Blue Section: **Weed Control in Corn and Soybean** Page

Blue Section continued: **Weed Control in Corn and Soybean** Page

Canola Control using Pre-emergent herbicides 1. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Casselton, ND to evaluate volunteer RR canola control using PRE herbicides. Pioneer RR canola was planted on June 12, 2013 in addition to volunteer population that emerged from prior years. PRE treatments were applied on May 15, 2013 at 10:45 am with 81 F air, 52.9 F soil at a four inch depth, 8% RH, 0% cloud cover, 2-4 mph NW wind, and dry soil moisture. 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 Tee Jet nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Study was located in an area where canola was not harvested the prior year and volunteer canola was expected. Very little canola emerged from previous year seed. Canola was seeded near a month after PRE herbicides were applied. Stand was light but treatment demarcations were easily observed for evaluations. Spring precipitation provided excellent herbicide activation.

Table. Canola control using Pre-emergent herbicides 1. (Zollinger, Wirth, Kazmierczak)

		14 DAA	28 DAA
Treatments	Rate	Canola	Canola
	(Product/A)	% Control	% control
PRE			
Sharpen	1 fl oz	25	25
Sharpen	2 fl oz	40	40
Sharpen	3 fl oz	47	47
SureStart	1.5 pt	57	57
SureStart	2 pt	90	90
Authority Assist	6 fl oz	63	63
Authority Assist	4 oz	95	95
Authority MTZ	10 oz	95	95
Boundary	1.6 pt	98	98
Broadaxe	20 fl oz	40	40
Broadaxe	26 fl oz	50	50
Gangster FirsRate+Gangster Valor	0.2 oz+1 oz	96	96
Gangster FirsRate+Gangster Valor	0.3 oz+1.5 oz	98	98
Valor SX	3 oz	73	73
Metribuzin	0.25 lb	95	95
Metribuzin	0.33 lb	96	96
Metribuzin	0.5 lb	99	99
LSD (0.05)		5	5

Canola Control using Pre-emergent herbicides 2. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Casselton, ND to evaluate volunteer RR canola control using PRE herbicides. Pioneer RR canola was planted on June 12, 2013 in addition to volunteer population that emerged from prior years. PRE treatments were applied on May 15, 2013 at 10:45 am with 81 F air, 52.9 F soil at a four inch depth, 8% RH, 0% cloud cover, 2-4 mph NW wind, and dry soil moisture. 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 Tee Jet nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Study was located in an area where canola was not harvested the prior year and volunteer canola was expected. Very little canola emerged from previous year seed. Canola was seeded near a month after PRE herbicides were applied. Stand was light but treatment demarcations were easily observed for evaluations. Spring precipitation provided excellent herbicide activation. Weed infestation prevented later evaluation for most treatments.

Table. Canola control using pre-emergent herbicides 2. (Zollinger, Wirth, Kazmierczak)

		14 DAA	28 DAA
Treatments	Rate	Canola	Canola
	(Product/A)	% Control	% control
PRE			
Zidua	2 oz	40	/
Zidua	3 oz	50	/
Zidua	4 oz	95	/
Zidua	5 oz	96	/
Fierce	3 oz	99	/
Fierce	3.75 oz	99	/
Fierce	4.5 oz	99	/
2,4-D Amine	1 pt	0	/
2,4-D Ester	1 pt	0	/
Banvel	8 fl oz	0	/
Banvel	26 fl oz	47	/
Camix	0.2 oz+1 oz	25	/
Camix	0.3 oz+1.5 oz	43	/
Resolve Q	1.25 oz	58	99
DPX 1-2-1	1.5 oz	63	99
Instigate	3 oz	63	99
Instigate	6 oz	99	99
Realm Q+PO+28% N	4 oz+1% v/v+2 qt	0	/
LSD (0.05)		5	0

False chamomile control with fall- and spring-applied herbicides. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate false chamomile control with fall-applied residual herbicides compared to glyphosate applied fall and/or spring. Fall treatments were applied October 1, 2012 to 4- to 8-inch rosettes and 12- to 14-inch flowering plants (up to 4 per sq ft). Glyphosate was applied with all fall treatments at 22 fl oz. In the spring, glyphosate was applied over all treatments on May 29 when chamomile was emerging to 14-inches tall (up to 8 per sq ft). No other herbicides were applied in the spring.

Glyphosate applied alone in the fall or spring provided 60-68% chamomile control at the July 26 evaluation. Tank mixes including Lorox and Metribuzin increased control slightly (74-75%). Treatments containing Valor at 2 or 3 oz provided excellent long-term control (93-97%).

Table. False chamomile control with fall- and spring-applied herbicides. (1329)

			False Chamomile Control					
			Old growth[c]		New growth[c]		Overall	
Treatment[a]	Rate	Timing[b]	May-29	Jun-25	May-29	Jun-25	May-10	Jul-26
			------%------		------%------		------%------	
Untreated / Gly	22 oz	Fall / Spring	0	80	0	64	0	60
Gly / Gly	22 oz / 22 oz	Fall / Spring	99	100	0	63	96	63
Gly + Lorox / Gly	22 oz + 2 lb / 22 oz	Fall / Spring	95	100	84	84	73	75
Gly + Lorox + Metri / Gly	22 oz + 1.25 lb + 3 oz / 22 oz	Fall / Spring	94	100	86	84	63	74
Gly + Lorox + Valor / Gly	22 oz + 1.25 lb + 2 oz / 22 oz	Fall / Spring	98	100	98	100	92	93
Gly + Lorox + Pursuit / Gly	22 oz + 1.25 lb + 2 oz / 22 oz	Fall / Spring	97	100	95	87	80	66
Gly + Valor / Gly	22 oz + 2 oz / 22 oz	Fall / Spring	98	100	93	100	95	95
Gly + Valor / Gly	22 oz + 3 oz / 22 oz	Fall / Spring	99	100	98	100	97	97
Gly	22 oz	Spring	0	77	0	67	0	68
Gly + Olympus / Gly	28.44 oz + 0.2 oz / 22 oz	Fall / Spring	99	100	33	64	97	72
LSD (0.05)			4.2	3.2	7.9	4.4	8.9	11.4
CV			4.2	2.8	9.3	3.2	7.6	10.3

[a] *Gly=Glyphosate; Metri=Metribuzin*

[b] *Fall treatments applied Oct 1, 2012. Spring glyphosate applied May 29, 2013.*

[c] *Old growth=plants emerged in the fall; New growth=plants emerged in the spring*

Kochia control in soybean with soil-applied herbicides. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate kochia control with soil-applied herbicides used in soybean. No crop was planted in this study due to excessively wet soil conditions. Herbicide treatments were applied June 18 when kochia was 2- to 7-inches tall with 3-10 plants per sq ft. All treatments were applied with glyphosate at 22 fl oz. At 4 weeks after treatment (WAT), all treatments provided ≥92% kochia control. At 8 WAT, only treatments containing metribuzin (0.66 lb/A) or sulfentrazone (Sonic, Authority MTZ, Authority Assist) provided >90% kochia control. Note that the metribuzin rate is very high, especially for light soils with high pH and low organic matter.

Table. Kochia control in soybean with soil-applied herbicides. (1338)

		Weed Control		
		Kochia		
Treatment[ab]	Rate	Jun-29	Jul-16	Aug-15
		----------%----------		
Gly + Zidua	22 oz + 3 oz	98	96	74
Gly + Zidua + Sharpen	22 oz + 3 oz + 1 oz	96	93	73
Gly + Zidua + Verdict	22 oz + 3 oz + 5 oz	98	95	81
Gly + Zidua + Verdict + Metribuzin	22 oz + 3 oz + 5 oz + 0.66 lb	99	100	99
Gly + Zidua + Sharpen + Metribuzin	22 oz + 3 oz + 1 oz + 0.66 lb	99	100	99
Gly + Verdict	22 oz + 5 oz	97	94	73
Gly + Verdict + Metribuzin	22 oz + 5 oz + 0.66 lb	99	100	98
Gly + Anthem	22 oz + 9 oz	96	92	68
Gly + Fierce	22 oz + 4.5 oz	98	97	85
Gly + Sonic	22 oz + 4 oz	97	98	94
Gly + Authority MTZ	22 oz + 14 oz	97	98	97
Gly + Authority Assist	22 oz + 6 oz	98	99	95
Gly + Zidua + Pursuit + Sharpen	22 oz + 3 oz + 2 oz + 1 oz	97	93	75
Gly		97	94	68
LSD (0.05)		NS	4	10.7
CV		1.4	2.5	7.6

[a] *All treatments applied to 2-7" Kochia (no crop-prevent plant)*

[b] *Gly=Glyphosate (PowerMax)*

Pre-plant burndown of GR Kochia. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Barney, ND to evaluate weed efficacy of glyphosate with saflufenacil and adjuvants herbicides. Treatments were applied on June 25, 2013 at 11:30 am with 78 F air 71.2 F soil at a four inch depth, 65% RH, 100% cloud cover, 6-8 mph S wind, and adequate soil moisture. Weed species present at the time of POST was: 6-10" (5-10/ft²) kochia, 6-10" (5-10/ft²) common lambsquarters, 6-10" (10-12/ft²) redroot pigweed, 2-3" (2/yd²) common ragweed, 6-8" bolt (1/yd²) dandelion, and 5-8" (1/yd²) wild buckwheat. Soil characteristics were: 39.9% sand, 37.6% silt, 22.5% clay, loam, 4% 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 8.5 gpa at 40 psi through 11001 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Study was placed in a field with glyphosate resistant kochia.

Table. POST Kochia Control. (Zollinger, Wirth, Kazmierczak)

		7 DAA		14 DAA		28 DAA	
Treatments	Rate	Colq	Koch	Colq	Koch	Colq	Koch
	(Product/A)	% control		% control		% control	
POST							
RU PM+Sharpen+UAD-1314	11fl oz+1fl oz+0.75% v/v	80	80	80	83	80	77
RU PM +Sharpen+UAD-1316	11fl oz+1fl oz+0.5% v/v	65	65	65	68	65	67
RU PM +Sharpen+UAD-1316	11fl oz+1fl oz+0.75% v/v	67	67	67	70	67	72
RU PM +Sharpen+UAD-1317	11fl oz+1fl oz+0.5% v/v	47	47	47	52	47	55
RU PM +Sharpen+UAD-1317	11fl oz+1fl oz+0.75% v/v	43	43	43	55	43	55
RU PM+Sharpen+UAD-1344	11fl oz+1fl oz+0.5% v/v	33	33	33	40	33	38
RU PM+Sharpen+UAD-1348	11fl oz+1fl oz+0.75% v/v	43	43	43	53	43	53
RU PM+Sharpen+UAD-1331	11fl oz+1fl oz+0.75% v/v	47	47	47	60	47	55
LSD (0.05)		11	11	11	6	11	9

*RU PM= Roundup Powermax

GR Kochia Control using Fierce and other PREs. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Barney, ND to evaluate weed efficacy of PRE herbicides. Treatments were applied on May 14, 2013 at 8:00 am with 76.2 F air 52.3 F soil at a four inch depth, 35% RH, 0% cloud cover, 7-9 mph NE wind, and adequate soil moisture. Weed species present at the time of PRE was: 2" rosette (1/yd^2). Soil characteristics were: 39.9% sand, 37.6% silt, 22.5% clay, loam, 4% 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 at 40 psi through 11002 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Study was placed in a field with glyphosate resistant kochia. May 28 - 14 daa - kochia was emerging at cotyledon to 0.5 inch. Excellent kochia control resulted from using multiple modes of action.

Table. Kochia Control using Fierce and other PRE's. (Zollinger, Wirth, Kazmierczak)

		14 DAA		28 DAA		42 DAA		56 DAA	
Treatments	Rate	Colq	Koch	Colq	Koch	Colq	Koch	Colq	Koch
	(Product/A)	% control		% control		% control		% control	
PRE									
Valor	2oz	99	80	80	68	80	67	80	43
Valor	2.5oz	99	88	93	82	93	81	85	75
Valor	3 oz	98	93	98	90	96	84	96	72
Valor+Harness	2.5oz+1.71pt	99	96	99	95	99	93	99	91
Valor+Warrant	2.5oz+2qt	99	93	99	88	99	86	99	72
Valor+Harness	2.5oz+3.43pt	99	93	99	95	99	94	99	92
Valor+Warrant	2.5oz+4qt	98	98	99	96	99	93	99	83
Fierce	2.5oz	99	96	99	86	98	88	98	70
Fierce	3 oz	99	99	99	86	99	86	99	79
Fierce	3.75oz	99	99	99	96	99	94	99	92
Fierce+Gangster FR	3.75oz+0.4oz	99	99	99	96	99	96	99	94
Fierce+Metribuzin	3oz+5.28oz	99	99	99	96	99	95	99	93
Fierce+Metribuzin	3oz+8oz	98	98	99	99	99	98	99	98
Fierce+Metribuzin	3.75oz+5.28oz	99	99	99	99	99	99	99	99
Fierce+Metribuzin	3.75oz+8oz	99	99	99	99	99	99	99	99
Authority MTZ	15oz	99	99	99	99	99	99	99	99
LSD (0.05)		2	7	3	7	3	7	1	5

GR Kochia Control using 2,4-D Amine and Clarity with PREs. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Barney, ND to evaluate weed efficacy of PRE herbicides. Treatments were applied on May 14, 2013 at 8:45 am with 76.2 F air 52.3 F soil at a four inch depth, 35% RH, 0% cloud cover, 4-6 mph NE wind, and adequate soil moisture. Weed species present at the time of PRE was: 2" rosette (1/yd^2). Soil characteristics were: 39.9% sand, 37.6% silt, 22.5% clay, loam, 4% 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 at 40 psi through 11002 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Study was placed in a field with glyphosate resistant kochia. May 21 = 7 daa. Kochia was not emerged and control ratings could not be done.
May 28 - 14 daa - kochia was emerging at cotyledon to 0.5 inch. Plant density and height was taken because of slow growth. Excellent kochia control resulted from using multiple modes of action.

