colq	vema	corn	weeds
	oz/A	gpa	mph		%	%	%	%	%	%	%
Glufosinate+AMS	8.5+48	17	5	A	13	94	93	90	91	10	0
Glufosinate+AMS	8.5+48	5	12	B	9	89	86	81	84	5	0
Glyphosate+AMS	12+11	17	5	A	0	97	96	96	91	0	0
Glyphosate+AMS	12+11	5	12	B	0	98	97	94	89	0	0
Glufosinate+Dicamba+AMS	8.5+4+48	17	5	A	10	93	92	92	95	7	0
Glufosinate+Dicamba	8.5+4	17	5	A	7	94	90	91	91	4	0
Glufosinate+Dicamba+AMS	8.5+4+48	5	12	B	9	89	85	84	86	6	0
Glufosinate+Dicamba	8.5+4	5	12	B	7	90	83	84	86	4	0
Untreated Check	0				0	0	0	0	0	0	0
CV					22	2	3	4	4	39	0
LSD P=.05					2	3	4	5	4	2	.

Treatment	Rate	Spray volume	Speed	Equip code	July 22					
					corn	wimu	rrpw	colq	vema	weeds
	oz/A	gpa	mph		%	%	%	%	%	%
Glufosinate+AMS	8.5+48	17	5	A	0	99	96	95	93	0
Glufosinate+AMS	8.5+48	5	12	B	0	99	83	82	81	0
Glyphosate+AMS	12+11	17	5	A	0	99	99	99	99	0
Glyphosate+AMS	12+11	5	12	B	0	99	98	98	99	0
Glufosinate+Dicamba+AMS	8.5+4+48	17	5	A	0	99	96	96	94	0
Glufosinate+Dicamba	8.5+4	17	5	A	0	99	92	92	90	0
Glufosinate+Dicamba+AMS	8.5+4+48	5	12	B	0	99	88	87	88	0
Glufosinate+Dicamba	8.5+4	5	12	B	0	99	81	84	83	0
Untreated Check	0				0	0	0	0	0	0
CV					0	0	4	4	2	0
LSD P=.05					.	.	4	5	3	.

Glufosinate caused injury to corn that persisted to the July 6 evaluation but was not observed July 22. Less injury to corn and less control of weeds was obtained when glufosinate treatment was applied in 5 gpa than 17 gpa. Glufosinate injury to corn was less when dicamba was included in the treatment. Including dicamba in the glufosinate treatment only improved control of existing weeds when AMS also was included. If glufosinate was applied in 17 gpa, dicamba did not improve weed control. Dicamba did not cause symptoms on weeds emerging after the treatments were applied.

IT1402 Effect on Herbicide Injury to Corn. Howatt, Roach, and Harrington. 'DKC 38-04RIB' corn was seeded near Fargo on May 17. Treatments were applied to V4 to V5 corn on June 21 with 83°F, 68% relative humidity, clear sky, 1 to 3 mph wind velocity at 225°, dry topsoil at 71°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design. Weeds were removed manually to reduce effect of competition. Ten plants from each plot were harvested on July 29 by clipping at the soil surface to obtain weight of above ground biomass. Ears were harvested from plants in 20 feet of row to estimate yield as unshelled ears.

Treatment	Rate	6/24 corn	6/27 corn	7/6 corn	7/18 corn	8/8 corn	8/16 corn	7/29 Plant g	10/19 Ears lb/A
Glyphosate	18	0	0	0	0	0	0	402	3275
Glyphosate+IT1402	18+8	0	0	0	0	0	0	418	3166
Glyphosate+IT1402	18+16	0	0	0	0	0	0	428	2961
Glyphosate+IT1402	18+24	0	0	0	0	0	0	380	3492
Untreated Check	0	0	0	0	0	0	0	410	3314
CV		0.0	0.0	0.0	0.0	0.0	0.0	28	29
LSD P=.05		.	.	.	.	.	.	177	1332

Corn was damaged by hail in mid-July that shredded leaves and caused 30 to 40% defoliation. Tassels were undamaged but some ears developed dead spots from hailstone strikes. Injury was not detected in any plot attributed to herbicide application. Therefore, benefit or detriment of including IT1402 could not be evaluated from vegetative evaluations. Reproductive stages of including tassels emergence, silk emergence, and maturation/drying were not noted to differ among treatments. Plant weight was similar across all treatments. And great variability within treatment, possibly resulting from rep effect of the hail event, made separation of ear yield impossible. Numerical values for yield did not suggest a consistent trend according to rate of IT1402.

IT1402 effect on herbicide injury to soybean. Howatt, Roach, and Harrington. 'Asgrow 0835' soybean were planted near Fargo on May 12. Treatments were applied to 2nd trifoliolate soybean on June 21 with 88°F, 38% relative humidity, 10% cloud cover, 4 to 6 mph wind velocity at 315°, and dry topsoil at 79°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Plots were weeded manually to remove effect of competition.

Treatment	Rate	6/24 soya	6/27 soya	7/6 soya	7/18 soya	8/8 soya	8/16 soya	9/28 Yield bu/A
Glyphosate	18	0	0	0	0	0	0	20
Glyphosate+IT1402	18+8	0	0	0	0	0	0	22
Glyphosate+IT1402	18+16	0	0	0	0	0	0	23
Untreated Check	0	0	0	0	0	0	0	23
CV		0	0	0	0	0	0	14
LSD P=.05		0	0	0	0	0	0	5

Soybean was damaged by hail in mid-July which severed the apical meristem on approximately 80% of the plants. Injury was not detected in any plot attributed to herbicide application. Therefore, benefit or detriment of including IT1402 could not be evaluated from vegetative evaluations. Reproductive stages of flower initiation, flowering duration, pod development and number, and maturation/drying were not noted to differ among treatments. There was a slight tendency for inclusion of IT1402 to result in more similar soybean seed yield to the untreated check than glyphosate applied alone, which had the lowest yield although well within the LSD.

Soybean PRE Herbicide Effectiveness with Limited Water

Mike Ostlie, Greg Endres, and Jesper Nielsen

The most important piece to combatting glyphosate-resistant weeds in soybeans is an effective pre-emergent (PRE) herbicide program. Predicting when an activating rainfall will occur is as difficult as ever even though we know that the amount of rain will impact the success of PRE herbicides. The question then becomes, "how will the herbicide be affected if we don't get enough rain to activate the product?" Herbicide labels will sometimes mention that tillage is an option for activating herbicides when rain does not occur. A field trial was established in 2016 to evaluate weed control using three soybean herbicides affected by delayed rain and if rotary hoeing can substitute for rain activation. These treatments were tested in both tilled and no-till (direct seeded) situations.

The three herbicides chosen, Spartan (sulfentrazone), Fierce (flumioxazin + pyroxasulfone), and metribuzin, represent the chemistries of a large portion of the rain activated PRE herbicides for soybeans. Metribuzin is a generic product sold under many names but was formerly sold as Sencor. Each herbicide was compared in corn stubble that was either tilled or left un-tilled. A center pivot irrigation system was used to simulate rainfall (0.5" of water) for the herbicide activation treatments. The herbicides were activated within 1 day of application, 7 days after application, rotary hoed 7 days after application, or received no activation treatment. The first natural activating rainfall occurred 16 days after treatment so the non-activated treatment was actually activated a little over 2 weeks following herbicide applications. The weeds in the study area were common lambsquarters and redroot pigweed. All existing weeds received glyphosate treatment immediately after planting so that only the pre-emerge component of the herbicides was evaluated.

The best way to start with the results will be to look at each main component of the trial. In general, no-till plots had less weed control than tilled plots (~10% less overall). The most likely cause for the difference is that the tilled treatments created more soil to herbicide contact while more herbicide may have gotten bound to residue in the no-till treatments. This was largely related to performance of a single product (metribuzin) as it tested much worse in no-till than with tilled treatments (Table 1). Spartan and Fierce were largely the same across tillage strategies, though Spartan under tillage actually performed worse than no-till on common lambsquarters when there was no activation. It is not immediately clear why this occurred.

Fierce was the most resilient product of the three. There was never a decline in performance across the tillage and activation strategies. Spartan was also resilient except for the one instance under tilled conditions where receiving no activation reduced control by nearly 20%. Metribuzin was affected the most by tillage and activation (see below). For individual species; metribuzin was better on lambsquarters than pigweed (~10% difference). Fierce was better on pigweed under tillage but provided equal control to both under no-till. Spartan provided statistically similar control to both species, though it often trended toward higher control of lambsquarters than pigweed.

A one week delay in rain activation only caused reduced control with metribuzin. With metribuzin the control dropped off dramatically under no-till when no activating rain occurred. Rotary hoeing did not increase control in no-till and actually reduced weed control under tilled conditions. In this case the rotary hoeing may have planted more seeds than it terminated, while not activating the product. Rotary hoeing did increase the weed control from Spartan under tilled conditions. Rotary hoeing had no effect

on no-till Spartan nor either tillage strategy with Fierce but control was already very high with those treatments. Based on these results, rotary hoeing would not be recommended with metribuzin.

It was surprising to see Fierce so stable across treatments. One of its components, pyroxasulfone (sold alone as Zidua), needs multiple rainfall events totaling at least 0.5" or more for activation. Yet, there was no apparent negative response due to activation strategy. In 2016 the activating rain came 16 days after the herbicides were applied. That is still a relatively short period of time. Spartan and Fierce would likely see a dramatic drop in efficacy between 21 and 28 days after application if not activated properly, though it is not clear which one would drop first. This study will continue in 2017 at the CREC.

Table 1. Comparison of herbicide activation strategies 1 and 7 days after herbicide treatment (

Activation	Tillage	Herbicide		Pigweed % control	Lambsquarters % control	Control Rating ¹
1 DAT	Till	metribuzin	1	88.8	95.8	G-E
7 DAT	Till	metribuzin	2	78.8	91.3	F-E
Rotary Hoe ²	Till	metribuzin	3	45.0	47.5	P
No Water	Till	metribuzin	4	89.5	93.8	G-E
1 DAT	Till	Fierce	5	97.0	82.5	G-E
7 DAT	Till	Fierce	6	93.8	87.5	G-E
Rotary Hoe	Till	Fierce	7	96.0	88.8	G-E
No Water	Till	Fierce	8	93.8	81.3	G-E
1 DAT	Till	Spartan	9	93.8	99.0	E
7 DAT	Till	Spartan	10	95.0	96.0	E
Rotary Hoe	Till	Spartan	11	86.0	92.3	G-E
No Water	Till	Spartan	12	87.5	75.0	F-G
1 DAT	no-till	metribuzin	13	78.8	88.8	F-G
7 DAT	no-till	metribuzin	14	52.5	76.3	P-F
Rotary Hoe	no-till	metribuzin	15	21.3	25.0	N
No Water	no-till	metribuzin	16	7.5	17.5	N
1 DAT	no-till	Fierce	17	92.3	92.5	E
7 DAT	no-till	Fierce	18	90.0	90.0	E
Rotary Hoe	no-till	Fierce	19	88.8	87.5	G
No Water	no-till	Fierce	20	93.8	87.5	G-E
1 DAT	no-till	Spartan	21	91.3	97.0	E
7 DAT	no-till	Spartan	22	93.8	95.0	E
Rotary Hoe	no-till	Spartan	23	90.0	93.8	E
No Water	no-till	Spartan	24	90.0	95.0	E
LSD (0.05)				8.4	9.7	

¹as per the North Dakota Weed Control Guide rating scale

²The rotary hoe treatment received no water activation and but occurred 7 DAT

Weed control in dicamba-tolerant soybean, Carrington, 2016: Greg Endres and Mike Ostlie. The trial was conducted at the NDSU Carrington Research Extension Center in cooperation with BASF to evaluate dicamba-tolerant soybean weed control with PRE herbicides followed by POST Engenia plus glyphosate. Experimental design was a randomized complete block with three replicates. The field trial was established on a conventionally-tilled Heimdal-Ernick loam soil with final preplant tillage on May 19. Peterson Farms Seed '16X07N' dicamba-tolerant soybean was planted on May 24 at 164,000 seeds/acre in 22-inch rows. Herbicide treatments were applied with a hand-held boom sprayer delivering 12 gal/A at 35 psi through TeeJet TT11002 nozzles to the center 6.7 ft of 10- by 30-ft plots. PRE treatments were applied on May 20 with 74 F, 37% RH, and 3 MPH wind. Following PRE herbicide application, rainfall totaled 0.3 inches during May 22-23. POST A treatments were applied on June 17 with 83 F, 36% RH, and 3 mph wind to first trifoliate stage (V1) soybean, 1- to 4-inch tall and tillering annual grasses (primarily yellow foxtail but also green foxtail and barnyardgrass), 1- to 4-inch tall common lambsquarters, 1- to 4-inch tall redroot and prostrate pigweed, and 0.5- to 1-inch tall wild buckwheat. POST B treatments were applied on June 21 with 86 F, 28% RH, and 1 mph wind to V1 stage soybean, 3- to 6-inch tall and tillering annual grasses (primarily yellow foxtail but also green foxtail and barnyardgrass), 2- to 3-inch tall common lambsquarters, 1- to 4-inch tall redroot and prostrate pigweed, and 0.5- to 2-inch tall wild buckwheat. Hail damage occurred on July 9 resulting in an estimated ≤ 10 -15 % leaf loss to soybean just prior to or in the first flower (R1) stage of growth.

No soybean response was noted during visual evaluation of weed control. Weed control with PRE herbicides (prior to POST treatments) generally provided suppression of grass and broadleaf weeds (Table). Grass, common lambsquarters and pigweed control generally was good to excellent (88-99%) with all treatments when evaluated about 2 and 4 weeks after application of POST herbicides. Wild buckwheat control was excellent (91-99%) when evaluated during both July dates with treatments 3, 6, 7 and 9. Soybean maturity was similar among treatments including the untreated check.

Table.															
Herbicide				Weed control (%) ¹											Soybean
Treatment ²		Rate	Application timing ³	17-Jun			5-Jul				19-Jul				Plant maturity
No.		fl oz product/A		fota	colq	pigw	fota	colq	pigw	wibw	fota	colq	pigw	wibw	Jday ⁴
1	check	x	x	0	0	0	0	0	0	0	0	0	0	0	190
2	RU PowerMax	22	POSTA												
	RU PowerMax	22	POSTB	x	x	x	99	97	99	75	97	93	96	88	189
3	Engenia	12.8	POSTA												
	RU PowerMax	22		x	x	x	97	96	98	93	92	96	96	99	189
4	Fierce	3 oz wt	PRE												
	Flexstar	12	POSTB												
	RU PowerMax	22		72	72	72	98	98	99	88	96	97	99	88	189
5	Verdict	5	PRE												
	Zidua	2 oz wt													
	RU PowerMax	22	POSTB	73	72	73	97	94	99	80	96	88	99	78	189
6	Verdict	5	PRE												
	Zidua	2 oz wt													
	Engenia	12.8	POSTB												
	RU PowerMax	22		72	74	72	98	99	99	99	96	99	99	99	189
7	Verdict	5	PRE												
	Zidua	2 oz wt													
	Engenia	12.8													
	RU PowerMax	22													
	Outlook	12 oz wt	POSTB	74	70	72	97	97	99	91	96	99	99	91	189
8	Fierce	3 oz wt	PRE												
	Engenia	12.8	POSTB												
	RU PowerMax	22		72	69	85	97	98	99	79	96	99	99	99	189
9	Authority MTZ	12 oz wt	PRE												
	Engenia	12.8	POSTB												
	RU PowerMax	22		63	71	57	95	98	97	91	89	99	98	99	190
10	Sharpen	1	PRE												
	Boundary	32													
	Engenia	12.8	POSTB												
	RU PowerMax	22		81	77	73	97	98	99	89	97	99	99	93	189
11	Zidua Pro	4.5	PRE												
	Engenia	12.8	POSTB												
	RU PowerMax	22		73	82	81	97	97	99	89	95	99	99	96	189
C.V. (%)				5.0	7.9	12.0	1.0	1.9	0.9	11.2	3.0	1.6	0.9	12.0	0.4
LSD (0.05)				6	9	13	2	3	1	15	4	2	1	17	NS

¹fota=primarily yellow foxtail, and green foxtail and barnyardgrass; colq=common lambsquarters; pigw= redroot and prostrate pigweed; and wibw=wild buckwheat.

²RU=Roundup PowerMax; includes addition of Class Act NG at 2.5% v/v. Engenia plus RU PowerMax includes addition of Class Act Ridion at 2% v/v. Verdict plus Zudua and Zidua Pro includes addition of Drexel at 16 fl oz/A plus Class Act NG at

³PRE=May 20; POSTA=June 17; POSTB=June 21.

⁴Jday: 190=July 9.

Limiting dicamba movement off-target. Howatt, Roach, and Harrington. 'RG 607' soybean were seeded near Casselton, ND on May 15. Treatments were applied to corn when surrounding soybean were 4 to 6 trifoliolate on June 29 with 74°F, 63% relative humidity, clear sky, 4 to 6 mph wind velocity at 225°, and dry topsoil at 75°F. Treatments were applied with a sprayer mounted on a 4 wheel all-terrain vehicle delivering 8.5 gpa at 30 psi through 11002 TT nozzles to a 10 foot wide area the length of 10 by 50 foot plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on September 28. Injury rating is a scale with 9 as dead. The e stands for number of feet away towards east, w for feet away towards west, and t for feet away towards east but under tarp during application to catch physical drift.