Table. Kochia Control Using 2,4-D Amine and Clarity with Other PRE's. (Zollinger, Wirth, Kazmierczak)

		14 DAA			28 DAA				42 DAA			56 DAA		
Treatments	Rate	Colq	Koch	Dali	Colq	Koch	Koch	Koch	Rrpw	Colq	Koch	Rrpw	Colq	Koch
	(Product/A)	% control			% control		Height	/m2	% control			% control		
PRE														
Clarity	1pt	85	67	63	76	60	2	70	33	37	55	33	37	55
Clarity	2pt	87	62	82	87	67	1	48	40	72	75	37	63	68
2,4-D Amine	1.5pt	88	53	43	63	47	2	117	40	37	32	40	37	25
2,4-D Amine	2 pt	87	70	57	83	67	2	60	30	37	62	30	37	42
Valor	2oz	87	52	53	88	83	1	5	90	87	82	90	88	84
Valor+Clarity	2oz+1pt	99	99	99	99	98	0	0	97	97	96	97	97	96
Valor+Clarity	2oz+2pt	99	99	99	99	99	0	0	88	88	92	88	88	94
Valor+2,4-D Amine	2oz+1.5pt	99	99	86	99	99	0	0	95	95	93	95	95	95
Valor+2,4-D Amine	2oz+2pt	99	99	83	99	96	0	1	92	92	96	92	92	96
Warrant	3pt	70	60	20	57	60	2	60	77	40	52	73	40	48
Warrant+Clarity	3pt+1pt	90	80	70	87	78	1	14	77	72	72	72	70	68
Warrant+Clarity	3pt+2pt	95	93	92	95	94	1	4	88	85	91	82	85	78
Warrant+2,4-D	3pt+1.5pt	83	58	63	81	65	2	45	70	60	65	70	60	62
Warrant+2,4-D	3pt+2pt	80	63	73	72	58	2	67	85	50	63	85	50	43
Liberty	28fl oz	50	50	47	33	33	3	100	20	20	37	20	20	28
LSD (0.05)		6	15	21	14	13	0	19	9	11	16	9	12	9

GR Kochia Control with Different Tank Mixtures. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Barney, ND to evaluate weed efficacy of PRE/POST herbicides. PRE treatments were applied on May 24, 2013 at 10:00 am with 63.4 F air 55.4 F soil at a four inch depth, 39% RH, 100% cloud cover, 8-10 mph S wind, and adequate soil moisture. Weed species present at the time of PRE were: seedling (15-20/ft²) kochia, 0.5-1" (1-5/ft²) common lambsquarters, and 2-3" rosette (1-2/yd²) dandelion. POST treatments were applied on July 1, 2013 at 1:00 pm with 90 F air, 80 F soil at a four inch depth, 25% RH, 0% cloud cover, 2-4 mph NNW wind, adequate soil moisture, good crop vigor, and no dew present. Weed species present at the time of POST were: 2-8" (3-5/ft²) kochia, and 3-5" (1-5/ft²) common lambsquarters. Soil characteristics were: 39.9% sand, 37.6% silt, 22.5% clay, loam, 4% 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 at 40 psi through 11002 TT nozzles for the PRE and 8.5 gpa at 40 psi through 11001 TT nozzles for the POST. The experiment had a randomized complete block design with three replicates per treatment.

Study was placed in a field with glyphosate resistant kochia. Excellent kochia control resulted from using multiple modes of action.

Table. Kochia Control with Different Tank Mixtures. (Zollinger, Wirth, Kazmierczak)

		28 DA PRE		14 DA POST		28 DA POST	
Treatments	Rate	Colq	Koch	Colq	Koch	Colq	Koch
	(Product/A)	% control		% control		% control	
PRE/POST							
Sonic	8oz						
2,4-D Amine+RU PM+AMS	1pt+32fl oz+1.5lb	99	96	99	96	99	96
Warrant	2 pt						
Clarity+RU PM+AMS	8fl oz+32fl oz+1.5lb	55	30	55	68	53	67
Valor XLT	5 oz						
Clarity+Warrant+RU PM+AMS	1pt+2pt+32fl oz+1.5lb	96	91	96	92	96	93
Clarity+RU PM+AMS	8fl oz+32fl oz+1.5lb						
Clarity+Warrant+RU PM+AMS	1pt+2pt+32fl oz+1.5lb	96	96	96	96	96	96
Prefix	2.3pt						
Halex GT+AMS	2pt+1.5lb	83	80	83	88	85	87
Zemax	2qt						
Flexstar+Liberty+AMS	1.5pt+36fl oz+1.5lb	94	80	94	93	93	92
Clarity+Zidua	1pt+1.5oz						
RU PM+AMS	32fl oz+1.5lb	99	99	99	99	99	99
Balance Pro+Sencor DF	3fl oz+8oz						
Liberty+AMS	36fl oz+1.5lb	99	99	99	99	99	99
Balance Pro+Sencor DF	3fl oz+8oz						
Liberty+2,4-D Amine+AMS	36fl oz+1pt+1.5lb	99	99	99	99	99	99
Balance Pro+Sencor DF	3fl oz+8oz						
Liberty+Clarity+AMS	36fl oz+1pt+1.5lb	99	99	99	99	99	99
Balance Pro+Sencor DF	3fl oz+8oz						
RU PM+AMS	32fl oz+1.5lb	99	99	99	99	99	99
Balance Pro+Sencor DF	3fl oz+8oz						
RU PM+Clarity+AMS	32fl oz+1pt+1.5lb	99	99	99	99	99	99
Balance Pro+Zidua	3fl oz+1.5oz						
Liberty+Clarity+AMS	36fl oz+1pt+1.5lb	99	99	99	99	99	99
LSD (0.05)		4	6	4	3	3	3

*RU PM= Roundup Powermax

GR Kochia Control with Different Tank Mixtures. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Barney, ND to evaluate weed efficacy of herbicides applied at different timings. PRE treatments were applied on May 24, 2013 at 10:50 am with 63.4 F air 55.4 F soil at a four inch depth, 39% RH, 100% cloud cover, 8-10 mph S wind, and adequate soil moisture. Weed species present at the time of PRE were: seedling (15-20/ft^2) kochia. POST 1.5" kochia treatments were applied on June 11, 2013 at 3:38 pm with 80 F air, 64 F soil at a four inch depth, 18% RH, 25% cloud cover, 2-4 mph NE wind, and adequate soil moisture. Weed species present at the time of POST 1.5" kochia treatments were: 0.5-2" (10-25/ft^2) kochia, 1-3" (1-10/yd^2) common lambsquarters, and 2-6" rosette (1-5/yd^2) dandelion. POST 1.5" kochia regrowth treatments were applied on July 1, 2013 at 1:00 pm with 90 F air, 80 F soil at a four inch depth, 25% RH, 0% cloud cover, 2-4 mph NNW wind, adequate soil moisture, good crop vigor, and no dew present. Weed species present at the time of POST was: 2-4" (3-5/ft^2) kochia. Soil characteristics were: 39.9% sand, 37.6% silt, 22.5% clay, loam, 4% 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 at 40 psi through 11002 TT nozzles for the PRE and 8.5 gpa at 40 psi through 11001 TT nozzles for the POST. The experiment had a randomized complete block design with three replicates per treatment.

Study was placed in a field with glyphosate resistant kochia. Excellent kochia control resulted from using multiple modes of action.

Table. Kochia Control using tank mixes and timings. (Zollinger, Wirth, Kazmierczak)

		14 DAA			28 DAA			14 DA Trt. 9			56 DAA		
Treatments	Rate	Rrpw	Colq	Koch	Rrpw	Colq	Koch	Rrpw	Colq	Koch	Rrpw	Colq	Koch
	(Product/A)	% control			% control			% control			% control		
PRE													
SA-0370102	2.5pt	50	90	85	40	90	82	40	90	82	40	90	82
Stalwart+SA-0330101	1pt+10fl oz	99	99	99	99	99	90	99	99	90	99	99	90
SA-0070116	3.5pt	96	97	90	96	97	83	75	97	83	75	97	83
SA-0370103	2.5pt	67	88	79	82	88	75	85	88	53	85	88	53
SA-0070115	3.5pt	94	94	94	94	94	92	94	94	92	94	94	92
PRE/1.5" Kochia													
FirstRate+Pursuit+Metribuzin	0.25oz+2fl oz+5.33oz												
RU PM+AMS	32fl oz+1.5lb	98	98	90	98	98	89	98	98	89	98	98	89
FirstRate+Pursuit+Valor	0.25oz+2fl oz+2.5oz												
RU PM+AMS	32fl oz+1.5lb	99	99	95	99	99	95	99	99	95	99	99	95
1.5" Kochia/1.5" Kochia													
Flexstar GT+Destiny HC+AMS	2.68pt+1.5pt+1.5lb												
RU PM+AMS	32fl oz+1.5lb	96	96	90	96	96	90	96	96	93	96	96	93
LSD (0.05)		18	7	15	6	7	12	5	7	11	5	7	11

* RU PM= Roundup Powermax

Early Pre-Plant GR Common Ragweed Control. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Mayville, ND to evaluate common ragweed efficacy. Early pre treatments were applied on May 15, 2013 at 1:45 pm with 83.1 F air, 67.5 F soil at a four inch depth, 9% RH, 0% cloud cover, 8-10 mph NW wind, and dry soil moisture. Soil characteristics were: 73.6% sand, 15.2% silt, 11.2% clay, sandy loam texture, 2.5% OM, and 6.2 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 15 gpa at 40 psi through 11002 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Study was placed in an area with documented glyphosate resistant common ragweed. Spring precipitation activated PRE herbicides and caused other flushes of weeds in treatments that either no herbicide residue or herbicides were degraded prior to the 42 DAA evaluation. Panther contains flumioxazin – the same active ingredient as in Valor.
May 22 = 7 daa. 100% control of emerged common ragweed. No other flushes.
May 29 = 14 daa - 100% control of emerged common ragweed. No other flushes. Control ratings were for 2nd flush. Common ragweed was in cotyledon stage and still emerging.
Jun 12 = 28 daa - Lower ratings were from new common ragweed flushes.

Table. Early Pre-Plant Common Ragweed Control. (Zollinger, Wirth, Kazmierczak)

		14 DAA		28 DAA		42 DAA			
Treatments	Rate	Colq	Corw	Colq	Corw	Yeft	Rrpw	Colq	Corw
	(Product/A)	% Control		% Control		% Control			
EPP									
Panther+PO	2oz+1%v/v	99	83	99	75	72	88	92	75
Panther+PO	3oz+1%v/v	99	87	99	77	96	99	99	75
Weedar 64+PO	1qt+1%v/v	99	85	99	47	20	20	20	42
Burnmaster+PO	1qt+1%v/v	99	70	99	43	20	20	20	50
Panther+Weedar 64+PO	2oz+1pt+1%v/v	99	78	99	58	93	92	88	57
Panther+Weedar 64+PO	2oz+1qt+1%v/v	99	92	99	75	75	93	90	78
Panther+Weedar 64+PO	3oz+1pt+1%v/v	99	72	99	52	78	99	99	45
Panther+Weedar 64+PO	3oz+1qt+1%v/v	99	90	99	73	75	95	93	62
Panther+Burnmaster+PO	2oz+1qt+1%v/v	99	90	99	70	95	99	93	62
Panther+Weedar 64+Credit Xtreme+PO+AMS	2oz+1pt+22fl oz+1%v/v+8.5lb/100 gal	99	80	99	57	92	93	96	53
Panther+Weedar 64+Credit Xtreme+PO+AMS	3oz+1pt+22fl oz+1%v/v+8.5lb/100 gal	99	83	99	73	90	90	95	72
Credit Xtreme+PO+AMS	22fl oz+1% v/v+8.5lb/100 gal	99	78	99	47	0	50	50	45
Sharpen+MSO+AMS	1fl oz+1% v/v+8.5lb/100 gal	83	50	73	40	50	50	50	33
Sharpen+Credit Xtreme+MSO+AMS	1fl oz+22fl oz+1% v/v+8.5lb/100 gal	56	30	46	23	50	50	50	23
LSD (0.05)		21	30	28	24	4	3	4	14

PRE-Plant GR Common Ragweed Control. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Mayville, ND to evaluate common ragweed efficacy. PRE treatments were applied on May 15, 2013 at 1:45 pm with 83.1 F air, 67.5 F soil at a four inch depth, 9% RH, 0% cloud cover, 8-10 mph NW wind, and dry soil moisture. Soil characteristics were: 73.6% sand, 15.2% silt, 11.2% clay, sandy loam texture, 2.5% OM, and 6.2 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 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Study was placed in an area with documented glyphosate resistant common ragweed. Spring precipitation activated PRE herbicides and caused other flushes of weeds in treatments that either no herbicide residue or herbicides were degraded prior to the 42 DAA evaluation. Panther contains flumioxazin – the same active ingredient as in Valor.
May 22 = 7 daa. 100% control of emerged common ragweed. No other flushes.
May 29 = 14 daa - 100% control of emerged common ragweed. No other flushes. Control ratings were for 2nd flush. Common ragweed was in cotyledon stage and still emerging.
Jun 12 = 28 daa - Lower ratings were from new common ragweed flushes.

Table. Pre-Plant Common Ragweed Control. (Zollinger, Wirth, Kazmierczak)

		14 DAA		28 DAA		42 DAA		
Treatments	Rate	Colq	Corw	Colq	Corw	Rrpw	Colq	Corw
	(Product/A)	% Control		% Control		% Control		
PRE								
Panther	2 oz	99	62	99	60	93	99	55
Panther	3 oz	99	68	99	65	95	99	50
Pursuit	4 fl oz	99	50	99	50	99	77	43
Panther+Pursuit	2 oz+2 fl oz	99	60	99	65	99	99	55
Panther+Pursuit	2 oz+4 fl oz	99	68	99	73	99	99	58
Panther+Pursuit	3 oz+2 fl oz	99	77	99	73	99	99	58
Panther+Pursuit	3 oz+4 fl oz	99	85	99	78	99	99	67
Authority Assist	8 fl oz	99	25	99	30	99	99	27
LSD (0.05)		0	17	0	18	2	2	12

POST GR Common Ragweed. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Mayville, ND to evaluate common ragweed efficacy. POST treatments were applied on June 11, 2013 at 1:05 pm with 85.1 F air, 68.9 F soil at a four inch depth, 14% RH, 0% cloud cover, 2-4 mph N wind, and dry soil moisture. Weed species present at the time of POST were: cotyledon-2.5" (10-20/ft²) common ragweed, 1-3" vine (1-5/yd²) wild buckwheat, cotyledon-1-2" (1-5/yd²) redroot pigweed. Soil characteristics were: 73.6% sand, 15.2% silt, 11.2% clay, sandy loam texture, 2.5% OM, and 6.2 pH. 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 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Study was placed in an area with documented glyphosate resistant common ragweed. Spring precipitation provided a heavy stand of ragweed. Soybean was volunteer from the last season and population was light which did not contribute to canopy closure and crop competition against ragweed. Results show Cobra application to small ragweed results in good control.