Treatment	Rate oz/A	July 22									
		10w	0w	0e	0t	10e	10t	20e	20t	30e	40e
AMS+NIS+Glyt4.5+Dica-C	22+0.25%+12+8	0	5	6	3	4	2	3	0	2	1
Loadup+AQ2092+Glyt4.5+Dica-C	0.5%+0.5%+12+8	0	4	8	3	5	1	4	0	3	2
Loadup+Glyt4.5+Dica-C	0.5%+12+8	0	4	9	2	5	0	3	0	2	1
AQ2100+Glyt4.5+Dica-C	0.5%+12+8	0	3	8	2	5	0	4	0	3	2
Untreated Check	0	0	0	0	0	0	0	0	0	0	0
CV		0	59	20	42	33	95	41	447	81	447
LSD P=.05			2	20	1	2	1	2	0	2	1

Treatment	Rate oz/A	August 11									
		50e	60e	70e	20w	10w	0w	0e	0t	10e	20t
AMS+NIS+Glyt4.5+Dica-C	22+0.25%+12+8	0	0	0	0	1	5	8	5	5	1
Loadup+AQ2092+Glyt4.5+Dica-C	0.5%+0.5%+12+8	2	1	0	0	0	5	8	4	6	0
Loadup+Glyt4.5+Dica-C	0.5%+12+8	0	0	0	0	0	5	8	4	5	0
AQ2100+Glyt4.5+Dica-C	0.5%+12+8	1	1	0	0	0	2	9	3	5	0
Untreated Check	0	0	0	0	0	0	0	0	0	0	0
CV		106	159	447	0	0	31	11	18	23	110
LSD P=.05		1	1	0		1	2	1	1	1	1

Treatment	Rate oz/A	August 11										September 28									
		30e	30t	40e	50e	60e	70e	Yield A		Yield B		Yield C		Yield D		Yield E		Yield F			
								bu/A		bu/A		bu/A		bu/A		bu/A		bu/A			
		30e	30t	40e	50e	60e	70e	bu/A	bu/A	bu/A	bu/A	bu/A	bu/A	bu/A	bu/A	bu/A	bu/A	bu/A	bu/A		
AMS+NIS+Glyt4.5+Dica-C	22+0.25%+12+8	3	0	3	3	2	1	32	18	21	28	21	28	27	24	27	24	27	24		
Loadup+AQ2092+Glyt4.5+Dica-C	0.5%+0.5%+12+8	4	0	3	3	2	1	24	13	13	19	19	26	23	21	23	21	23	21		
Loadup+Glyt4.5+Dica-C	0.5%+12+8	3	0	2	1	0	0	29	10	10	24	24	26	22	23	22	22	22	23		
AQ2100+Glyt4.5+Dica-C	0.5%+12+8	3	0	3	1	1	1	28	7	7	23	23	23	22	22	22	22	22	22		
Untreated Check	0	0	0	0	0	0	0	36	36	36	39	36	39	35	32	35	32	35	32		
CV		32	329	35	53	75	115	21	38	32	28	32	28	30	14	30	14	30	14		
LSD P=.05		1	0	1	1	1	1	10	10	12	12	12	12	12	12	12	12	12	12		

Yield designations are for area location relative to treated plot. A was adjacent towards west. B was adjacent towards east, C was adjacent towards east under tarp. D was 30 feet away towards east under tarp. E was 30 feet away towards east. And F was 70 feet away towards east.

Summary of injury on July 22.

Distance west (ft)							Treatment	Distance east (ft)						
60	50	40	30	20	10	0		10	20	30	40	50	60	70
0	0	0	0	0	0	5	1	4	3	2	1	0	0	0
								2	0	0				
0	0	0	0	0	0	4	2		4	3	2	2	1	0
								1	0	1				
0	0	0	0	0	0	4	3		3	2	1	0	0	0
								0	0	0				
0	0	0	0	0	0	3	4	5	4	3	2	1	1	0
								0	0	0				
0	0	0	0	0	0	0	5	0	0	0				
								0	0	0	0	0	0	0

Summary of injury on August 11.

Distance west (ft)							Treatment	Distance east (ft)						
60	50	40	30	20	10	0		10	20	30	40	50	60	70
0	0	0	0	0	1	5	1	5	4	3	3	3	2	1
0	0	0	0	0	0	5	2	3	1	0	3	3	2	1
						6		4	4					
0	0	0	0	0	1	5	3	1	0	0	3	3	2	1
0	0	0	0	0	0	5	3	5	3	3	2	1	0	0
						0		0	0					
0	0	0	0	0	0	5	4	5	4	3	3	1	1	1
						0		0	0					
0	0	0	0	0	0	5	5	0	0	0	0	0	0	0
						0		0	0					

Preplant dandelion control with Glyphosate + Group 14 herbicides. (Minot). The objective of the study was to evaluate preplant dandelion control with glyphosate alone compared to glyphosate tank mixed with Group 14 herbicides (Aim, Sharpen, Spartan, and Valor). All treatments were applied 5 days prior to planting. All treatments were applied May 7 and wheat planted on May 12. All treatments were applied with AMS and MSO.

Glyphosate applied alone or tank mixed with Express or 2,4-D provided approximately 87-90% dandelion control (based on June 15 evaluation). Glyphosate applied with Group 14 herbicides (Aim, Sharpen, Spartan, or Valor) provided only 50-70% dandelion control (based on June 15 evaluation). Thus, if dandelion is the primary weed to be controlled, it would be better to apply glyphosate by itself or with Express or 2,4-D. Glyphosate should be applied separate from Aim, Sharpen, Spartan, and Valor when targeting dandelion or other perennial weeds.

Table. Preplant dandelion control with Glyphosate + Group 14 herbicides. (1659)					
			Weed Control		
			Dandelion		
Treatment	Rate	Timing	May-12	May-24	Jun-15
			-----%-----		
Untreated			0	0	0
Glyphosate ^a	22 oz	5 DPP	10	90	89
Aim + Glyphosate ^{ab}	1 oz + 22 oz	5 DPP	52	75	65
Sharpen + Glyphosate ^{ab}	1 oz + 22 oz	5 DPP	68	75	63
Sharpen + Glyphosate ^{ab}	2 oz + 22 oz	5 DPP	73	77	70
Spartan + Glyphosate ^{ab}	4 oz + 22 oz	5 DPP	30	57	55
Spartan Charge + Glyphosate ^{ab}	5 oz + 22 oz	5 DPP	58	77	66
Valor + Glyphosate ^{ab}	2 oz + 22 oz	5 DPP	45	65	50
Express + Glyphosate ^{ac}	0.25 oz + 22 oz	5 DPP	13	91	90
Glyphosate + 2,4-D ester ^a	22 oz + 0.5 pt	5 DPP	27	87	87
LSD (0.05)			6.9	8.9	12.7
^a Applied with AMS (2.5 gal/100 gal)					
^b Applied with MSO (1%)					
^c Applied with NIS (0.25%)					

Pyridate Control of Kochia. Howatt, Roach, and Harrington. 'Tradition' barley was seeded near Valley City, ND on April 22, 2016. Barley was seeded at 60 lb/A with a drill that had rows spaced at 6 inches. Field was a silty clay loam with 4.2% organic matter and 7.9 pH. Treatments (0.5-inch timing) were applied to 1 to 1.5 leaf barley (BBCH=11) and 4 to 8 leaf kochia on May 11 with 48°F air temperature; 60% relative humidity; 100% cloudy sky; 1 to 3 mph wind at 225°; and damp soil at 49°F. Treatments (2 weeks after treatment) were applied to 4 leaf barley (BBCH=14) and kochia up to 5 inches tall in check plots on May 27 with 61°F air temperature; 95% relative humidity; 10% cloud-cover; 5 to 9 mph wind at 45°; and slightly moist soil. All treatments were applied with a backpack sprayer delivering 17 gpa through 11002 TT nozzles to an area 7 ft wide the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Application timing	May 20				May 27		
			Kochia			Barley injury	Kochia		Barley injury
			Control	Sprayed	New		Control	New	
	oz ai/A		%	no./ft ²	no./ft ²	%	%	no./ft ²	%
Fomesafen	3	0.5"	5	40	5	0	1	12	0
Fluthiacet	0.07	0.5"	10	42	7	0	6	22	0
Pyridate	8.75	0.5"	32	21	6	0	30	20	0
Pyridate	11.2	0.5"	35	26	7	0	37	29	0
Pyridate	15	0.5"	37	20	5	0	37	19	0
Pyridate/Pyridate	6.25/6.25	0.5"/2WAT	37	19	5	0	30	18	0
Pyridate+COC	11.2+1%	0.5"	65	24	7	16	81	14	9
Pyridate+Metribuzin	8.75+2	0.5"	72	37	6	19	79	16	9
Pyridate+Fluthiacet	4.37+0.07	0.5"	22	31	4	0	31	14	0
Untreated Check	0		0	34	5	0	0	22	0
CV			17	39	35	31	23	47	25
LSD P=0.05			8	17	3	2	11	13	1

Number of kochia receiving treatment on May 11 ranged from 19 to 42 plants per square foot, averaged within treatment. Fomesafen and fluthiacet produced very minor injury; however, an oil adjuvant typically is applied with these to achieve optimum control. Observed damage was necrotic lesions on leaf tissue and none of the plants died.

Pyridate gave substantially better control than fomesafen or fluthiacet even though control only ranged from 30 to 40%. Some kochia were completely desiccated before the first evaluation. Other kochia remained smaller than plants in other treatments and were generally chlorotic but did not express desiccated lesions. Pyridate rate did not greatly influence this activity. Addition of crop oil concentrate or metribuzin improved kochia control to 65 and 72%, respectively, on May 20. Control with these treatments was near 80% on May 27 while treatments with pyridate alone remained less than 40%.

The number of new kochia observed after the first application ranged from 4 to 7 per square foot in the first week. Another flush of kochia occurred during the second week after application, 12 to 29 per square foot. Compared with the untreated check, there is not evidence of residual kochia control with any of the treatments, even though metribuzin is known to have soil residual.

Pyridate alone did not damage barley. Tankmix of pyridate with crop oil concentrate or metribuzin caused 16 and 19% injury. Damage was observed as necrosis on the outer margins of older leaves that were exposed during treatment application. This injury subsided but remained at 9% injury for both treatments on May 27.

The general field area was treated with bromoxynil and pyrasulfotole about 3 days after the 2 WAT split timing. This treatment drifted into the study area and irreparably damaged the kochia under evaluation. This incident confounded any further data to be collected and the study was terminated.

Soybean response to BCP258. Howatt, Roach, and Harrington. 'RG 607' soybeans were seeded near Fargo on May 20. Treatments were applied as follows:

	Date	Crop stage	Air temp°F	RH	Cloud cover %	Wind velocity mph	Wind direction°	Soil moisture	Soil temp°F
2DBP	5/18	PRE	55	33.5	0	5	135	dry	60
Emerg	6/7	emerging	68	62	0	2-5	360	dry	60
2-Tri	6/21	2 nd tri	84	43	0	1-3	225	dry	75
4-Tri	6/29	3-4 tri	65	66	0	3-6	225	dry	70
8-Tri	7/18	R1	70	88	10	0-2	350	dry	68

All treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. The entire study area was treated with herbicides to remove competition. Harvest for yield was on September 28.

Treatment	Rate	Stage	6/8 soya	6/14 soya	6/22 soya	6/30 soya	7/6 soya	7/12 soya	7/21 soya	7/28 soya	8/12 soya	9/28 Yield
	oz/A		%	%	%	%	%	%	%	%	%	bu/A
BCP258	3.12	PRE	0	0	0	0	0	0	0	0	0	24
BCP258	6.24	PRE	0	0	0	0	0	0	0	0	0	28
BCP258	12.43	PRE	0	0	0	0	0	0	0	0	0	25
BCP258	3.12	Emerg	0	7	0	0	0	0	0	0	0	26
BCP258	6.24	Emerg	0	14	0	0	0	0	0	0	0	24
BCP258	12.48	Emerg	0	34	19	15	18	10	7	10	8	19
BCP258	3.12	2-Tri	0	0	0	13	10	6	4	5	7	22
BCP258	6.24	2-Tri	0	0	0	26	26	15	12	17	19	19
BCP258	12.48	2-Tri	0	0	0	38	36	25	19	20	18.8	18
BCP258	3.12	4-Tri	0	0	0	0	16	10	9	15	13	18
BCP258	6.24	4-Tri	0	0	0	0	31	24	24	28	19	21
BCP258	12.48	4-Tri	0	0	0	0	53	44	53	58	53	10
BCP258	3.12	8-Tri	0	0	0	0	0	0	10	21	16	17
BCP258	6.24	8-Tri	0	0	0	0	0	0	13	31	28	19
BCP258	12.48	8-Tri	0	0	0	0	0	0	30	55	50	10
Untreated	0		0	0	0	0	0	0	0	0	0	27
CV			0	48	102	32	33	36	20	19	4	21
LSD P=.05			.	2	2	3	5	4	3	4	19	6

Soybean was damaged by hail in mid-July which severed the apical meristem on approximately 80% of the plants. Soybean did not recover from the initial injury caused by BCP258 when applied at the 2nd trifoliate stage or later. Yield was less than the control if treatment caused lasting visible injury. Injury increased with increased rate of herbicide.

Weed control in 2,4-D-res Soybean. Howatt, Roach, and Harrington. 'D134FA6BNB' soybean were seeded near Fargo on May 20. Treatments (Pre) were applied preemergence on May 20 with 72°F, 39% relative humidity, 65% cloud cover, 7 mph wind velocity at 165°, and dry topsoil at 68°F. Treatments (3-4") were applied to 3 trifoliolate soybean; 2 to 4 inch redroot pigweed, common lambsquarters, and wild mustard; and 3 to 5 inch yellow foxtail on June 26 with 73°F, 40% relative humidity, clear sky, 2 mph wind velocity at 30°, and dry topsoil at 71°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 AIRX nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Stage	June 16			
			soya	yft	rrpw	colq
	oz/A		%	%	%	%
Clor&Suen/Glyt-dma+AMS-L	3.14/16+2.5%	PRE/3-4"	0	74	97	98
Clor&Suen/Glyt&2,4-D+AMS-L	3.14/23.4+2.5%	PRE/3-4"	0	76	98	98
Clor&Suen/Glyt&2,4-D+AMS-L	3.14/31.2+2.5%	PRE/3-4"	0	77	96	98
Clor&Suen/2,4-D-CH+Glyt-dma+AMS-L	3.14/11.4+12+2.5%	PRE/3-4"	0	74	96	98
Clor&Suen/2,4-D-CH+Glyt-dma+AMS-L	3.14/15.2+16+2.5%	PRE/3-4"	0	77	96	98
Clor&Suen/Gluf+AMS-L	3.14/7.7+2.5%	PRE/3-4"	0	81	97	98
Clor&Suen/2,4-D-CH+Gluf+AMS-L	3.14/11.4+7.7+2.5%	PRE/3-4"	0	72	94	98
Clor&Suen/2,4-D-CH+Gluf+AMS-L	3.14/15.2+7.7+2.5%	PRE/3-4"	0	76	97	99
Untreated Check	0		0	0	0	0
CV			0	6	3	1
LSD P=.05				6	4	1

Treatment	Rate	Stage	June 16	June 23	June 30	July 7
			wimu	soya	yft	yft
	oz/A		%	%	%	%
Clor&Suen/Glyt-dma+AMS-L	3.14/16+2.5%	PRE/3-4"	99	0	98	98
Clor&Suen/Glyt&2,4-D+AMS-L	3.14/23.4+2.5%	PRE/3-4"	99	0	97	97
Clor&Suen/Glyt&2,4-D+AMS-L	3.14/31.2+2.5%	PRE/3-4"	99	0	98	98
Clor&Suen/2,4-D-CH+Glyt-dma+AMS-L	3.14/11.4+12+2.5%	PRE/3-4"	98	0	97	97
Clor&Suen/2,4-D-CH+Glyt-dma+AMS-L	3.14/15.2+16+2.5%	PRE/3-4"	99	0	98	98
Clor&Suen/Gluf+AMS-L	3.14/7.7+2.5%	PRE/3-4"	99	0	85	85
Clor&Suen/2,4-D-CH+Gluf+AMS-L	3.14/11.4+7.7+2.5%	PRE/3-4"	99	0	84	84
Clor&Suen/2,4-D-CH+Gluf+AMS-L	3.14/15.2+7.7+2.5%	PRE/3-4"	99	0	85	85
Untreated Check	0		0	0	0	0
CV			1	0	2	2
LSD P=.05			1		2	2

Chloransulam and sulfentrazone provided exceptional pre-emergence control of weeds, especially broadleaf weeds. Minor broadleaf weed presence at post emergence application was sparse and vigor was poor because of herbicide symptoms. Premix of glyphosate and 2,4-D gave similar control with tankmix of glyphosate and 2,4-D for each species. Broadleaf weeds remaining at post emergence application were easily controlled by all herbicide treatments and were not present at later evaluation dates.

Initial control of yellow foxtail was better with glufosinate than glyphosate, but addition of 2,4-D to glufosinate caused antagonism while addition of 2,4-D to glyphosate did not antagonize foxtail control. By June 30, glyphosate control of foxtail was better than glufosinate but the antagonism by 2,4-D was not detected. Emergence of any weed was not observed after the post emergence application.

Glufosinate programs in Liberty Link Soybean 1. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and soybean injury from PRE, EPOST, and LPOST herbicides. Soybeans were planted on May 17, 2016. PRE treatments were applied on May 18, 2016 at 9:30 AM with 67 F air, 62 F soil at a four inch depth, 20% RH, 0% cloud cover, 8-10 mph NW wind, and dry soil moisture. EPOST treatments were applied on June 16, 2016 at 8:00 AM with 74 F air, 71 F soil at a four inch depth, 57% RH, 25% cloud cover, 3-5 mph SE wind, and moist soil moisture. Weeds present at the time of EPOST applications were: cobc 5-7" at 6-8/ft2, corw 4-6" at 6-8/ft2, rrpw 2-4" at 2-4/ft2, colq 2-4" at 2-4/ft2, wibw 2-4" at 2-4/ft2, hand 2-4" at 2-4/ft2, and wimu 2-4" at 2-4/ft2. LPOST treatments were applied on June 21, 2016 at 11:00 AM with 85 F air, 74 F soil at a four inch depth, 13% RH, 0% cloud cover, 3-5 mph NW wind, and adequate soil moisture. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 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 through 11002 TTI nozzles for PRE and 11002 TT nozzles for POST and LPOST, all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Glufosinate programs in Liberty Link Soybean 1 (Zollinger, Wirth, Adams).