Table. POST Common Ragweed Control. (Zollinger, Wirth, Kazmierczak)

		7 DAA			14 DAA			28 DAA			42 DAA		
Treatments	Rate	Soy	Colq	Corw	Soy	Colq	Corw	Soy	Colq	Corw	Soy	Colq	Corw
	(Product/A)	% Inj	% Control		% Inj	% Control		% Inj	% Control		% Inj	% Control	
POST													
Roundup PowerMax + AMS	32 fl oz + 2.5 lb	0	67	43	0	67	60	0	67	50	0	67	50
Prefix + Roundup PowerMax + AMS + PO	1 qt + 32 fl oz + 2.5 lb + 1 qt	8	99	98	7	99	98	7	99	88	0	99	90
Cobra + V-10206 + Roundup PowerMax + AMS + PO	12.5 fl oz + 1.5 oz + 32 fl oz + 2.5 lb + 1 qt	28	99	97	15	99	99	15	99	99	10	99	99
Cobra + V-10206 + Roundup PowerMax + AMS + PO	12.5 fl oz + 2 oz + 32 fl oz + 2.5 lb + 1 qt	32	99	96	15	99	99	15	99	99	5	90	99
Cobra + Warrant + Roundup PowerMax + AMS + PO	12.5 fl oz + 3 pt + 32 fl oz + 2.5 lb + 1 qt	22	99	83	13	99	99	13	99	99	2	82	92
Cobra + Dual II Magnum + Roundup PowerMax + AMS + PO	12.5 fl oz + 1.33 oz + 32 fl oz + 2.5 lb + 1 qt	27	99	93	15	99	99	15	99	99	0	95	99
LSD (0.05)		6	4	6	3	4	2	3	4	2	2	5	2

GR Common Ragweed control using Enlist Duo. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Mayville, ND to evaluate weed efficacy in corn using Enlist Duo. DKC 33-53 corn was planted on May 14, 2013. PRE treatments were applied on May 15, 2013 at 1:45 pm with 83.1 F air, 67.5 F soil at a four inch depth, 9% RH, 0% cloud cover, 8-10 mph NW wind, and dry soil moisture. POST V2 treatments were applied on June 13, 2013 at 10:20 am with 74.1 F air, 63.1 F soil at a four inch depth, 56% RH, 10% cloud cover, 1-3 mph NE wind, adequate soil moisture, good crop vigor, and no dew present at V2-V3 corn. Weed species present at the time of V2 were: cotyledon-2.5" (5-20/ft²) common ragweed, 1-3" vine (1-5/yd²) wild buckwheat, cotyledon-1.5" (5-15/yd²) redroot pigweed, and cotyledon-1.5" (1-5/yd²) common lambsquarters. POST V4 treatments were applied on June 18, 2013 at 10:40 am with 72 F air, 67.5 F soil at a four inch depth, 44% RH, 5% cloud cover, 1-3 mph S wind, dry soil moisture, good crop vigor, and no dew present at V4 corn. Weed species present at the time of V4 with a PRE (trts 1-7, and 24): cotyledon-1.5" (1-7/ft²) common ragweed, cotyledon-0.5" (1-5/yd²) redroot pigweed, and cotyledon (1/yd²) common lambsquarters. Weed species present at the time of V4 without a PRE (trts 15-23): 1-6" (10-25/ft²) common ragweed, 1-4.5" vine (1-5/yd²) wild buckwheat, cotyledon-2" (1-10/ft²) redroot pigweed, and cotyledon-4" (1-10/ft²) common lambsquarters. Soil characteristics were: 73.6% sand, 15.2% silt, 11.2% clay, sandy loam texture, 2.5% OM, and 6.2 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 15 gpa at 40 psi through 11015 AIXR nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Table. Enlist Duo in Corn. (Zollinger, Wirth, Kazmierczak)

		Prior to V4		14 DAA		28 DAA	
Treatments	Rate	Colq	Corw	Colq	Corw	Colq	Corw
	(Product/A)	% Control		% Control		% Control	
PRE/V4							
SureStart	1.75pt						
Durango+N Pak AMS	1.5pt+3pt	92	58	90	60	90	53
SureStart	1.75pt						
Enlist Duo+N Pak AMS	3.5pt+3pt	90	65	99	93	99	95
SureStart	1.75pt						
Enlist Duo+N Pak AMS	4.67pt+3pt	87	57	99	96	99	96
Harness Xtra	2qt						
Roundup Powermax+Clarity+N Pak AMS	1.33pt+1pt+3pt	72	53	96	83	96	82
Lumax EZ	5pt						
Durango+N Pak AMS	1.5pt+3pt	96	77	90	87	90	80
Verdict	11fl oz						
Durango+N Pak AMS	1.5pt+3pt	47	33	83	58	83	47
Harness Xtra+Clarity	3pt+1pt						
Roundup Powermax+Impact+Atrazine+MSO+AMS	32fl oz+0.75fl oz+0.42lb+0.5% v/v+8.5lb/100 gal	0	0	99	99	99	99
V2							
SureStart+Durango+N Pak AMS	2.5pt+1.5pt+3pt	33	33	90	78	90	82
SureStart+Enlist Duo+N Pak AMS	2pt+3.5pt+3pt	47	45	99	99	99	98
Harness Xtra+Roundup Powermax+Status+N Pak AMS	1.5pt+1.33pt+10oz+3pt	62	60	99	99	99	99
Roundup Powermax+Clarity+N Pak AMS	1.77pt+1pt+3pt	33	33	99	99	99	99
Corvus+Durango+N Pak AMS	3.3fl oz+1.5pt+3pt	30	30	99	98	99	98
Expert+N Pak AMS	3qt+3pt	63	63	99	99	99	99
Halex GT+N Pak AMS+Preference	3.6pt+3pt+4.8fl oz	30	30	99	99	99	99
V4							
Corvus+Durango+N Pak AMS	3.3fl oz+1.5pt+3pt	30	30	95	82	95	87
SureStart+Durango+N Pak AMS	2pt+2pt+3pt	0	0	90	70	90	70
SureStart+Enlist Duo+N Pak AMS	2pt+3.5pt+3pt	0	0	95	85	95	90
Harness Xtra+Roundup Powermax+Status+N Pak AMS	1.5qt+1.33pt+10oz+3pt	0	0	99	96	99	97
Expert+N Pak AMS	3qt+3pt	0	0	99	99	99	99
Halex GT+N Pak AMS+Preference	3.6pt+3pt+4.8fl oz	0	0	93	77	93	73
Durango+N Pak AMS	2pt+3pt	0	0	90	60	90	60
Enlist Duo+N Pak AMS	3.5pt+3pt	0	0	92	75	92	75
Enlist Duo+N Pak AMS	4.67pt+3pt	0	0	98	93	98	93
Roundup Powermax+Clarity+N Pak AMS	1.77pt+1pt+3pt	0	0	95	86	95	89
LSD (0.05)		8	10	2	6	2	4

Early Pre-Plant Timing to Control Glyphosate Resistant Waterhemp. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Fargo, ND to evaluate glyphosate waterhemp efficacy. Early Pre-Plant treatments were applied on May 23, 2013 at 9:30 am with 71.9 F air 61.9 F soil at a four inch depth, 27% RH, 0% cloud cover, 1-3 mph E wind, and moist soil moisture. Soil characteristics were: 16% sand, 52.7% silt, 31.3% clay, silty clay loam, 5.6% OM, and 7.9 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 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

The study was placed in an area with glyphosate resistant waterhemp. NUP-12090 is a glyphosate + fomesafen mixture.
May 31 - waterhemp was cotyledon stage and still emerging and not dense enough to rate.
June 7 - 14 dae - Conditions were cool and wet since May 17. Only 40-50% of the weed species has emerged. Emerged weeds were only cotyledon stage. A 14 daa evaluation was not taken because an accurate evaluation could not be made. Even though weeds were still emerging in general, all PRE treatments gave 99% weed control.

Table. Early Pre-Plant Timing to Control Glyphosate Resistant Waterhemp. (Zollinger, Wirth, Kazmierczak)

		28 DAA		42 DAA	
Treatments	Rate	Colq	Wahe	Colq	Wahe
	(Product/A)	% control		% control	
EPP					
NUP-12090+AMS	32fl oz+3lb	90	97	95	97
NUP-12090+AMS	42fl oz+3lb	96	95	96	96
NUP-12090+MSO+AMS	32fl oz+1pt+3lb	90	90	93	92
NUP-12090+MSO+AMS	42fl oz+1pt+3lb	96	93	93	93
Flexstar GT 3.5+MSO	56fl oz+1pt	91	88	93	96
Flexstar GT 3.5+AMS	56fl oz+3lb	96	91	96	96
Flexstar GT 3.5+MSO+AMS	56fl oz+1pt+3lb	96	95	96	96
LSD (0.05)		7	7	5	3

PRE Timing to Control Glyphosate Resistant Waterhemp. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Fargo, ND to evaluate glyphosate waterhemp efficacy. PRE treatments were applied on May 23, 2013 at 10:20 am with 71.9 F air 61.9 F soil at a four inch depth, 27% RH, 0% cloud cover, 1-3 mph E wind, and moist soil moisture. Soil characteristics were: 16% sand, 52.7% silt, 31.3% clay, silty clay loam, 5.6% OM, and 7.9 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 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

The study was placed in an area with glyphosate resistant waterhemp. The waterhemp also had a level of ALS resistance.
May 31 - waterhemp was cotyledon stage and still emerging and not dense enough to rate.
June 7 - 14 dae - Conditions were cool and wet since May 17. Only 40-50% of the weed species has emerged. Emerged weeds were only cotyledon stage. A 14 daa evaluation was not taken because an accurate evaluation could not be made. Even though weeds were still emerging in general, all PRE treatments gave 99% weed control.

Table. PRE Timing to Control Glyphosate Resistant Waterhemp. (Zollinger, Wirth, Kazmierczak)

		28 DAA		42 DAA	
Treatments	Rate	Colq	Wahe	Colq	Wahe
	(Product/A)	% control		% control	
PRE					
Panther	2oz	99	96	99	58
Panther	3oz	99	99	99	72
Pursuit	4fl oz	92	55	80	55
Panther+Pursuit	2oz+2fl oz	99	99	99	83
Panther+Pursuit	2oz+4fl oz	99	99	99	77
Panther+Pursuit	3oz+2fl oz	99	99	99	80
Panther+Pursuit	3oz+4fl oz	99	99	99	92
Authority Assist	8fl oz	92	85	92	87
LSD (0.05)		3	5	11	5

Glyphosate Resistant Waterhemp Control. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Fargo, ND to evaluate glyphosate waterhemp efficacy. PRE treatments were applied on May 23, 2013 at 10:00 am with 71.9 F air 61.9 F soil at a four inch depth, 27% RH, 0% cloud cover, 1-3 mph E wind, and moist soil moisture. POST 2-4" waterhemp treatments were applied on June 18, 2013 at 3:40 pm with 82 F air, 77.5 F soil at a four inch depth, 16% RH, 25% cloud cover, 3-5 mph SE wind, and dry soil moisture. Weed species present at the time of POST 2-4" waterhemp treatments were: 1-4" (10-25/ft^2) waterhemp, 1-4" (5-15/ft^2) redroot pigweed, and 2-4" (1-5/yd^2) common lambsquarters. POST 2-4" waterhemp regrowth treatments were applied on June 29, 2013 at 9:30 am with 72 F air, 68 F soil at a four inch depth, 72% RH, 0% cloud cover, 8-10 mph NW wind, and moist soil moisture.Weed species present at the time of POST 2-4" waterhemp regrowth was: 2-4" (2-3/ft^2) waterhemp. Soil characteristics were: 16% sand, 52.7% silt, 31.3% clay, silty clay loam, 5.6% OM, and 7.9 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 TT nozzles for the PRE and 8.5 gpa at 40 psi through 11001 TT nozzles for the POST. The experiment had a randomized complete block design with three replicates per treatment.

The study was placed in an area with glyphosate resistant waterhemp.

Table. Glyphosate Resistant Waterhemp Control. (Zollinger, Wirth, Kazmierczak)

		14 DA POST		28 DA POST	
Treatments	Rate	Colq	Wahe	Colq	Wahe
	(Product/A)	% control		% control	
2-4" Weeds					
RU PM+Clarity+N Pak AMS	1.77pt+1pt+3pt	99	83	99	93
Halex GT+N Pak AMS+Preference	3.6pt+3pt+4.8fl oz	99	83	99	80
PRE/2-4" Weeds					
Harness Xtra 6	3pt				
RU PM+Clarity+N Pak AMS	1.33pt+1pt+3pt	99	96	99	98
Harness Xtra 6+Clarity	3pt+1pt				
RU PM+Impact+Atrazine+MSO+AMS	32fl oz+0.75fl oz+0.42lb+0.5% v/v+8.5lb/100gal	99	99	99	97
Harness Xtra 6+Clarity	3pt+1pt				
Impact+Atrazine+MSO+AMS	0.75fl oz+0.42lb+0.5% v/v+8.5lb/100gal	99	95	99	93
LSD (0.05)		0	7	0	4

*RU PM= Roundup Powermax

Glyphosate Resistant Waterhemp Control 2. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Fargo, ND to evaluate glyphosate waterhemp efficacy. POST treatments were applied on June 18, 2013 at 3:50 pm with 82 F air 77.5 F soil at a four inch depth, 16% RH, 25% cloud cover, 3-5 mph SE wind, and dry soil moisture. Weed species present at the time of POST treatments were: 2-4" (10-25/ft^2) waterhemp, 1-4" (5-15/ft^2) redroot pigweed, 2-5" (1-10/yd^2) common lambsquarters, 2-6" diameter (5-15yd^2) common purslane. Soil characteristics were: 16% sand, 52.7% silt, 31.3% clay, silty clay loam, 5.6% OM, and 7.9 pH. 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 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

The study was placed in an area with glyphosate resistant waterhemp.