Treatment ¹	Rate (Product/A)	Prior to EPOST						28 DA EPOST						56 DA EPOST					
		Soy Yeft	Rrpw	Colq	Hans	Corw	Cocb	Soy Yeft	Rrpw	Colq	Hans	Corw	Cocb	Soy Yeft	Rrpw	Colq	Hans	Corw	Cocb
Untreated Check		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(PRE) Boundary	1.5pt																		
(LPOST) Liberty	24flox	0	99	99	99	99	32	0	99	99	99	99	83	0	99	99	99	99	95
(EPOST) Liberty	24flox	0	0	0	0	0	0	0	83	83	83	83	83	0	78	63	63	58	92
(EPOST) Liberty+Dual Magnum	24flox+1pt	0	0	0	0	0	0	0	83	83	83	83	83	0	83	60	58	57	93
(EPOST) Liberty+Flexstar	24flox+0.75pt	0	0	0	0	0	0	0	88	88	88	88	88	0	87	62	62	63	82
(EPOST) Liberty+Dual Magnum +Flexstar	24flox+1pt +1pt	0	0	0	0	0	0	0	88	88	88	88	88	0	82	82	72	72	95
(PRE) Tricor+Satellite	0.68pt+1.92pt																		
(EPOST) Liberty	29flox	0	99	99	99	99	63	0	99	99	99	99	99	0	99	99	99	99	99
(LPOST) Liberty	29flox																		
(PRE) Tricor+Satellite	0.68pt+1.92pt																		
(EPOST) Interline	29flox	0	99	99	99	99	75	0	99	99	99	99	99	0	99	99	99	99	99
(LPOST) Interline	29flox																		
LSD (0.05)		0	0	0	0	0	4	3	0	3	3	3	4	3	4	3	4	3	4

¹All EPOST & LPOST treatments contained Ammonium Sulfate at 8.5lb/100gal of water

Liberty Link soybean programs. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and soy injury from PRE, POST, and LPOST herbicides. Soybeans were planted on May 17, 2016. PRE was applied on May 18, 2016 at 9:30 AM with 67 F air, 62 F soil at a four inch depth, 20% RH, 0% cloud cover, 8-10 mph NW wind, and dry soil moisture. EPOST treatments were applied on June 9, 2016 at 10:45 AM with 85 F air, 75 F soil at a four inch depth, 52% RH, 0% cloud cover, 6-8 mph SE wind, and adequate soil moisture. Weeds present at the time of EPOST application were rrpw 3-5" at 30-40/yard, 13% corw 0.25-2" at 15-25/yard, and yeft 1-2" at 10-15/yard. LPOST treatments were applied on June 21, 2016 at 11:00 AM with 85 F air, 74 F soil at a four inch depth, 13% RH, 0% cloud cover, 3-5 mph NW wind, and adequate soil moisture. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 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 through 11002 TTI nozzles for EPP, PRE, EPOST, and LPOST, all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Liberty Link soybean programs (Zollinger, Wirth, Adams).

Treatment ¹	Rate (Product/A)	14 DA EPOST				28 DA EPOST				42 DA EPOST			
		Soy Yeft	Rrpw	Colq	Hans	Corw	Cocb	Soy Yeft	Rrpw	Colq	Hans	Corw	Cocb
(EPP ¹) Gramoxone+NIS	3pt+0.25%/v	-----% control-----				-----% control-----				-----% control-----			
Untreated Check		0	0	0	0	0	0	0	0	0	0	0	0
(EPP) Tricor+Gramoxone+NIS	0.376pt+3pt+0.25%/v												
(PRE) Tricor+Satellite Hydrocap	0.56pt+2pt												
(EPOST) Interline+Ultra Blazer	29flox+1.5pt												
+Mocassin+PO+AMS	+20flox+1qt+3lb	32	99	99	99	99	99	32	99	99	99	99	99
(LPOST) Interline+Ultra Blazer	29flox+1.5pt												
+PO+AMS	+1qt+3lb												
(EPP) Gramoxone+NIS	3pt+0.25%/v												
(PRE) Tricor+Satellite Hydrocap	0.75pt+2pt												
(EPOST) Interline+Ultra Blazer	29flox+1.5pt												
+Mocassin+PO+AMS	+20flox+1qt+3lb	14	99	99	99	99	99	14	99	99	99	99	99
(LPOST) Interline+Ultra Blazer	29flox+1.5pt												
+PO+AMS	+1qt+3lb												
(EPP) Gramoxone+NIS	3pt+0.25%/v												
(PRE) Tricor+Satellite Hydrocap	0.75pt+2pt												
(EPOST) Interline+Storm	29flox+1.5pt												
+Mocassin+PO+AMS	+20flox+1qt+3lb	13	99	99	99	99	99	13	99	99	99	99	99
(LPOST) Interline+Ultra Blazer	29flox+1.5pt												
+PO+AMS	+1qt+3lb												
(EPP) Gramoxone+NIS	3pt+0.25%/v												
(PRE) Tricor+Satellite Hydrocap	0.75pt+2pt												
(EPOST) Interline+Ultra Blazer	29flox+1.5pt												
+Mocassin+PO+AMS	+20flox+1qt+3lb	0	99	99	99	99	63	0	99	99	99	99	80
(LPOST) Interline+Ultra Blazer	29flox+1.5pt												
+Mocassin+PO+AMS	+20flox+1qt+3lb												
LSD (0.05)		4	0	0	0	0	2	4	0	0	0	0	0

¹ EPP = Early Pre-plant

Bolt soybean tolerance to ALS herbicides. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate Bolt soybean injury and weed control using ALS herbicides. Soy beans were planted on May 18, 2016. PRE treatments were applied on May 18, 2016 at 9:30 AM with 67 F air, 62 F soil at a four inch depth, 20% RH, 0% cloud cover, 8-10 mph NW wind, and dry soil moisture. POST treatments were applied on June 13, 2016 at 12:00 PM with 81 F air, 75 F soil at a four inch depth, 20% RH, 25% cloud cover, 4-6 mph NW wind, and adequate soil moisture. Weeds present at the time of POST applications were: coxb 3-4" at 1-2/4yd2, corw 1-3" at 1-2/4yd2, rrpw 1-3" at 8-10/4yd2, yeft 3" at 1/4yd2, colq 1-3" at 3-4/4yd2, wibw 2-4" at 1/4yd2, hans 1-3" at 1/4yd2, and wimu 2-4" at 3-5/4yd2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, 4.5% OM, and 7.7 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 through 11002 TTI nozzles for PRE and POST, both at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Bolt soybean tolerance to ALS herbicides (Zollinger, Wirth, Adams).

Treatment ¹	Rate (Product/A)	Prior to POST						7 & 14 DA POST						42 DA POST												
		Soy	Yeft	Wimu	Rpww	Colq	Hans	Corw	Cocb	Soy	Yeft	Wimu	Rpww	Colq	Hans	Corw	Cocb	Soy	Yeft	Wimu	Rpww	Colq	Hans	Corw	Cocb	
		-% inj-						-% control-						-% inj-						-% control-						
(PRE) Rim ² +Thifen	1oz+0.25oz																									
(POST) RUPM+Thifen	22floz+0.5oz	0	52	99	99	99	99	99	50	48	0	95	99	99	99	99	95	92	0	83	99	95	96	95	95	99
(PRE) Rim+Thifen+Flum	1oz+0.25oz+2oz																									
(POST) RUPM+Thifen	22floz+0.5oz	0	67	99	99	99	99	99	99	52	0	95	99	99	99	99	99	99	0	73	99	99	99	99	99	99
(PRE) Rim+Thifen+Flum+Chlor	1oz+0.75oz+2oz+0.32oz																									
(POST) RUPM+Thifen	22floz+0.5oz	0	68	99	99	99	99	99	99	42	0	95	99	99	99	99	99	99	0	73	99	99	99	99	99	99
(PRE) Rim+Thifen+Flum+Trib	1oz+0.5oz+2oz+0.25oz																									
(POST) RUPM+Thifen	22floz+0.5oz	0	60	99	99	99	99	99	99	50	0	95	99	99	99	99	99	99	0	73	99	99	99	99	99	99
Untreated Check		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
(PRE) Thifen+Flum+Chlor	0.5oz+2oz+0.32oz																									
(POST) RUPM+Thifen	22floz+0.5oz	0	28	99	99	99	99	99	99	50	0	95	99	99	99	99	99	99	0	72	99	99	99	99	99	99
(POST) RUPM+Thifen+Flum	22floz+0.5oz+2oz	0	0	0	0	0	0	0	0	0	0	90	99	99	99	99	99	99	0	52	99	99	99	66	99	95
(PRE) Authority MTZ	14oz																									
(POST) RUPM	22floz	0	68	99	99	99	99	99	72	67	0	95	99	99	99	99	99	99	0	63	99	99	99	99	99	99
Untreated Check		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SD (0.05)		0	3	0	0	0	0	0	3	3	0	0	0	0	0	0	0	2	0	4	0	0	0	1	0	0