Table. Glyphosate Resistant Waterhemp Control 2. (Zollinger, Wirth, Kazmierczak)

		7 DAA			14 DAA			28 DAA			42 DAA			56 DAA		
Treatments	Rate	Soy	Colq	Wahe	Soy	Colq	Wahe	Soy	Colq	Wahe	Soy	Colq	Wahe	Soy	Colq	Wahe
	(Product/A)	%inj	% control		%inj	% control		%inj	% control		%inj	% control		%inj	% control	
2" Weeds																
Statement+Glyfos X-tra+AMS	32fl oz+32fl oz+8.5lb/100gal	18	96	96	18	96	96	15	96	96	5	96	96	0	96	96
Statement+Glyfos X-tra+AMS	40fl oz+32fl oz+8.5lb/100gal	17	96	98	15	96	98	15	96	98	5	96	98	0	96	98
Rhythm+Glyfos X-tra+AMS	26fl oz+32fl oz+8.5lb/100gal	12	87	96	10	88	96	10	88	96	0	87	95	0	87	95
Dawn+Glyfos X-tra+AMS	24fl oz+32fl oz+8.5lb/100gal	7	70	96	5	73	96	5	73	96	0	72	95	0	72	95
Prefix+Glyfos X-tra+AMS	32fl oz+32fl oz+8.5lb/100gal	18	92	98	17	92	98	5	92	97	0	90	96	0	90	96
Prefix+Glyfos X-tra+AMS	40fl oz+32fl oz+8.5lb/100gal	20	94	96	15	94	96	5	94	96	0	92	96	0	92	96
Glyfos X-tra+AMS	32fl oz+8.5lb/100gal	2	63	67	0	63	67	0	63	65	0	60	62	0	60	62
LSD (0.05)		4	5	5	3	4	5	0	4	4	0	3	2	0	3	2

Glyphosate Resistant Waterhemp Control 3. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Fargo, ND to evaluate glyphosate waterhemp efficacy. POST treatments were applied on June 18, 2013 at 4:00 pm with 82 F air 77.5 F soil at a four inch depth, 16% RH, 25% cloud cover, 3-5 mph SE wind, and dry soil moisture. Weed species present at the time of POST treatments were: 1-4" (10-25/ft^2) waterhemp, 1-3" (5-10/ft^2) redroot pigweed, 1-4" (1-10/yd^2) common lambsquarters, 2-6" diameter (5-15yd^2) common purslane. Soil characteristics were: 16% sand, 52.7% silt, 31.3% clay, silty clay loam, 5.6% OM, and 7.9 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 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

The study was placed in an area with glyphosate resistant waterhemp.

Table. Glyphosate Resistant Waterhemp Control 3. (Zollinger, Wirth, Kazmierczak)

		7 DAA		14 DAA		28 DAA	
Treatments	Rate	Colq	Wahe	Colq	Wahe	Colq	Wahe
	(Product/A)	% control		% control		% control	
POST							
Clarity+Induce	6.4fl oz+0.25% v/v	33	33	37	37	37	37
Clarity+Induce	9.6fl oz+0.25% v/v	40	40	47	47	47	52
Clarity+Induce	12.8fl oz+0.25% v/v	37	37	53	53	53	57
Weedar 64+Induce	16fl oz+0.25% v/v	30	30	52	52	52	48
Weedar 64+Induce	24fl oz+0.25% v/v	33	33	67	67	67	67
Weedar 64+Induce	32fl oz+0.25% v/v	40	40	72	72	72	70
Clarity+RU PM+Induce	6.4fl oz+14.2fl oz+0.25% v/v	47	47	55	55	55	50
Clarity+RU PM+Induce	9.6fl oz+31.3fl oz+0.25% v/v	37	37	53	53	53	40
Clarity+RU PM+Induce	12.8fl oz+28.4fl oz+0.25% v/v	50	50	80	80	80	70
Weedar 64+RU PM+Induce	16fl oz+14.2fl oz+0.25% v/v	53	53	68	68	68	57
Weedar 64+RU PM+Induce	24fl oz+21.3fl oz+0.25% v/v	57	57	88	88	88	82
Weedar 64+RU PM+Induce	32fl oz+28.4fl oz+0.25% v/v	60	60	88	88	88	85
LSD (0.05)		9	9	8	8	8	7

Early Pre-Plant Tank Mixes. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Grand Forks, ND to evaluate weed efficacy of glyphosate with pendimethalin and adjuvants and glyphosate with pyroxasulfone and adjuvants. Early Pre-Plant treatments were applied on June 28, 2013 at 1:30 pm with 83 F air 73 F soil at a four inch depth, 41% RH, 40% cloud cover, 8-10 mph NW wind, and adequate soil moisture. Weed species present at the time of EPP were: bolt-flower (5-10/ft²) mustard, 1-3" (5-10/yd²) redroot pigweed in 3rd range, 1-3" (2-6/yd²) common lambsquarters in 3rd range, 8-10" (3-7/ft²) Canada thistle in 3rd range, and 7-12" (1-3/yd²) perennial sowthistle. Soil characteristics were: 23.5% sand, 52% silt, 24.5% clay, silt loam, 4% OM, and 8 pH. 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 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Weed population was light for most weed species. All treatments initially provided complete control of annual weeds. Lower annual weed ratings at later evaluations were from flushes that came up after application.

Table. Early Pre-Plant Tank Mixes. (Zollinger, Wirth, Kazmierczak)

		14 DAA							28 DAA							42 DAA						
Treatments	Rate	Yeft	Wimu	Rrpw	Colq	Koch	Pest	Cath	Yeft	Wimu	Rrpw	Colq	Koch	Pest	Cath	Yeft	Wimu	Rrpw	Colq	Koch	Pest	Cath
	(Product/A)	% control							% control							% control						
EPOST																						
Makaze+Stealth	1qt+1.5pt	99	99	94	94	99	99	82	99	99	94	94	99	99	83	99	99	94	94	99	99	83
Makaze+Stealth+LI-700	1qt+1.5pt+0.25% v/v	99	98	96	96	99	99	65	99	98	96	96	99	99	82	99	98	96	96	99	99	82
Makaze+Stealth+Infuse	1qt+1.5pt+12fl oz	99	94	91	94	99	99	91	99	94	90	94	99	99	93	99	94	90	94	99	99	93
Makaze+Stealth+Infuse+LI-700	1qt+1.5pt+12fl oz+0.25% v/v	99	94	94	94	99	99	94	99	94	94	94	99	99	95	99	94	94	94	99	99	95
Makaze+Stealth+Infuse	1qt+1.5pt+24fl oz	99	99	89	91	99	99	89	99	99	85	91	99	94	93	99	99	85	91	99	94	93
Makaze+Stealth+Infuse+LI-700	1qt+1.5pt+24fl oz+0.25% v/v	99	99	94	99	99	99	85	99	99	94	99	99	99	85	99	99	94	99	99	99	85
Makaze+Zidua	1qt+3 oz	99	99	91	91	99	99	73	99	99	91	91	99	99	73	99	99	91	91	99	99	73
Makaze+Zidua+LI-700	1qt+3oz+0.25% v/v	99	99	94	99	99	99	85	99	99	96	99	99	99	85	99	99	96	99	99	99	85
Makaze+Zidua+Infuse	1qt+3oz+12fl oz	99	96	96	96	99	99	96	99	96	96	96	99	99	96	99	96	96	96	99	99	96
Makaze+Zidua+Infuse+LI-700	1qt+3oz+12fl oz+0.25% v/v	99	99	96	96	99	94	96	99	99	96	96	99	94	96	99	99	96	96	99	94	96
Makaze+Zidua+Infuse	1qt+3oz+24fl oz	99	99	99	99	99	99	91	99	99	99	99	99	98	93	99	99	99	99	99	98	93
Makaze+Zidua+Infuse+LI-700	1qt+3oz+24fl oz+0.25% v/v	99	99	86	94	99	99	87	99	99	86	94	99	99	87	99	99	86	94	99	99	87
LSD (0.05)		0	6	8	8	0	4	18	0	6	9	8	0	6	16	0	6	9	8	0	6	16

Early Pre-Plant Application of DPX 1-2-1. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Barney, ND to evaluate weed efficacy of DPX 1-2-1. Early Pre-Plant treatments were applied on May 15, 2013 at 6:00 pm with 86.2 F air 63.7 F soil at a four inch depth, 6% RH, 0% cloud cover, 8-10 mph NW wind, and dry soil moisture. POST treatments were applied on June 13, 2013 at 12:40 pm with 78.5 F air, 65.5 F soil at a four inch depth, 24% RH, 10% cloud cover, 3-5 mph NE wind, dry soil moisture, good crop vigor, and no dew present. Weed species present at the time of POST were: 0.5-2" (5-25/ft^2) Kochia, post flower 2-6" diameter (1-5/yd^2) dandelion, and 1-3" vine (1-5/yd^2) wild buckwheat. Soil characteristics were: 39.9% sand, 37.6% silt, 22.5% clay, loam, 4% 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 at 40 psi through 11002 TT nozzles for the PRE and 8.5 gpa at 40 psi through 11001 TT nozzles for the POST. The experiment had a randomized complete block design with three replicates per treatment.

Study was located at a site which contained glyphosate resistant kochia. Dandelion was from established plants and population was light. Sulfonylurea herbicides used in this study has shown good to excellent dandelion control in other studies. Kochia did not interfere with spray retention or interference until later in the growing season. The reason for poor dandelion control is not known. May 28 - 14 daa - kochia was emerging at cotyledon to 0.5 inch. Dandilion population was not consistent across the trial. July 11 - 28 da POST - Uncontrolled GR kochia had grown vigorously, had taken over the plots, and either had killed the dandelion through inter-species competition or had produced a dense canopy that an accurate dandelion evaluation could not be made. Aug 1 - 56 daa - same comments as July 11.

Table. Early Pre-Plant Application of DPX 1-2-1. (Zollinger, Wirth, Kazmierczak)

Treatments	Rate (Product/A)	14 DAA			28 DAA			28 DA POST			56 DA POST		
		Colq	Koch	Dali	Colq	Koch	Dali	Colq	Koch	Dali	Colq	Koch	Dali
		% control			% control			% control			% control		
PRE-PLANT/POST													
Rim+Thifen+Abundit Extra+AMS	1oz+0.5oz+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	96	50	47	96	57	47	96	43	47	96	30	47
Rim+Thifen+Abundit Extra+AMS	1oz+0.5oz+1qt+2lb												
Rim+Thifen+Iso+Abundit Extra+AMS	0.92oz+0.1oz+0.23oz+1qt+2lb	95	50	33	95	50	37	95	50	37	95	45	37
Rim+Thifen+Breakfree+Abundit Extra+AMS	1oz+0.5oz+1.5pt+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	93	83	40	93	77	37	93	53	37	93	48	37
Rim+Thifen+Breakfree+Abundit Extra+AMS	1oz+0.5oz+1.5pt+1qt+2lb												
Rim+Thifen+Iso+Abundit Extra+AMS	0.92oz+0.1oz+0.23oz+1qt+2lb	92	83	48	92	71	52	92	57	52	92	50	52
Rim+Thifen+Clarity+Abundit Extra+AMS	1oz+0.5oz+4fl oz+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	83	63	20	82	60	37	82	47	37	82	40	37
Rim+Thifen+Clarity+Abundit Extra+AMS	1oz+0.5oz+4fl oz+1qt+2lb												
Rim+Thifen+Iso+Abundit Extra+AMS	0.92oz+0.1oz+0.23oz+1qt+2lb	77	43	45	75	43	38	75	40	38	75	33	38
Rim+Thifen+Sharpen+MSO+Abundit Extra+AMS	1oz+0.5oz+4fl oz+1% v/v+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	90	65	53	87	62	52	87	43	52	87	32	52
Rim+Thifen+Sharpen+MSO+Abundit Extra+AMS	1oz+0.5oz+4fl oz+1% v/v+1qt+2lb												
Rim+Thifen+Iso+Abundit Extra+AMS	0.92oz+0.1oz+0.23oz+1qt+2lb	87	67	58	87	65	53	87	58	53	87	52	53
Rim+Thifen+Abundit Extra+AMS	1oz+0.5oz+1qt+2lb												
Rim+Meso+Iso+Abundit Extra+AMS	1.2oz+2.5oz+0.3oz+1qt+2lb	92	77	47	85	65	47	85	75	47	85	68	47
Abundit Extra+AMS	1qt+2lb												
Abundit Extra+AMS	1qt+2lb	75	0	22	67	0	13	67	0	13	67	0	13
LSD (0.05)		7	14	17	10	19	22	10	12	22	10	6	22

* (Triben= Tribenuron ; Thifen= Thifensulfuron) Affinity BS

Early Pre-Plant Application of Affinity Broadspec. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Barney, ND to evaluate weed efficacy of Affinity Broadspec. Early Pre-Plant treatments were applied on May 15, 2013 at 6:00 pm with 86.2 F air 63.7 soil at a four inch depth, 6% RH, 0% cloud cover, 3-5 mph NE wind, and dry soil moisture. POST treatments were applied on June 13, 2013 at 12:20 pm with 78.5 F air, 65.5 F soil at a four inch depth, 24% RH, 10% cloud cover, 3-5 mph NW wind, dry soil moisture, good crop vigor, and no dew present. Weed species present at the time of POST were: 0.5-2" (5-25/ft²) Kochia, post flower 2-6" diameter (1-5/yd²) dandelion, and 1-3" vine (1-5/yd²) wild buckwheat. Soil characteristics were: 39.9% sand, 37.6% silt, 22.5% clay, loam, 4% 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 at 40 psi through 11002 TT nozzles for the PRE and 8.5 gpa at 40 psi through 11001 TT nozzles for the POST. The experiment had a randomized complete block design with three replicates per treatment.