¹All POST treatments contained Ammonium Sulfate at 17lb/100gal of water

²Rim = Rimsulfuron, Thifen = Thifensulfuron, RUPM=Roundup Powermax, Flum = Flumioxazin, Chlor = Chlorimuron, Trib = Tribenuron

Roundup Ready 2 Xtend soybean program. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and soy injury from PRE, EPOST, and POST herbicides. Roundup Ready Xtend soybeans were planted on May 17, 2016. PRE treatments were applied on May 18, 2016 at 9:30 AM with 67 F air, 62 F soil at a four inch depth, 20% RH, 0% cloud cover, 8-10 mph SW wind, and dry soil moisture. EPOST1 and EPOST2 treatments were applied on June 16, 2016 at 8:00 AM with 74 F air, 71 F soil at a four inch depth, 57% RH, 25% cloud cover, 3-5 mph SE wind, and moist soil moisture. Weeds present at the time of EPOST applications were: cobb 4-6" at 1-2/yd2, corw 2-4" at 4-6/ft2, rrpw 2-4" at 8-10/ft2, yeft 2-4" 4-6/ft2, colq 2-4" at 4-6/ft2, wibw 2-4" at 4-6/ft2, hans 2-4" at 4-6/ft2, and wimu 4-6/ft2 at 3-5/ft2. POST1 and POST2 treatments were applied on June 6, 2016 at 11:00 AM with 85 F air, 74 F soil at a four inch depth, 13% RH, 0% cloud cover, 3.5-5 mph NW wind, and adequate soil moisture. Weeds present at the time of POST applications were with PRE: cobb 2-4" at 1/ft2, corw 2-4" at 1/ft2, rrpw 2-4" at 1/ft2, yeft 2-4" at 1/ft2, and without PRE: cobb 4-6" at 5/ft2, corw 4-2" at 5/ft2, rrpw 4-6" at 5/ft2, colq 4-6" at 2/ft2, yeft 6-8" at 2/ft2, and wimu 4-6" at 1/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 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 through 11002 TTI nozzles for all applicatoins at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Roundup Ready 2 Xtend soybean program (Zollinger, Wirth, Adams).

Treatment¹	Rate (Product/A)	Prior to POST										14 DA POST										28, 42, & 56 DA POST																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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¹POST1/POST2 and EPOST1/EPOST2 applications refer to split applications of RUPM (Roundup Powermax) and Clarity the same day due to regulations of tankmixes

Zidua PRE applied in soybean. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and soybean injury from PRE Zidua and POST herbicide applications. Soybean was planted on May 17, 2016. PRE treatments were applied on May 18, 2016 at 9:30 AM with 67 F air, 62 F soil at a four inch depth, 20% RH, 0% cloud cover, 8-10 mph SW wind, and dry soil moisture. POST treatments were applied on June 22, 2016 at 11:45 AM with 84 F air, 75 F soil at a four inch depth, 36% RH, 0% cloud cover, 0 mph wind, and adequate soil moisture. Weeds present at the time of POST applications were: corw 4-6" at 6-8/ft2, cobc 6-8" at 4-6/ft2, yeft 4-6" at 1-2/ft2, wimu 4-6" at 1-2/ft2, and colq 2-4" at 1/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 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 through 11002 TT nozzles for PRE and POST, both at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Zidua PRE applied in soybean (Zollinger, Wirth, Adams).

Treatment ¹	Rate (Product/A)	14 DA PRE					14 & 28 DA POST					42 & 56 DA POST										
		Soy	Yeft	Rrpw	Colq	Hans	Corw	Cocb	Soy	Yeft	Rrpw	Colq	Hans	Corw	Cocb	Soy	Yeft	Rrpw	Colq	Hans	Corw	Cocb
		-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-	-% inj-
Untreated Check		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(PRE) Zidua+Sharpen	3.3oz+1floc																					
(POST) RUPM+AMS	22floc+8.5lb/100gal	0	99	99	99	99	72	0	99	99	99	99	99	99	0	99	99	99	99	99	99	99
(PRE) Zidua Pro	4.5floc																					
(POST) RUPM+AMS	22floc+8.5lb/100gal	0	99	99	99	99	72	0	99	99	99	99	99	87	0	99	99	99	99	99	95	99
(PRE) Zidua+Verdict	3.3oz+5floc																					
(POST) RUPM+AMS	22floc+8.5lb/100gal	0	99	99	99	99	72	0	99	99	99	99	99	86	0	99	99	99	99	99	95	99
(PRE) Authority Assist+Verdict	9floc+5floc																					
(POST) RUPM+AMS	22floc+8.5lb/100gal	0	99	99	99	99	82	92	0	99	99	99	99	72	0	99	99	99	99	99	93	99
(PRE) Authority MTZ	12oz																					
(POST) RUPM+AMS	22floc+8.5lb/100gal	0	99	99	99	99	42	40	0	99	99	99	99	52	0	99	99	99	99	99	78	99
(PRE) Fierce	3oz																					
(POST) RUPM+AMS	22floc+8.5lb/100gal	0	99	99	99	99	82	40	0	99	99	99	99	99	0	99	99	99	99	99	96	99
SD (0.05)		0	0	0	0	0	4	4	0	0	0	0	0	3	0	0	0	0	0	0	5	0

¹RUPM = Roundup Powermax

Soybean herbicide programs. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and soybean injury from PRE, EPOST and LPOST herbicides. Soybeans were planted on May 18, 2016. PRE treatments were applied on May 18, 2016 at 9:30 AM with 67 F air, 62 F soil at a four inch depth, 20% RH, 0% cloud cover, 8-10 mph NW wind, and dry soil moisture. EPOST treatments were applied on June 16, 2016 at 8:00 AM with 74 F air, 71 F soil at a four inch depth, 57% RH, 25% cloud cover, 3-5 mph SE wind, and moist soil moisture. Weeds present at the time of EPOST applications were: coxb 5-7" at 4-6/yd2, corw 2-4" at 2-4/yd2, rrpw 2-4" at 2-4/yd2, colq 2-4" at 2-4/yd2, wibw 2-4" at 2-4/yd2, and wimu 2-4" at 2-4/yd2. LPOST treatments were applied on June 21, 2016 at 11:00 AM with 85 F air, 74 F soil at a four inch depth, 13% RH, 0% cloud cover, 3-5 mph NW wind, and adequate soil moisture. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, 4.5% OM, and 7.7 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 through 11002 TTI nozzles for PRE and 11002 TT nozzles to EPOST and LPOST, all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Soybean herbicide programs (Zollinger, Wirth, Adams).

Treatment¹	Rate (Product/A)	Prior to POST						14 DA POST						28, 42, & 56 DA POST																												
		Soy	Yeft	Rrpw	Colq	Hans	Corw	Cocb	Soy	Yeft	Rrpw	Colq	Hans	Corw	Cocb	Soy	Yeft	Rrpw	Colq	Hans	Corw	Cocb																				
		-% inj- ----- % control-----						-% inj- ----- % control-----						-% inj- ----- % control-----																												
(PRE) Authority Assist (EPOST) Anthem Maxx +RUPM²+PO	6flox 3flox +32flox+1pt	0	45	99	99	99	20	20	0	99	99	99	99	70	77	0	99	99	99	99	70	99																				
(PRE) Authority MITZ (EPOST) Anthem Maxx +RUPM+PO	14oz 3flox +32flox+1pt	0	23	99	99	99	65	43	0	99	99	99	99	83	90	0	99	99	99	99	75	99																				
(PRE) Authority Elite (EPOST) Marvel+RUPM+PO	28flox 7.25flox+32flox+pt	0	99	99	99	99	20	20	0	99	99	99	99	70	90	0	99	99	99	99	69	99																				
(PRE) Fierce (EPOST) Cobra+RUPM+PO	3oz 10flox+32flox+1pt	0	75	99	99	99	72	23	0	99	99	99	99	99	99	0	89	99	99	99	87	99																				
(PRE) Rowel (EPOST) Warrant+RUPM	3oz 1.5pt+32flox	0	99	99	99	99	57	20	0	99	99	99	99	95	99	0	99	99	99	99	99	99																				
(PRE) Sonic (LPOST) Durango	3oz 24flox	0	25	99	99	99	67	63	0	50	99	99	99	67	82	0	99	99	99	99	99	99																				
(PRE) Sonic (LPOST) Durango	4.5oz 24flox	0	50	99	99	99	72	72	0	53	99	99	99	72	82	0	99	99	99	99	99	99																				
(PRE) Sonic (LPOST) Durango+FirstRate	3oz 24flox+0.3oz	0	43	99	99	99	70	63	0	53	99	99	99	70	82	0	99	99	99	99	99	99																				
(PRE) Surveil (LPOST) Durango	2.8oz 24flox	0	65	99	99	99	96	73	0	93	99	99	99	96	88	0	99	99	99	99	99	99																				
(PRE) Surveil (LPOST) Durango	4.2oz 24flox	0	90	99	99	99	93	87	0	95	99	99	99	95	95	0	99	99	99	99	99	99																				
LSD (0.05)																						0	6	0	0	0	6	6	0	3	0	0	0	4	4	0	1	0	0	0	3	0