Study was located at a site which contained glyphosate resistant kochia. Dandelion was from established plants and population was light. Sulfonylurea herbicides used in this study has shown good to excellent dandelion control in other studies. Kochia did not interfere with spray retention or interference until later in the growing season. May 28 - 14 daa - kochia was emerging at cotyledon to 0.5 inch. Dandilion population was not consistent across the trial. July 11 - 28 da POST - Uncontrolled GR kochia had grown vigorously, had taken over the plots, and either had killed the dandelion through inter-species competition or had produced a dense canopy that an accurate dandelion evaluation could not be made. Aug 1 - 56 daa - same comments as July 11.

Table. Early Pre-Plant Application of Affinity Broadspec. (Zollinger, Wirth, Kazmierczak)

		14 DAA			28 DAA			28 DA POST			56 DA POST		
Treatments	Rate	Colq	Koch	Dali	Colq	Koch	Dali	Colq	Koch	Dali	Colq	Koch	Dali
	(Product/A)	% control			% control			% control			% control		
PRE-PLANT/POST													
Triben+Thifen+Abundit Extra+AMS	0.25oz+0.25oz+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	87	40	28	83	40	28	83	23	28	82	23	28
Triben+Thifen+Abundit Extra+AMS	0.25oz+0.25oz+1qt+2lb												
Cinch+Abundit Extra+AMS	1pt+1qt+2lb	78	30	47	80	40	50	80	40	50	77	32	50
Triben+Thifen+Valor+Abundit Extra+AMS	0.25oz+0.25oz+2oz+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	96	96	93	96	96	83	96	73	83	96	63	83
Triben+Thifen+Valor+Abundit Extra+AMS	0.25oz+0.25oz+3oz+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	99	99	72	99	99	77	99	85	77	99	75	77
Triben+Thifen+Valor+Abundit Extra+AMS	0.25oz+0.25oz+2oz+1qt+2lb												
Cinch+Abundit Extra+AMS	1pt+1qt+2lb	98	96	95	98	98	95	98	68	95	98	62	95
Valor+Abundit Extra+AMS	2oz+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	90	73	50	90	77	53	90	70	53	90	60	53
Valor+Abundit Extra+AMS	3oz+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	87	62	67	88	65	68	88	60	68	88	53	68
Triben+Thifen+Sharpen+MSO+Abundit Extra+AMS	0.25oz+0.25oz+1fl oz+1% v/v+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	80	20	63	75	20	67	75	20	67	75	20	67
Triben+Thifen+Spartan+Abundit Extra+AMS	0.25oz+0.25oz+4.5fl oz+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	93	98	67	93	98	70	93	98	70	93	92	70
Triben+Thifen+Abundit Extra+AMS	0.25oz+0.06oz+1qt+2lb												
Abundit Extra+AMS	1qt+2lb	82	20	57	82	20	63	82	20	63	82	20	63
LSD (0.05)		7	12	29	7	11	22	7	6	22	6	5	22

* (Triben=Tribenuron ; Thifen= Thifensulfuron) Affinity BS

Alternatives to glyphosate for preemergence weed control. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate possible alternatives to glyphosate for kochia control. Glyphosate-resistant kochia is known to exist in the state. In this study, we evaluated other herbicides that might be used in place of glyphosate for kochia control. No crop was planted in this field due to wet soil conditions. All treatments were applied June 18 (kochia 1.5-4 inch, lambsquarters 3-5 inch, seepweed 1-4 inch, prickly lettuce 4-6 inch). Authority MTZ and Express did not control kochia 10 days after treatment. Only Gramoxone, Spartan Charge, and Spartan + Sharpen provided excellent kochia control at the Aug 6 evaluation (7 weeks after treatment). Glyphosate, Sharpen, Liberty, and Authority MTZ provided significantly less kochia control on Aug 6. This lower level of control may be due in part to a later flush, but we believe that few new plants emerged after application. Gramoxone has no residual activity, yet provided 92% control on Aug 6. Most treatments provided excellent control of lambsquarters, seepweed, and prickly lettuce. The only exceptions were Authority MTZ and Spartan Charge, which provided poor prickly lettuce control.

Table. Alternatives to glyphosate for preemergence weed control. (1307)

		Weed Control								
		Kochia			Lambsquarters		Seepweed		Prickly lettuce	
Treatment[a]	Rate	Jun-28	Jul-16	Aug-6	Jun-28	Jul-16	Jun-28	Jul-16	Jun-28	Jul-16
		%			%		%		%	
Untreated		0	0	0	0	0	0	0	0	0
Glyphosate[b]	22 oz	90	83	57	96	100	89	93	93	94
Sharpen[bc]	1 oz	88	90	75	100	100	100	100	100	100
Gramoxone[d]	2 pt	99	97	92	100	100	100	100	100	100
Liberty[e]	29 oz	90	88	67	100	100	100	100	98	100
Express[d]	0.33 oz	20	17	3	83	99	91	98	89	99
Authority MTZ	11 oz	60	69	55	98	100	99	100	27	57
Spartan Charge[c]	5 oz	98	97	97	100	100	100	100	50	65
Spartan + Sharpen[bc]	4 oz + 1 oz	99	99	98	100	100	100	100	100	100
LSD (0.05)		8.8	9.3	14.0	2.0	0.3	6.1	6.9	7.1	5.4
CV		8.4	9.1	15.9	1.3	0.2	4.1	4.5	5.6	4.4

[a] *All treatments applied June 18 (no crop-prevent plant)*

[b] *Applied with AMS (2.5%)*

[c] *Applied with MSO (1%)*

[d] *Applied with NIS (0.25%)*

[e] *Applied with AMS (3 lb/A)*

Tankmixes with Balance Flexx in Corn. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy in corn using Balance Flexx. N20Y-300GT corn was planted on May 16, 2013. PRE treatments were applied on May 16, 2013 at 6:50 pm with 59.3 F air, 62.9 F soil at a four inch depth, 98% RH, 100% cloud cover, 8-10 mph N wind, and adequate soil moisture. POST V3-V4 treatments were applied on June 13, 2013 at 3:30 pm with 85 F air, 66 F soil at a four inch depth, 21% RH, 25% cloud cover, 2-4 mph NE wind, dry soil moisture, good crop vigor, and no dew present at V3-V4 corn. Weed species present at the time of POST V3-V4 WITH a PRE applied before were: cotyledon-1" (5-10/ft²) hairy nightshade, 0.5-2"/1-3 lf (10-20/ft²) yellow foxtail, 1-2" vine (1-5/yd²) wild buckwheat, and 1-3" (1-5/yd²) common cocklebur. Weed species present at the time of POST V3-V4 WITHOUT a PRE applied before were: cotyledon-2" (5-10/ft²) hairy nightshade, 1-3"/2-4 lf (5-15/yd²) yellow foxtail, 1-4" vine (1-10/yd²) wild buckwheat, 1-3.5" (1-10/yd²) common cocklebur, cotyledon-3" (5-20/ft²) common lambsquarters, cotyledon-2" (5-20/ft²) redroot pigweed, cotyledon-3" (1-10/ft²) common ragweed, and 2-6" diameter (1-10/yd²) wild mustard. Soil characteristics were: 32.4% sand, 41% silt, 26.6% clay, loam texture, 3.8% OM, and 7.4 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 TT nozzles for PRE applications and 8.5 gpa at 40 psi through 11001 TT nozzles for POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Wet conditions before and after PRE application activated PREs well resulting in increased weed control for all treatments including a PRE herbicide. At 28 DAA, PRE fb V3-V4 treatments controlled all weed species.
June 6 (14 DAE) - Conditions had been cool and wet since May 17. Only 40-50% of the weed species has emerged. Emerged weeds were only cotyledon stage. The 14 DAA evaluation was not taken because an accurate evaluation could not be made. Even though weeds were still emerging in general, all PRE treatments gave 99% weed control.

Table. Tankmixes with Balance Flexx in Corn. (Zollinger, Wirth, Kazmierczak)

		14 DAA								28 DAA							
Treatments	Rate (Product/A)	Corn % inj	Yeft % control	Rrpw % control	Colq % control	Hans % control	Wibw % control	Corw % control	Cocb % control	Corn % inj	Yeft % control	Rrpw % control	Colq % control	Hans % control	Wibw % control	Corw % control	Cocb % control
PRE																	
Corvus+Atrazine+RU PM+AMS	5.6fl oz+0.56oz+22fl oz+8.5lb/100gal	0	93	99	99	99	96	99	96	0	88	99	99	99	96	99	96
V3-V4																	
Capreno+Atrazine+RU PM+AMS	3fl oz+0.56lb+22fl oz+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Laudis+Atrazine+RU PM+AMS	3fl oz+0.56lb+22fl oz+8.5lb/100gal	0	96	96	96	96	96	96	96	0	90	96	95	96	96	96	96
Status+Atrazin+RU PM+AMS	6oz+0.56lb+22fl oz+8.5lb/100gal	0	87	87	87	87	87	87	87	0	80	80	80	80	85	90	90
PRE/V3-V4																	
Balance Flexx+Atrazine	4fl oz+0.56lb																
Capreno+RU PM+Clarity+AMS	3fl oz+22fl oz+8fl oz+8.5lb/100gal	0	99	99	99	99	99	99	99	0	85	99	99	99	99	99	99
Balance Flexx	4fl oz																
Capreno+Atrazine+RU PM+AMS	3fl oz+0.56lb+22fl oz+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Balance Flexx+Atrazine	4fl oz+0.56lb																
Laudis+Clarity+RU PM+AMS	3fl oz+8fl oz+22fl oz+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Balance Flexx	4fl oz																
Laudis+Atrazine+RU PM+AMS	3fl oz+0.56lb+22fl oz+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Lumax EZ	4pt																
RU PM+AMS	22fl oz+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
LSD (0.05)		0	7	4	4	4	5	4	5	0	2	3	0	3	5	3	4

* RU PM= Roundup Powermax

Corn Herbicide Trials: BASF Collaboration

Mike Ostlie, Greg Endres, and Justin Berg

Two corn trials were conducted in 2013 to evaluate the effectiveness of pre-emergent (PRE) and residual herbicides on grass and broadleaf weeds. One of the primary targets for these herbicide programs in a commercial setting is kochia, however, poor kochia emergence this year led to the absence of any evaluation. Each of the two trials contained 13 treatments. Trial 1 was focused on applying a pre-emergent residual, followed by a post-emergent residual (plus glyphosate), potentially providing a clean field all season. The highlighted treatments were applied only at the V2 corn growth stage to provide a comparison between one and two applications; glyphosate was not applied to these treatments later in the season. In Trial 2, residual products were only applied PRE with glyphosate alone applied as a post-emergent measure. RoundUp Powermax was the glyphosate formulation used, applied at 22 oz/a with 0.25% NIS and AMS at 8 lb/100gal. Each study contained 4 replicates, each 30' long for weed evaluation and harvest.

Unfortunately, the PRE application timing did not receive adequate rain activation for control. The predicted rain at the time of application did not occur, with the next rainfall event occurring 3 days after application and only 0.5". Zidua, in particular, needs at least 1" of rain for adequate activation. Consequently, the actual weed control from these products was variable and lower than what would be expected under better conditions. Still the resulting weed control data is useful. The other issue with the trial was the abundance of Canada thistle in a number of the plots. Of the products used, only Status and Surestart have meaningful activity on Canada thistle. While this did not influence weed control measurement much, it certainly could skew the yield data and did contribute to variability.

In both experiments there was no phytotoxicity to the corn as a result of herbicide treatments. As far as treatment effectiveness on weed species, Zidua alone was fairly poor on grass control across both studies. Capreno and Balance Flexx were similarly poor. Even with the poor activation, all herbicides except Dual II Magnum (at all rating periods) and Carpeno (only at the earliest rating period) provided acceptable pigweed control throughout the season. In Trial 2, control was improved 8 WAT by the application of the mid-season glyphosate a week prior to evaluation.

For controlling glyphosate resistant kochia, Zidua (pyroxasulfone), applied in combination with another product such as Verdict, Sharpen, AAtrex, or others, should be an effective option. Fierce and Anthem also contain pyroxasulfone along with either Valor or Cadet respectively, making them a good option as standalone products for kochia control. In summary, pyroxasulfone will be an important product in managing glyphosate resistant kochia in the future as it is a new class of herbicide, but will need the help of other products for high levels of control.