¹All POST treatments contained Ammonium Sulfate at 8.5lb/100gal of water

²RUPM=Roundup Powermax, PO = Petroleum Oil

DuPont pre-plant followed by POST applications on conventional tilled. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate pre-plant followed by POST applications in a conventional tillage system. Pre-plant treatments were applied on May 17, 2016 at 1:00 PM with 72 F air, 60 F soil at a four inch depth, 17% RH, 0% cloud cover, 2-4 mph NW wind, and adequate soil moisture. POST treatments were applied on June 16, 2016 at 10:00 AM with 74 F air, 71 F soil at a four inch depth, 57% RH, 25% cloud cover, 3-5 mph SE wind, and moist soil moisture. Weeds present at the time of POST applications were: coxb 4-6" at 1-2/4yd2, corw 1-3" at 1-2/4yd2, rrpw 1-3" at 1-2/4yd2, colq 1-3" at 1-2/4yd2, wibw 1-3" at 1-2/4yd2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 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 through 11002 TT nozzles for PRE and POST, both at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. DuPont pre-plant followed by POST applications on conventional tilled ground (Zollinger, Wirth, Adams).

Treatment¹	Rate (Product/A)	14 DA Pre-Plant					Prior to POST					14, 28 & 42 DA POST							
		Yeft	Rrpw	Colq	Hans	Corw	Cocb	Yeft	Rrpw	Colq	Hans	Corw	Cocb	Yeft	Rrpw	Colq	Hans	Corw	Cocb
		% control					% control					% control							
(PP) Flum+Trib+Thif	2oz+0.25oz+0.25oz																		
(POST) RUPM+D1691	22floz+16floz	99	99	99	99	99	67	99	99	99	99	99	65	99	99	99	99	99	99
(PP) Flum+Trib+Thif	2oz+0.25oz+0.25oz																		
(POST) RUPM+D1691+Cinch	22floz+16floz+1pt	99	99	99	99	99	67	99	99	99	99	47	43	99	99	99	99	99	99
(PP) Flum+Trib+Thif	2oz+0.25oz+0.25oz																		
(POST) RUPM+Prefix	22floz+2pt	99	99	99	99	99	58	99	99	99	99	47	43	99	99	99	99	82	78
(PP) Flum+Chlor+Thif	2oz+0.32oz+0.5oz																		
(POST) RUPM+D1691	22floz+16floz	99	99	99	99	99	73	99	99	99	99	77	63	89	99	99	99	99	99
(PP) Flum+Chlor+Thif	2oz+0.32oz+0.5oz																		
(POST) RUPM+D1691+Cinch	22floz+16floz+1pt	99	99	99	99	99	77	99	99	99	99	93	85	99	99	99	99	99	99
(PP) Flum+Chlor+Thif	2oz+0.32oz+0.5oz																		
(POST) RUPM+Prefix	22floz+2pt	99	99	99	99	99	83	99	99	99	99	96	87	99	99	99	99	82	86
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		0	0	0	0	0	4	0	0	0	0	6	6	1	0	0	0	3	2

¹Flum=Flumioxazin, Trib=Tribenuron, Thif=Thifensulfuron, RUPM=Roundup Powermax, Chlor=Chlorimuron

DuPont pre-plant followed by POST applications on no-till bare-ground. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate pre-plant followed by POST applications in a no-till system. Pre-plant treatments were applied on June 16, 2016 at 8:00 AM with 74 F air, 71 F soil at a four inch depth, 57% RH, 25% cloud cover, 3-5 mph SE wind, and moist soil. Weeds present at the time of pre-plant applications were: coxb 4-6" at 4/ft2, corw 2-4" at 3/ft2, rrpw 2-4" at 3/ft2, colq 2-4" at 3/ft2, yeft 2-4" at 3/ft2, wibw 2-4" at 3/ft2, wimu 2-4" at 3/ft2. POST treatments were applied on June 28, 2016 at 2:00 PM with 75 F air, 73 F soil at a four inch depth, 40% RH, 0% cloud cover, 1-3 mph N wind, and adequate soil moisture. Weeds present at the time of POST applications were: coxb 4-6" at 5/ft2, corw 2-4" at 5/ft2, rrpw 1-3" at 3/ft2, yeft 3-5" at 9/ft2, colq 1-3" at 3/ft2, wibw 1-3" at 1-2/yd2, hans 2-4" at 1-2/yd2, and wimu 4-6" at 3/yd2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 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 through 11002 TT nozzles for pre-plant and POST, both at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. DuPont pre-plant followed by POST applications on no-till bare-ground (Zollinger, Wirth, Adams).

Treatment ¹	Rate (Product/A)	Prior to POST					14 DA POST					28 & 42 DA POST									
		Yeft	Rrpw	Colq	Hans	Corw	Cocb	Yeft	Rrpw	Colq	Hans	Corw	Cocb	Yeft	Rrpw	Colq	Hans	Koch	Corw	Cocb	
		-----% control-----					-----% control-----					-----% control-----									
(PP) Flum+Trib+Thif +RUPM+D1691 (POST) RUPM+D1691	2oz+2.5oz+0.25oz +22flobz+16flobz 22flobz+16flobz	87	87	88	88	73	90	99	99	99	99	95	91	99	99	99	99	99	95	90	99
(PP) Flum+Trib+Thif +RUPM+D1691 (POST) RUPM+D1691+Cinch	2oz+2.5oz+0.25oz +22flobz+16flobz 22flobz+16flobz+1pt	90	90	90	90	72	92	99	99	99	99	91	72	99	99	99	99	99	91	70	99
(PP) Flum+Trib+Thif +RUPM+D1691 (POST) RUPM+Prefix	2oz+2.5oz+0.25oz +22flobz+16flobz 22flobz+2pt	92	92	92	92	70	92	99	99	99	99	91	72	99	99	99	99	99	91	70	99
(PP) Flum+Chlor+Thif +RUPM+D1691 (POST) RUPM+D1691	2oz+0.32oz+0.5oz +22flobz+16flobz 22flobz+16flobz	99	99	99	99	86	95	99	99	99	99	96	89	99	99	99	99	99	96	88	99
(PP) Flum+Chlor+Thif +RUPM+D1691 (POST) RUPM+D1691+Cinch	2oz+0.32oz+0.5oz +22flobz+16flobz 22flobz+16flobz+1pt	90	90	91	90	73	95	90	99	99	99	91	75	99	90	99	99	99	91	75	99
(PP) Flum+Chlor+Thif +RUPM+D1691 (POST) RUPM+Prefix	2oz+0.32oz+0.5oz +22flobz+16flobz 22flobz+2pt	95	95	95	95	73	95	95	99	99	99	86	72	99	95	99	99	99	86	72	99
(PP) Flum+Trib+Thif+Metri +RUPM+D1691 (POST) RUPM+D1691	2oz+2.5oz+0.25oz+4oz +22flobz+16flobz 22flobz+16flobz	95	90	90	90	87	95	95	99	99	99	71	83	99	95	99	99	99	71	82	99
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		2	2	3	2	4	2	0	0	0	0	2	4	0	0	0	0	0	2	2	0

¹Flum=Flumioxazin, Trib=Tribenuron, Thif=Thifensulfuron, RUPM=Roundup Powermax, Chlor=Chlorimuron

Common ragweed control using Panther Pro applied as an Early Pre-plant and PRE. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Mayville, ND to evaluate weed control using EPP, PRE, and POST herbicides. EPP treatments were applied on May 30, 2016 at 9:30 AM with 78 F air, 62 F soil at four inch depth, 38% RH, 30% cloud cover, 1-2 mph NW eind, and moist soil moisture. Weeds present at the time of EPP (2-3" weeds) applications were: colq 3-8" at 4-6/ft2, wibw 3-8" at 1-2/ft2, shep 8-10" at 3-4/ft2, and corw 1-3" at 4-6/ft2. PRE treatments were applied on June 8, 2016 at 10:00 AM with 78 F air, 59 F soil at a four inch depth, 40% RH, 40% cloud cover, 3-5 mph SW wind, and moist soil moisture. Weeds present at the time of PRE application were colq 6-12" at 2-4/ft2, shep 10-14" at 5-7/ft2, wibw 6-8" at 2-5/ft2, and corw 4-6" at 1-3/ft2. POST treatments were applied on June 22, 2016 at 9:30 AM with 75 F air, 67 F soil at a four inch depth, 48% RH, 0% cloud cover, 3-3.5 mph NE wind, and adequate soil moisture. Weeds present at the time of POST applications were: colq 6-12" at 6-8/ft2, wibw 6-8" at 4-6/ft2, yeft 2-4" at 1/ft2, shep 8-10" at 2-4/ft2, and corw 2-4" at 2-4/ft2. Soil characteristics were: 80.2% sand, 12.9% silt, 6.9% clay, Clay Loamy Sand, 2% OM, and 6.7 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 through 11002 TT nozzles for PRE and 8.5 gpa through 11001 TT nozzles for the EPOST and LPOST applications at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Common ragweed control using Panther Pro applied as an Early Pre-plant and PRE (Zollinger, Wirth, Adams).

Treatment	Rate (Product/A)	14 DA PRE			14, 28, and 42 DA POST		
		Wibw	Colq	Corw	Wibw	Colq	Corw
		-----% control-----			-----% control-----		
Untreated		0	0	0	0	0	0
(EPP ¹) Cheetah+AMS	22floz+3lb						
+Panther Pro+MSO	+15floz+1pt	93	96	99	94	98	99
(POST) Credit Xtreme+AMS	22floz+8.5lb/100gal						
(EPP) Cheetah+AMS	22floz+3lb						
+Authority Assist+MSO	+10floz+1pt	65	73	72	68	95	68
(POST) Credit Xtreme+AMS	22floz+8.5lb/100gal						
(EPP) Cheetah+AMS	22floz+3lb						
(PRE) Panther Pro	12floz	73	85	88	93	93	86
(POST) Credit Xtreme+AMS	22floz+8.5lb/100gal						
(EPP) Cheetah+AMS	22floz+3lb						
(PRE) Panther Pro	15floz	96	93	99	92	96	93
(POST) Credit Xtreme+AMS	22floz+8.5lb/100gal						
(EPP) Cheetah+AMS	22floz+3lb						
(PRE) Authority Assist	10floz	67	60	67	77	83	70
(POST) Credit Xtreme+AMS	22floz+8.5lb/100gal						
(EPP) Spitfire+MSO	32floz+1pt						
+Credit Xtreme+AMS	+22floz+8.5lb/100gal	99	99	99	99	99	99
(PRE) Panther Pro	15floz						
(POST) Credit Xtreme+AMS	22floz+8.5lb/100gal						
LSD (0.05)		4	7	3	7	8	4

¹ EPP=Early Pre-Plant

Common ragweed control using Ultra Blazer and Flexstar with adjuvants. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Mayville, ND to evaluate varying rates of Ultra Blazer with adjuvants. EPOST treatments were applied on May 30, 2016 at 9:30 AM with 78 F air, 62 F soil at four inch depth, 38% RH, 30% cloud cover, 1-2 mph NW wind, and moist soil moisture. Weeds present at the time of EPOST applications were: colq 6-10" at 10/ft² in the 1st rep and 4-6" at 10/ft² in the 2nd rep, corw 0-3" at 4-6/ft², wibw 1-2" at 1-2/yd², and shep 10-12" at 1-2/yd². POST treatments were applied on June 8, 2016 at 10:00 AM with 78 F air, 59 F soil at a four inch depth, 40% RH, 40% cloud cover, 3-5 mph SW wind, and moist soil moisture. Weeds present at the time of POST applications were: colq 10-16" at 45-55/yd², corw 2-4" at 20-30/yd², shep 16-20" at 1-2/yd², and fipc 16-20" at 1-2/yd². Soil characteristics were: 80.2% sand, 12.9% silt, 6.9% clay, Clay Loamy Sand, 2% OM, and 6.7 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 through 11002 TT nozzles for EPOST and POST at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Ultra Blazer was enhanced by oil adjuvants more than surfactants. As rates of EPOST and LPOST Ultra Blazer increased, the control of weeds increased. Flexstar had more control of weeds than Ultra Blazer.

Table. Common ragweed control using Ultra Blazer and Flexstar with adjuvants (Zollinger, Wirth, Adams).

Treatment	Rate	Prior to LPOST		28 DA LPOST	
		Colq	Corw	Colq	Corw
	(Product/A)	-% control-		-% control-	
(EPOST) UB ¹ +NIS	0.5pt+0.25%v/v	20	20	20	20
(EPOST) UB+PO	0.5pt+1pt	20	22	20	22
(EPOST) UB+NIS	1pt+0.25%v/v	24	32	24	52
(EPOST) UB+PO	1pt+1pt	20	25	20	25
(EPOST) UB+NIS	1.5pt+0.25%v/v	25	27	25	27
(EPOST) UB+PO	1.5pt+1pt	32	40	32	40
(EPOST) UB+NIS	0.5pt+0.25%v/v				
(LPOST) UB+NIS	0.5pt+0.25%v/v	20	20	20	20
(EPOST) UB+NIS	1pt+0.25%v/v				
(LPOST) UB+NIS	0.5pt+0.25%v/v	22	25	22	58
(EPOST) UB+NIS	1pt+0.25%v/v				
(LPOST) UB+NIS	1pt+0.25%v/v	27	35	27	35
(EPOST) UB+PO	0.5pt+1pt				
(LPOST) UB+PO	0.5pt+1pt	25	28	25	28
(EPOST) UB+PO	1pt+1pt				
(LPOST) UB+PO	0.5pt+1pt	22	27	22	33
(EPOST) UB+PO	1pt+1pt				
(LPOST) UB+PO	1pt+1pt	23	30	35	80
(EPOST) Flexstar+PO	0.75pt+1pt	40	73	40	82
(LPOST) Flexstar+PO	0.75pt+1pt	0	0	40	50
(EPOST) Flexstar+PO	0.375pt+1pt				
(LPOST) Flexstar+PO	0.375pt+1pt	37	63	37	73
(EPOST) Flexstar+PO	0.5pt+1pt				
(LPOST) Flexstar+PO	0.375pt+1pt	37	63	37	75
LSD (0.05)		3	3	3	4

¹UB=Ultra Blazer

Waterhemp control using PRE herbicides. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Hickson, ND to evaluate waterhemp control using PRE herbicides. PRE treatments were applied on May 6, 2016 at 9:15 AM with 83 F air, 61 F soil at a four inch depth, 27% RH, 10% cloud cover, 0-6 mph W wind, and dry soil moisture. Soil characteristics were: 4.6% sand, 40% silt, 55.4% clay, Silty Clay, 6.6% OM, and 7.5 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 through 11002 TT nozzles for PRE at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Waterhemp control using PRE herbicides (Zollinger, Wirth, Adams).

		28 DAA	42 DAA	56 DAA
Treatment	Rate	Wahe	Wahe	Wahe
	(Product/A)	-----% control-----		
Authority MTZ	11oz	92	88	87
Authority MTZ	16oz	91	89	88
Fierce+Metribuzin	3oz+4oz	93	83	83
Fierce+Metribuzin	4.5oz+6oz	99	99	99
Fierce XLT	4oz	93	95	93
Valor+Metribuzin	2oz+4oz	95	95	93
Fierce	3oz	88	93	92
Boundary	2pt	88	88	87
Authority First	4.5oz	80	78	77
LSD (0.05)		8	6	5

Glyphosate resistant waterhemp control using Flexstar. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Hickson, ND to evaluate waterhemp control using EPOST and LPOST applications of Flexstar. EPOST treatments were applied on June 17, 2016 at 11:30 AM with 79 F air, 70 F soil at a four inch depth, 83% RH, 95% cloud cover, 1-3 mph NE wind, and adequate soil moisture. Waterhemp at the time of application was 1-3" tall at 3-5/yd². LPOST treatments were applied on June 22, 2016 at 1:45 PM with 82 F air, 75 F soil at a four inch depth, 70% RH, 5% cloud cover, 1-3 mph SE wind, and adequate soil moisture. Waterhemp at the time of application was 2-4" tall at 3-5/yd². Soil characteristics were: 4.6% sand, 40% silt, 55.4% clay, Silty Clay, 6.6% OM, and 7.5 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 through 11002 TT nozzles at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Glyphosate resistant waterhemp control using Flexstar (Zollinger, Wirth, Adams).

Treatment ¹	Rate (Product/A)	7 DA EPOST	14 DA EPOST	14 DA LPOST	28 DA LPOST
		Wahe	Wahe	Wahe	Wahe
		-----% control-----			
(EPOST) Flexstar GT	2.68pt	74	73	68	67
(EPOST) Flexstar GT+RUPM ²	2.68pt+7floz	84	87	83	82
(EPOST) Flexstar+RUPM	0.75pt+28floz	93	95	96	96
(LPOST) Flexstar GT	2.68pt	0	55	96	96
(LPOST) Flexstar GT+RUPM ²	2.68pt+7floz	0	53	97	97
(LPOST) Flexstar+RUPM	0.75pt+28floz	0	50	97	97
(EPOST) RUPM	28floz	22	23	33	28
LSD (0.05)		4	6	4	4

¹ All applications included an MSO applied at 1% v/v and AMS applied at 8.5 lb/100gal

² RUPM = Roundup Powermax