Table 1. Weed control with Verdict and Zidua in corn

PP		POST		Control				Harvest		
Product	Rate	Product	Rate	3 weeks after PRE		3 weeks after POST		Moisture	Test Weight	Yield
	oz/a		oz/a	Foxtail*	RRPGWD**	Foxtail	RRPGWD	%	lb/bu	bu/a
				%	%	%	%			
Trial 1. PP and POST residual treatments										
non treated	-			0	0	0	0	.	52.15	15.0
Zidua	2.5	Status	5	60	76	63	95	21.2	52.55	91.3
Zidua	2.5	Armezon + AAtrex	0.5 + 1 pt/a	40	73	65	95	20.6	52.14	87.5
Zidua + AAtrex +Armezon	2.5 + 0.5 qt 0.5			53	81	85	90	19.4	52.39	96.3
Verdict	13	Status	5	58	88	78	95	21.1	52.01	102.5
Verdict	13	Armezon + AAtrex	0.5 + 1 pt/a	77	91	55	93	21.2	52.25	106.3
Verdict + Zidua	10 + 2.5	Status	5	74	95	79	95	20.1	52.54	110.0
Halex GT + AAtrex	4 pt/a + 1 qt/a			68	93	90	95	19.8	53.00	107.5
Capreno + AAtrex	3 + 1 pt/a			50	94	86	95	19.5	52.75	108.8
Anthem ATZ	2.25 pt/a			61	76	86	94	21.2	52.69	91.3
Surestart	2.5 pt/a			74	91	78	94	19.2	53.17	106.3
Dual II Magnum	1.5 pt/a	Callisto Extra	1.5 pt/a	66	64	76	89	18.9	53.57	78.8
Lumax	4 pt/a			66	76	83	94	18.3	53.93	91.3
LSD (0.05)				15	18	12	5	2.3	1.14	18.8

planted 5/17; harvested 10/21

		2 WAT***	4 WAT		8 WAT		Harvest		
Trial 2. PP followed by glyphosate		Foxtail	RRPGWD	Foxtail	RRPGWD	Foxtail	Moisture	Test Weight	Yield
non treated	-	0	0	0	0	0	.	53.08	28.1
Zidua	2.5	46	78	53	99	95	21.4	52.50	88.9
Zidua + Sharpen	2.5 + 2.5	54	85	56	99	98	19.9	52.73	99.5
Zidua + Verict	2.5 + 10	65	92	60	99	91	21.1	52.33	108.0
Zidua + Verict +AAtrex	2.5 + 10 1 pt/a	66	95	73	99	99	20.8	52.38	119.2
Zidua + Sharpen +AAtrex	2.5 + 2.5 1 pt/a	60	96	60	99	99	20.6	52.20	95.2
Verdict	13	59	91	53	99	99	20.8	51.93	103.7
Anthem ATZ	2.25 pt/a	70	96	79	99	99	20.8	51.98	106.0
Lumax	2.5 qt/a	66	89	74	99	99	20.3	52.18	107.4
Surestart	2.5 pt/a	68	95	66	99	97	20.8	51.75	103.1
Corvus + Aatrex	5.6 + 1 pt/a	68	94	58	99	97	19.9	53.25	101.8
Balance Flexx +AAtrex	5 1 pt/a	48	93	54	99	99	21.1	52.13	100.0
Capreno	3	43	68	39	99	99	21.0	52.18	93.3
LSD (0.05)		12.8	12.6	11.1	0	4	2.2	0.98	10.1

*green and yellow foxtail **redroot pigweed *** Weeks after Treatment planted 5/17; harvested 11/4

Corvus in Corn. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy in corn using Corvus. N20Y-300GT corn was planted on May 16, 2013. PRE treatments were applied on May 16, 2013 at 6:50 pm with 59.3 F air, 62.9 F soil at a four inch depth, 98% RH, 100% cloud cover, 8-10 mph N wind, and adequate soil moisture. POST V5-V6 treatments were applied on June 18, 2013 at 12:50 pm with 82 F air, 71 F soil at a four inch depth, 25% RH, 50% cloud cover, 2-4 mph N wind, dry soil moisture, good crop vigor, and no dew present at V5-V6 corn. Weed species present at the time of POST were: 0.5-1" (1-5/yd^2) yellow foxtail. Soil characteristics were: 32.4% sand, 41% silt, 26.6% clay, loam texture, 3.8% OM, and 7.4 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 TT nozzles for PRE applications and 8.5 gpa at 40 psi through 11001 TT nozzles for POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Wet conditions before and after PRE application activated PREs well resulting in increased weed control for all treatments including a PRE herbicide. By 28 DA POST, Corvus (thiencarbazone + isoxaflutole) and Atrazine alone as a PRE gave 95-99% weed control. The addition of a POST V5-V6 application gave excellent weed control.
June 6 (14 DAE) - Conditions had been cool and wet since May 17. Only 40-50% of the weed species has emerged. Emerged weeds are only cotyledon stage. The 14 DAA evaluation were not taken because an accurate evaluation could not be made. Even though weeds were still emerging in general, all PRE treatments gave 99% weed control.
Jun 25- Injury was stalk breakage.

Table. Corvus in Corn. (Zollinger, Wirth, Kazmierczak)

Treatments	Rate	28 DA E								7 DA PO								14 DA PO								28 DA PO							
		Corn	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Corn	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Corn	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Corn	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb
	(Product/A)	% inj	% control							% inj	% control							% inj	% control							% inj	% control						
PRE																																	
Corvus+Atrazine	5.6fl oz+0.56lb	0	95	99	99	99	99	99	95	0	95	99	99	99	99	99	95	0	95	99	99	99	99	99	95	0	95	99	99	99	99	99	95
PRE/V5-V6																																	
Corvus+Atrazine	5.6fl oz+0.56lb																																
RU PM+AMS	32fl oz+17lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Corvus+Atrazine	3.3fl oz+0.56lb																																
RU PM+Clarity+AMS	32fl oz+8fl oz+17lb/100gal	0	99	99	99	99	99	99	99	23	99	99	99	99	99	99	99	23	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Corvus+Atrazine	3.3fl oz+0.56lb																																
RU PM+Clarity+AMS	32fl oz+16fl oz+17lb/100gal	0	99	99	99	99	99	99	99	12	99	99	99	99	99	99	99	12	99	99	99	99	99	99	99	5	99	99	99	99	99	99	99
Corvus+Atrazine	3.3fl oz+0.56lb																																
RU PM+Clarity+AE 000178+AMS	32fl oz+8fl oz+0.4106fl oz+17lb/100gal	0	99	99	99	99	99	99	99	23	99	99	99	99	99	99	99	23	99	99	99	99	99	99	99	5	99	99	99	99	99	99	99
Corvus+Atrazine	3.3fl oz+0.56lb																																
RU PM+Clarity+AE 000178+AMS	32fl oz+16fl oz+0.821fl oz+17lb/100gal	0	99	99	99	99	99	99	99	12	99	99	99	99	99	99	99	12	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Corvus+Atrazine	3.3fl oz+0.56lb																																
RU PM+Status+AMS	32fl oz+5fl oz+17lb/100gal	0	88	93	93	93	93	93	93	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Corvus+Atrazine	3.3fl oz+0.56lb																																
RU PM+Status+AMS	32fl oz+10oz+17lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
LSD (0.05)		0	2	2	2	2	2	1	2	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* RU PM= Roundup Powermax

FMC Tankmixtures in Corn. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy in corn using FMC products at different application timings. N20Y-300GT corn was planted on May 16, 2013. PRE treatments were applied on May 16, 2013 at 6:50 pm with 59.3 F air, 62.9 F soil at a four inch depth, 98% RH, 100% cloud cover, 8-10 mph N wind, and adequate soil moisture. POST V2 treatments were applied on June 10, 2013 at 5:50 pm with 74.1 F air, 68.2 F soil at a four inch depth, 53% RH, 25% cloud cover, 5-7 mph S wind, adequate soil moisture, good crop vigor, and no dew present at V2 corn. Weed species present at the time of POST V2 were: cotyledon-2" (1-10/yd²) common ragweed, 0.5-2.5"/1-3 lf (1-10/ft²) yellow foxtail, cotyledon-2" (5-10/ft²) common lambsquarters, cotyledon-2" (5-10/ft²) redroot pigweed, and cotyledon-1.5" (1-5/yd²) wild mustard. 45 DAP treatments were applied on June 18, 2013 at 12:48 pm with 82 F air, 71 F soil at a four inch depth, 25% RH, 50% cloud cover, 2-4 mph N wind, dry soil moisture, good crop vigor, and no dew present at V4-V5 corn. Weed species present at the time of 45 DAP were: 1-4" (5-15/ft²) common ragweed, 1-3"/1-4 lf (15-25/ft²) yellow foxtail, 1-3" (1-5/yd²) common lambsquarters, and 1-3" (1-5/yd²) common cocklebur. POST V4 treatment was applied on July 1, 2013 at 1:00 pm with 85 F air, 80.1 F soil at a four inch depth, 21% RH, 20% cloud cover, 1-5 mph N wind, and adequate soil moisture, good crop vigor, and no dew present at V5 corn. Weeds present at the time of POST V4 were: 2-6" (8-10/ft²) common ragweed, 2-5" (5-8/ft²) yellow foxtail, and 4-8" (1-2/ft²) common cocklebur. Soil characteristics were: 32.4% sand, 41% silt, 26.6% clay, loam texture, 3.8% OM, and 7.4 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 TT nozzles for PRE applications and 8.5 gpa at 40 psi through 11001 TT nozzles for POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Wet conditions before and after PRE application activated PREs well resulting in increased weed control for all treatments including a PRE herbicide. By 28 DAA, the V2 Roundup treatment alone did fair while the V2 Roundup treatments when tankmixed with other products did excellent.

June 6 (14 DAE) - Conditions had been cool and wet since May 17. Only 40-50% of the weed species emerged. Emerged weeds were only cotyledon stage. The 14 DAA evaluation was not taken because an accurate evaluation could not be made. Even though weeds were still emerging in general, all PRE treatments gave 99% weed control.

Table. FMC Tankmixtures in Corn. (Zollinger, Wirth, Kazmierczak)

		28 DA E									14 DAA									29 DAA								
Treatments	Rate (Product/A)	Corn % inj	Yeft % control	Wimu % control	Rrpw % control	Colq % control	Hans % control	Wibw % control	Corw % control	Cocb % control	Corn % inj	Yeft % control	Wimu % control	Rrpw % control	Colq % control	Hans % control	Wibw % control	Corw % control	Cocb % control	Corn % inj	Yeft % control	Wimu % control	Rrpw % control	Colq % control	Hans % control	Wibw % control	Corw % control	Cocb % control
PRE/45 DAP																												
Anthem	10fl oz																											
RU PM+AMS	22fl oz+8.5lb/100gal	0	99	99	93	90	88	77	73	73	0	99	93	93	92	90	77	73	73	0	99	93	93	92	90	77	73	77
Anthem ATZ	40fl oz																											
RU PM+AMS	22fl oz+8.5lb/100gal	0	99	99	99	99	99	99	92	78	0	99	99	99	99	99	99	90	83	0	99	99	99	99	99	99	95	87
Anthem+F9387	10fl oz+3fl oz																											
RU PM+AMS	22fl oz+8.5lb/100gal	0	99	99	99	99	99	99	93	93	0	99	99	99	99	99	99	98	95	0	99	99	99	99	99	99	98	95
Harness	2pt																											
RU PM+AMS	22fl oz+8.5lb/100gal	0	83	83	78	78	75	75	70	50	0	83	83	78	78	75	75	65	37	0	78	78	73	73	72	72	50	40
SureStart	2pt																											
RU PM+AMS	22fl oz+8.5lb/100gal	0	82	99	99	85	83	88	82	78	0	83	99	99	90	85	88	80	78	0	77	99	99	90	85	92	77	77
PRE/V4																												
Anthem+F9387	10fl oz+3fl oz																											
RU PM+PO+AMS	22fl oz+1% v/v+8.5lb/100gal	0	73	92	92	72	72	75	62	60	0	99	99	99	99	99	99	99	99	0	77	77	75	70	75	75	75	75
V2																												
Anthem+RU PM+AMS	8fl oz+22fl oz+8.5lb/100gal	0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Anthem ATZ+RU PM+AMS	32fl oz+22fl oz+8.5lb/100gal	0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
F9387+RU PM+NIS+AMS	3fl oz+22fl oz+0.25% v/v+8.5lb/100gal	0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
F9387+PO	3 fl oz+1% v/v	13	99	99	99	99	99	99	99	99	13	99	99	99	99	99	99	99	99	13	99	99	99	99	99	99	99	99
RU PM+AMS	22fl oz+8.5lb/100gal	0	88	99	99	82	82	80	80	73	0	87	99	88	78	75	73	71	73	0	77	82	73	75	75	73	70	72
LSD (0.05)		6	3	2	5	9	6	8	9	12	6	2	3	4	6	5	5	6	9	6	3	3	3	4	3	3	4	6

* RU PM= Roundup Powermax

Herbicide Programs in Corn. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy in corn herbicides applied at different application timings. N20Y-300GT corn was planted on May 16, 2013. PRE treatments were applied on May 16, 2013 at 6:50 pm with 59.3 F air, 62.9 F soil at a four inch depth, 98% RH, 100% cloud cover, 8-10 mph N wind, and adequate soil moisture. EPOST treatments were applied on June 10, 2013 at 6:05 pm with 74.1 F air, 68.2 F soil at a four inch depth, 53% RH, 25% cloud cover, 5-7 mph S wind, adequate soil moisture, good crop vigor, and no dew present at V2 corn. Weed species present at the time of EPOST WITHOUT a PRE treatment were: cotyledon-2.5" (10-20/yd^2) common ragweed, cotyledon-2.5" (10-20/ft^2) common lambsquarters, cotyledon-2.5" (5-10/ft^2) redroot pigweed, cotyledon-2.5" diameter (1-5/yd^2) wild mustard, 0.5-2.5" 1-3 lf (5-10/ft^2) yellow foxtail, and cotyledon-1.5" (1-5/yd^2) hairy nightshade. POST treatments were applied on July 1, 2013 at 1:00 pm with 85 F air, 80.1 F soil at a four inch depth, 21% RH, 20% cloud cover, 1-5 mph N wind, adequate soil moisture, good crop vigor, and no dew present at V5-V6 corn. Weed species present at the time of POST were: 2-6" (5-6/ft^2) common ragweed, 3-5" (8-10/ft^2) yellow foxtail, 2-4" (3-4/ft^2) redroot pigweed, and 2-4" (3-5/ft^2) common lambsquarters. Soil characteristics were: 32.4% sand, 41% silt, 26.6% clay, loam texture, 3.8% OM, and 7.4 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 TT nozzles for PRE applications and 8.5 gpa at 40 psi through 11001 TT nozzles for EPOST and POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Wet conditions before and after PRE application activated PREs well resulting in increased weed control for all treatments including a PRE herbicide. This data shows the utility and good weed management of using a soil-applied fb POST program. Herbicides with several mechanisms of action were used to delay weed resistance.
Jun 24 - All treatments killed emerged plants. Treatments receiving less than 99% was because of new flushes of weeds emerging from excess rainfall.

Table. Herbicide Programs in Corn. (Zollinger, Wirth, Kazmierczak)

		14 DAA								28 DAA								42 DAA							
Treatments	Rate	Corn	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Corn	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Corn	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb
	(Product/A)	% inj	% control							% inj	% control							% inj	% control						
PRE																									
Lumax EZ	6pt	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Keystone LA + Hornet	1.5qt+3oz	0	70	99	83	83	83	80	85	0	70	99	83	83	83	80	85	0	70	99	83	83	83	80	85
PRE/EPOST																									
Lumax EZ	3pt																								
Halex GT+NIS+AMS	3.6pt+0.5% v/v+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
PRE/POST																									
Lumax EZ	4pt																								
Touchdown Total+AMS	24fl oz+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Dual II Magnum+Atrazine	2pt+0.56lb																								
Halex GT+NIS+AMS	3.6pt+0.5% v/v+8.5lb/100gal	0	99	99	99	96	99	47	57	0	99	99	99	98	99	75	92	0	99	99	99	98	99	80	93
SureStart	1.75pt																								
Durango+AMS	1.5pt+8.5lb/100gal	0	82	99	78	78	87	73	85	0	99	99	99	99	99	73	99	0	99	99	99	98	99	85	99
SureStart+Atrazine	1.75pt+0.56lb																								
Durango+AMS	1.5pt+8.5lb/100gal	0	77	99	85	85	85	80	85	0	99	99	99	99	99	83	99	0	99	99	99	99	99	93	99
SureStart	1.5pt																								
SureStart+Durango+AMS	1.5pt+1.5pt+8.5lb/100gal	0	87	99	85	87	87	72	85	0	99	99	99	99	99	72	99	0	99	99	99	99	99	85	99
Harness Xtra 6	3pt																								
Impact+RU PM+Atrazine+MSO+AMS	0.75fl oz+22fl oz+0.42lb+0.5% v/v+8.5lb/100gal	0	99	99	99	99	99	83	94	0	99	99	99	99	99	85	94	0	99	99	99	99	99	92	96
EPOST																									
Halex GT+NIS+AMS	3.6pt+0.5% v/v+8.5lb/100gal	0	77	85	83	83	99	99	99	0	78	99	85	78	99	99	99	0	78	99	85	78	99	99	99
SureStart+Durango+AMS	1.5pt+1.5pt+8.5lb/100gal	0	90	90	90	90	90	90	90	0	90	90	90	90	90	90	90	0	90	90	90	90	90	90	90
Warrant+Impact+RU PM+Atrazine+MSO+AMS	3pt+0.75fl oz+22fl oz+0.42lb+0.5% v/v+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
EPOST/POST																									
Touchdown Total+AMS	24fl oz+8.5lb/100gal																								
Touchdown Total+AMS	24fl oz+8.5lb/100gal	0	75	99	70	70	75	75	77	0	99	99	99	73	82	73	87	0	99	99	99	99	99	99	99
LSD (0.05)		0	5	2	5	4	8	6	8	0	3	0	1	4	2	5	4	0	3	0	1	2	1	4	3

* RU PM= Roundup Powermax

Weed control in corn. (Jenks, Walter, and Willoughby). The objective of this study was to evaluate general weed control in corn with various soil-applied and postemergence herbicides. The study was conducted under conventional tillage. Corn (Mycogen 2K154) was planted May 14 followed by preemergence (PRE) herbicide applications on May 15. One treatment consisted of a split application of glyphosate applied at V3 followed by V4 to V5. All other treatments consisted of a PRE followed by a POST application at V4 to V5.

All treatments provided excellent wild oat control. Only two treatments provided greater than 80% yellow foxtail control (Balance fb Gly + Atrazine and Zidua fb Gly + Atrazine). Only four treatments provided greater than 90% wild buckwheat control (Acet fb Liberty + Atrazine; Acet + Clarity fb Gly + Atrazine; Sharpen + Outlook fb Gly + Atrazine; and Acet fb Capreno + Atrazine). It is likely that a new weed flush emerged after the POST application, which contributed to the lower weed control.

Table. Weed control in corn. (1345)

			Weed Control								
			Wild oat			Yellow foxtail			Wild buckwheat		
Treatment[a]	Rate	Timing	Jul-2	Aug-1	Aug-22	Jul-2	Aug-1	Aug-22	Jul-2	Aug-1	Aug-22
			----------%----------			----------%----------			----------%----------		
Untreated			0	0	0	0	0	0	0	0	0
Gly[b] / Gly[b]	22 oz / 22 oz	V3 / V4-5	100	100	100	99	78	77	92	77	78
Acet / Liberty + Atr + AMS	1.75 pt / 22 oz + 0.375 lb ai + 8.82%	PRE / V4-5	96	95	95	96	64	64	99	91	90
Acet / Gly + Atr[b]	1.75 pt / 22 oz + 0.375 lb ai	PRE / V4-5	99	100	100	95	69	71	88	88	87
Balance Pro / Gly + Atr[b]	2.5 oz / 22 oz + 0.375 lb ai	PRE / V4-5	99	100	100	98	93	94	87	76	77
Acet / SF + Clarity + Atr[c]	1.75 pt / 0.75 oz + 4 oz + 0.375 lb ai	PRE / V4-5	95	100	100	89	70	70	96	82	83
Acet / Option + Status[c]	1.75 pt / 1.5 oz + 5 oz	PRE / V4-5	95	100	100	89	68	66	96	85	82
Acet + Clarity / Gly + Atr[b]	1.25 pt + 0.5 pt / 22 oz + 0.375 lb ai	PRE / V4-5	98	100	100	93	68	68	87	91	91
Zidua / Gly + Atr[b]	3 oz / 22 oz + 0.375 lb ai	PRE / V4-5	99	100	100	99	84	84	90	93	89
Sharpen + Outlook / Gly + Atr[b]	3 oz + 12.5 oz / 22 oz + 0.375 lb ai	PRE / V4-5	97	100	100	86	72	73	96	96	96
Acet / Armezon + Atr + MSO[b]	1.75 pt / 0.75 oz + 0.375 lb ai + 1%	PRE / V4-5	94	100	98	95	65	68	89	56	57
Acet / Capreno + Atr + MSO[b]	1.75 pt / 3 oz + 0.375 lb ai + 1%	PRE / V4-5	95	91	91	98	82	79	98	93	92
LSD (0.05)			3.8	4.6	4.9	6.7	11.8	12.1	6.1	14.2	15.4
CV			2.5	3.0	3.2	4.6	10.3	10.6	4.2	10.8	11.9

[a] *Gly=Glyphosate; Acet=Acetochlor; Atr=Atrazine; SF=Steadfast*

[b] *Applied with AMS (2.5%)*

[c] *Applied with MSO (1.5 pt) and UAN (2 qt)*

Instigate in Corn. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy in corn using Instigate. N20Y-300GT corn was planted on May 16, 2013. PRE treatments were applied on May 16, 2013 at 6:50 pm with 59.3 F air, 62.9 F soil at a four inch depth, 98% RH, 100% cloud cover, 8-10 mph N wind, and adequate soil moisture. EPOST treatments were applied on June 10, 2013 at 5:50 pm with 74.1 F air, 68.2 F soil at a four inch depth, 53% RH, 25% cloud cover, 5-7 mph S wind, adequate soil moisture, good crop vigor, and no dew present at V2 corn. Weed species present at the time of EPOST were: cotyledon-2.5" (1-5/yd^2) common ragweed, 0.5-2.5"/1-3 lf (5-10/ft^2) yellow foxtail, cotyledon-3" (5-10/ft^2) common lambsquarters, cotyledon-2" (5-10/ft^2) redroot pigweed, cotyledon-2" (1-5/yd^2) wild mustard, and 0.5-2" (1-5/yd^2) kochia. POST treatments were applied on June 25, 2013 at 11:20 am with 76.5 F air, 70 F soil at a four inch depth, 91% RH, 100% cloud cover, 6-8 mph SW wind, moist soil moisture, good crop vigor, and no dew present at V4-V5 corn. Weed species present at the time of POST were: cotyledon-1.5" (1-5/ft^2) common lambsquarters, 0.5-3" (5-10/ft^2) yellow foxtail, 1-3" (1-3/ft^2) common cocklebur, and cotyledon-1.5" (1-5/ft^2) redroot pigweed. LPOST treatments were applied on July 1, 2013 at 1:00 pm with 85 F air, 80.1 F soil at a four inch depth, 21% RH, 20% cloud cover, 1-5 mph N wind, and adequate soil moisture, good crop vigor, and no dew present at V5 corn. Weeds present at the time of LPOST were: 3-5" (3-5/ft^2) common ragweed, 2-4" (2-3/ft^2) yellow foxtail, 2-3" (2-3/ft^2) common lambsquarters, and 2-3" (1-2/ft^2) redroot pigweed. Soil characteristics were: 32.4% sand, 41% silt, 26.6% clay, loam texture, 3.8% OM, and 7.4 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 TT nozzles for PRE applications and 8.5 gpa at 40 psi through 11001 TT nozzles for POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Wet conditions before and after PRE application activated PREs well resulting in increased weed control for all treatments including a PRE herbicide. PRE herbicides were activated due to wet spring which lead to 99% weed control throughout the growing year or at least until corn row closure. Significant corn injury came from PRE application Rim+Meso+Iso at 12oz+2.5oz+0.3oz and POST application Abundit Extra+AMS at 1qt+2lb. By 28 DAA, EPOST/LPOST treatment gave 99% weed control and no corn injury.

June 6 (14 DAE) - Conditions had been cool and wet since May 17. Only 40-50% of the weed species has emerged. Emerged weeds were only cotyledon stage. The 14 DAA evaluation was not taken because an accurate evaluation could not be made. Even though weeds were still emerging in general, all PRE treatments gave 99% weed control.

Table. Instigate in Corn. (Zollinger, Wirth, Kazmierczak)

Treatments	Rate	28 DA E									28 DAA								
		Corn	Yeft	Wimu	Rrpw	Colq	Hans	Wibw	Corw	Cocb	Corn	Yeft	Wimu	Rrpw	Colq	Hans	Wibw	Corw	Coc
	(Product/A)	% inj	% control								% inj	% control							
PRE/POST																			
Rim+Meso	1oz+5oz																		
Rim+Meso+Iso+Abundit Extra+AMS	1.2oz+2.5oz+0.3oz+1qt+2lb	18	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Rim+Meso+Atrazine	1oz+5oz+0.56lb																		
Rim+Meso+Iso+Abundit Extra+AMS	1.2oz+2.5oz+0.3oz+1qt+2lb	17	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Rim+Meso+Breakfree ATZ	1oz+5oz+3pt																		
Abundit Extra+AMS	1qt+2lb	23	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Rim+Meso+Breakfree	1oz+5oz+1.25pt																		
Abundit Extra+AMS	1qt+2lb	10	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Rim+Meso+Breakfree	1oz+5oz+2.25pt																		
Abundit Extra+AMS	1qt+2lb	0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Rim+Meso+Cinch ATZ	1oz+5oz+3pt																		
Abundit Extra+AMS	1qt+2lb	12	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Rim+Meso+Cinch	1oz+5oz+1pt																		
Abundit Extra+AMS	1qt+2lb	15	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Rim+Meso+Iso	12oz+2.5oz+0.3oz																		
Abundit Extra+AMS	1qt+2lb	53	99	99	99	99	99	99	99	99	30	99	99	99	99	99	99	99	99
Lumax EZ	4pt																		
Abundit Extra+AMS	1qt+2lb	0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
EPOST/LPOST																			
Abundit Extra+AMS	1qt+2lb																		
Abundit Extra+AMS	1qt+2lb	0	87	99	99	83	88	77	77	85	0	99	99	99	99	99	99	99	99
LSD (0.05)		6	3	0	0	4	4	4	4	4	0	0	0	0	0	0	0	0	0

* Rim=Rimsulfuron ; Meso= Mesotrione ; Iso= Isoxadifen

Tankmixes with WideMatch in Corn. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy in corn using WideMatch. N20Y-300GT corn was planted on May 16, 2013. POST treatments were applied on June 10, 2013 at 5:25 pm with 74.1 F air, 68.2 F soil at a four inch depth, 53% RH, 25% cloud cover, 5-7 mph S wind, adequate soil moisture, good crop vigor, and no dew present at V2 corn. Weed species present at the time of POST were: cotyledon-3" (10-20/ft^2) common lambsquarters, cotyledon-2.5" (1-10/yd^2) common ragweed, cotyledon-3" (1-10/ft^2) common cocklebur, 0.5-2.5" 1-3 lf (1-10/ft^2) yellow foxtail, cotyledon-2" (1-10/ft^2) redroot pigweed, and cotyledon-3" vine (1-10/yd^2) wild buckwheat. Soil characteristics were: 32.4% sand, 41% silt, 26.6% clay, loam texture, 3.8% OM, and 7.4 pH. 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 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

All treatments gave excellent weed control at 7 DAA and 14 DAA. Treatments 1, 2, and 5 started to lose control at 28 DAA. Weed efficacy did not differ from 28 DAA to 42 DAA due to crop canopy aiding in weed control. Herbicides with several mechanisms of action were used to delay weed resistance.

Table. Tankmixes with WideMatch in Corn. (Zollinger, Wirth, Kazmierczak)

		3 DAA	7 DAA							14 DAA								28 DAA								42 DAA							
Treatments	Rate	Corn	Corn	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Corn	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Corn	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Corn	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb
	(Product/A)	% inj	% inj	% control							% inj	% control							% inj	% control							% inj	% control						
POST																																	
Durango + N Pak AMS	1 qt + 48 fl oz	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	85	85	85	99	99	0	99	99	85	85	85	99	99
Durango + N Pak AMS + Widematch	1 qt + 48 fl oz + 1 pt	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	90	90	90	99	99	0	99	99	90	90	90	99	99
Durango + N Pak AMS + Surpass	1 qt + 48 fl oz + 1.25 pt	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Durango + N Pak AMS + Surpass	1 qt + 48 fl oz + 2 pt	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Durango + N Pak AMS + Dual II Magnum	1 qt + 48 fl oz + 2 pt	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	90	90	90	99	99	0	99	99	90	90	95	99	99
Durango + Widematch + N Pak AMS + Surpass	1 qt + 1 pt + 48 fl oz + 1.25 pt	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Durango + Widematch + N Pak AMS + Surpass	2 qt + 2 pt + 48 fl oz + 2.5 pt	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Durango + Widematch + N Pak AMS + Surpass	1 qt + 1 pt + 48 fl oz + 2 pt	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Durango + Widematch + N Pak AMS + Surpass	2 qt + 2 pt + 48 fl oz + 4 pt	0	23	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Durango + Stinger + N Pak AMS + Surpass	1 qt + 4 fl oz + 48 fl oz + 1.25 pt	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Durango + Stinger + N Pak AMS + Surpass	1 qt + 4 fl oz + 48 fl oz + 2 pt	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Durango + N Pak AMS + Lumax EZ	1 qt + 48 fl oz + 4 pt	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Durango + N Pak AMS + Corvus	1 qt + 48 fl oz + 3.33 fl oz	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Durango + N Pak AMS + Laudis	1 qt + 48 fl oz + 3 fl oz	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Durango + N Pak AMS + Status	1 qt + 48 fl oz + 10 oz	0	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
LSD (0.05)		0	1	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	0	0	0	0	0	0

POST Canada thistle control in corn, Carrington, 2013. Greg Endres and Mike Ostlie. A field study was conducted at the NDSU Carrington Research Extension Center to examine control of Canada thistle with POST herbicides in corn. Experimental design was a randomized complete block with four replications. Roundup Ready corn (DKC33-78 RIB) was planted into wheat stubble at 36,000 seeds/A on May 14. Herbicides were applied with a CO_2-pressurized plot sprayer delivering 12 (PRE) or 17 (POST) gal/A at 35 psi through 8001 flat fan nozzles to the center 6.7 ft of 10- by 30-ft plots. SureStart at 38 fl oz/A + Roundup PowerMax at 32 fl oz/A + Class Act NG at 32 fl oz/A was PRE applied to all plots on May 23 at 56 F, 46% RH and 6 mph wind to emerging to 3-inch tall Canada thistle. Rain totaled 0.9 inches 2 wk following application of PRE herbicide. POST herbicide treatments were applied June 17 at 67 F, 63% RH and 8 mph wind to 2- to 15-inch Canada thistle and V3-4 stage corn.

Canada thistle control visually evaluated 2 week after treatment was excellent (93%) with Halex GT plus Aatrex 4L while other treatments generally provided good (76 to 89%) control (Table). Status at 5 and 10 fl oz/A provided 82 to 83% control 1 month after treatment (MAT). Canada thistle plant regrowth or new shoots were noted with all herbicide treatments 1 MAT. Canada thistle was suppressed (64 to 76% control) 2 MAT with Roundup PowerMax, WideMatch, Halex GT plus Aatrex 4L and Status. At 3 MAT, Status at 10 fl oz/A provided suppression (71%), while control ratings with other herbicide treatments ranged from 23 to 61%. Corn response to herbicides and grain yield were not measured.

Table.

Herbicide		Canada thistle control			
Treatment[1]	Rate	2-Jul-13	19-Jul-13	4-Aug-13	12-Sep-13
			%		
RU PM	22 fl oz/A				
Class Act NG	2.5% v/v	76	74	68	61
WideMatch	21.3 fl oz/A	80	75	64	56
Capreno	3 fl oz/A				
Aatrex 4L	16 fl oz/A				
MSO	1% v/v				
UAN	48 fl oz/A	86	63	33	28
Halex GT	64 fl oz/A				
Aatrex4L	16 fl oz/A				
Class Act NG	2.5% v/v	93	78	69	60
Laudis	3 fl oz/A				
Aatrex 4L	16 fl oz/A				
MSO	1% v/v				
UAN	48 fl oz/A	89	66	39	23
Status	5 oz wt/A				
Class Act NG	2.5% v/v				
Superb HC	0.5% v/v	82	82	68	53
Status	10 oz wt/A				
Class Act NG	2.5% v/v				
Superb HC	0.5% v/v	87	83	76	71
Armazon	1 oz wt/A				
Aatrex 4L	16 fl oz/A				
MSO	1% v/v				
UAN	48 fl oz/A	78	49	31	35
CV (%)		3.9	7.5	12.5	24.5
LSD (0.05)		5	8	10	17

[1]RU PM=Roundup PowerMax; MSO=Destiny HC (Winfield).

Timing of weed control in soybean, Carrington, 2013. Greg Endres and Mike Ostlie. The study is being conducted to build a North Dakota database documenting response of soybean to initial timing of weed control. Experimental design was a randomized complete block with four replicates. The field trial was conducted at the NDSU Carrington Research Extension Center. 'DSR0404' Roundup Ready inoculated soybean was planted at 200,000 seeds/A in 15-inch rows on May 28. Herbicides were applied with a hand-held boom sprayer delivering 14 gal/A at 35 psi through 8001 flat fan nozzles to the center 6.7 ft of 10- by 25-ft plots. PRE Zidua at 4 oz wt/A plus metribuzin at 0.33 lb/A was applied on May 28 with 72 F, 50% RH, 10 mph wind on a dry soil surface. Rain totaled 0.8 inches one wk after application of PRE herbicides. Table 1 provides POST application details for glyphosate (Roundup Powermax at 32 fl oz/A plus Class Act NG at 2.5% v/v). The trial was harvested for grain yield on October 1.

Table 1. POST glyphosate application details for soybean response to timing of weed control, Carrington, 2013.

Application date	POST treatment	Soybean[1]		Average weed height	Weed density[2]		Environment			
		Stage	Plant height		Grass	Broad-leaf	Air temp.	RH	Wind speed	Clouds
			inches	inches	square foot		F	%	MPH	%
21-Jun	A	V1	x	2	16	19	74	71	9	100
3-Jul	B	V3	x	6	9	17	75	43	7	0
10-Jul	C	V4-5	x	10	x	x	70	71	3	0

[1]Soybean density on June 21 averaged 275,300 plants/A.

[2]Grass weeds include green and yellow foxtail; Broadleaf weeds include common lambsquarters, common purslane, kochia, redroot and prostrate pigweed, shephardspurse and wild buckwheat.

Untreated check plant height was reduced compared to treatments with weed control (Table 2). Seed yield tended to be higher with initial weed control at planting compared to POST treatments and the untreated check.

Table 2. Soybean response to timing of weed control, Carrington, 2013.

Treatment		Plant height	Physiological maturity	Seed yield	Test weight	Seeds/lb	Oil	Protein
Number	Description[1]	inches	Jday	bu/A	lb/bu		%	
1	untreated	19	254	22.9	56.2	3376	17.5	33.2
2	PRE/POSTB	22	255	32.8	56.3	3270	16.9	33.9
3	POSTA	25	255	27.4	56.4	3289	16.8	34.3
4	POSTB	22	255	29.8	56.4	3304	17.3	33.7
5	POSTC	22	255	22.7	56.3	3215	17.5	33.1
C.V. (%)		7.2	0.4	45.8	0.8	2.7	2.0	2.5
LSD (0.05)		2	NS	NS	NS	NS	0.5	NS

[1]PPI=Sharpen at 1 fl oz/A plus Zidua at 2.5 oz wt/A;POSTA-D=Roundup Powermax at 22 fl oz/A plus Class Act NG at 2.5% v/v.

Weed control with Zidua herbicide in soybean, Carrington, 2013. Greg Endres and Mike Ostlie. The trial was conducted at the NDSU Carrington Research Extension Center in cooperation with BASF to evaluate soybean weed control with Zidua and other soil-applied 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 3.8% organic matter and 6.5 pH. 'DSR0404' Roundup Ready soybean seed was inoculated and planted at 200,000 seeds/A on May 28 in 15-inch rows. Herbicide treatments were applied with a hand-held boom sprayer delivering 14 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 29 with 62 F, 81% RH, and 7 MPH wind. Rainfall totaled 0.9 inches within 7 days of PRE herbicide application. POST Roundup PowerMax at 32 fl oz/A plus Class Act NG at 2.5% v/v was applied to all plots including the check on July 3 with 75 F, 43% RH, and 5 mph wind to V3-stage soybean, 4- to 8-inch tall green and yellow foxtail, 1- to 5-inch tall common lambsquarters, 1- to 10-inch tall kochia, 2- to 10-inch tall redroot and prostrate pigweed, and 3- to 20-inch long wild buckwheat. The trial was combine harvested for seed yield on October 1.

Foxtail control visually evaluated about 4 weeks after treatment (WAT) was good (84 to 88%) with PRE treatments 4, 12 and 13 (Table). Excellent control (90 to 99%) of all broadleaf weeds in the trial occurred with treatments 4, 5, 7 and 12. Additional treatments that provided excellent weed control included: common lambsquarters - treatments 2, 3, 6, 10, 11 and 13; kochia - treatment 10; pigweed and wild buckwheat - treatments 2, 3, 6 and 13. POST glyphosate generally provided good to excellent control of all weeds 4 WAT. No crop injury was observed on June 12 (2 WAT). Yield was similar among treatments. Dry conditions during soybean reproductive stages combined with soil variability within the trial area contributed to variability of yield data.

Table.

Herbicide			Weed control (%)[1]										Soybean
Treatment[2]		Rate	28-Jun					31-Jul					Yield
No.		fl oz product/A	fota	colq	kochia	piqw	wibw	fota	colq	kochia	pigw	wibw	bu/A
1	Zidua	2.5 oz wt	33	63	0	43	0	99	99	99	99	88	28.1
2	Zidua + Sharpen	2 oz wt +1	71	99	38	96	99	99	99	99	99	99	30.7
3	Zidua + Verdict	2.5 oz wt + 5	76	99	73	91	97	99	99	99	99	99	22.1
4	Zidua + Verdict + Metribuzin	2.5 oz wt + 5 + 10.56 oz wt	84	99	90	99	99	99	99	99	99	99	25.8
5	Zidua + Sharpen + Metribuzin	2.5 oz wt + 1 + 10.56 oz wt	74	99	99	99	99	99	99	99	99	99	25.4
6	Verdict	5	74	99	0	91	97	99	99	99	99	99	21.0
7	Verdict + Metribuzin	5 + 10.56 oz wt	67	99	99	99	99	98	99	99	99	99	26.3
8	Anthem	9	43	30	0	25	13	99	99	99	99	88	29.1
9	Fierce	4.5 oz wt	53	77	76	81	33	99	99	99	99	76	27.7
10	Authority First	8 oz wt/A	55	91	97	86	68	99	99	99	99	88	21.9
11	Authority MTZ	16 oz wt	45	99	68	76	68	98	98	98	98	88	24.4
12	Authority Assist	10	88	99	97	99	99	99	99	99	99	99	31.1
13	Zidua + Pursuit + Sharpen	2.5 oz wt + 2 + 1	86	99	65	99	97	99	99	99	99	99	22.5
14	check	x	0	0	0	0	0	98	99	91	99	88	24.9
C.V. (%)			31.5	26.2	32.0	22.7	20.2	0.6	0.4	3.8	0.4	12.6	32.6
LSD (0.05)			32	37	31	30	24	NS	NS	NS	NS	NS	NS

[1]fota=green and yellow foxtail; colq=common lambsquarters; pigw= redroot and prostrate pigweed; wibw=wild buckwheat.

[2]All treatments include July 3 POST Roundup PowerMax at 32 fl oz/A plus Class Act NG at 2.5% v/v.

PRE Treatments in Soybean. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy of different PRE treatments in soybean. AG00832 RR soybean was planted on May 16, 2013. PRE treatments were applied on May 23, 2013 at 9:50 pm with 61.6 F air, 47.8 F soil at a four inch depth, 18% RH, 0% cloud cover, 8-10 mph E wind, and adequate soil moisture. POST blanket application treatment was applied on July 9, 2013 at 6:40 pm with 72 F air, 85 F soil at a four inch depth, 55% RH, 20% cloud cover, 8-10 mph NNW wind, adequate soil moisture, good crop vigor, and no dew present at R2 soybean. Weed species present at the time of POST treatment were: 6-8" (1-2/yd^2) yellow foxtail, 2-3" (5/yd^2) common lambsquarters, 1-3" (1-2/yd^2) redroot pigweed, 5-6" vine (2-4/yd^2) wild buckwheat, 6-7" (3-4/yd^2) common cocklebur, 3-8" (1-3/ft^2) common ragweed, and 16-19" (1-3/ft^2) wild mustard in JUST POST treatment. Soil characteristics were: 29% sand, 42.7% silt, 28.3% clay, clay loam texture, 3.8% OM, and 8.2 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 TT nozzles for PRE applications and 8.5 gpa at 40 psi through 11001 TT nozzles for POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Wet conditions before and after PRE application activated PREs well resulting in increased weed control for all treatments. This data shows the utility and good weed management of using a soil-applied followed by POST program

Table. PRE Treatments in Soybean. (Zollinger, Wirth, Kazmierczak)

		14 Days Prior to POST								14 DA PRE								42 DA PRE							
Treatments	Rate	Soy	Wimu	Rrpw	Colq	Hans	Wibw	Corw	Cocb	Soy	Wimu	Rrpw	Colq	Hans	Wibw	Corw	Cocb	Soy	Wimu	Rrpw	Colq	Hans	Wibw	Corw	Cocb
	(Product/A)	% inj	% control							% inj	% control							% inj	% control						
PRE																									
Vise	2pt	7	99	99	99	99	82	99	99	3	99	99	99	99	90	99	99	3	99	99	99	99	90	99	99
Prefix	2pt	10	99	99	99	99	78	99	99	3	99	99	99	99	88	99	99	3	99	99	99	99	88	99	99
Tailwind	20fl oz	0	99	99	99	85	83	85	99	0	99	99	99	85	92	85	99	0	99	99	99	85	92	85	99
Boundary	20fl oz	0	99	99	99	82	78	82	99	0	99	99	99	82	92	82	99	0	99	99	99	82	92	82	99
Pummel	1.5pt	0	99	99	99	95	95	82	99	0	99	99	99	95	96	82	99	0	99	99	99	95	96	82	99
Pummel	2pt	0	99	99	99	95	95	87	99	0	99	99	99	95	96	87	99	0	99	99	99	95	96	87	99
Torment	0.75pt	0	99	99	99	99	90	99	99	0	99	99	99	99	95	99	99	0	99	99	99	99	95	99	99
Torment	1pt	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Torment+Sharpen	0.75pt+1fl oz	23	99	99	99	99	95	99	99	18	99	99	99	99	96	99	99	18	99	99	99	99	96	99	99
OpTill	2fl oz	0	99	99	99	99	99	70	99	0	99	99	99	99	99	85	99	0	99	99	99	99	99	85	99
Warrant+Giory	3pt+4oz	0	99	99	99	95	82	83	99	0	99	99	99	95	92	87	99	0	99	99	99	95	92	87	99
Outflank	2oz	0	99	99	99	93	63	63	63	0	99	99	99	93	82	77	99	0	99	99	99	93	82	77	99
Pursuit	4fl oz	0	99	99	63	99	63	53	99	0	99	99	95	99	82	73	99	0	99	99	95	99	82	73	99
Valor XLT	3oz	30	99	99	99	99	99	99	99	28	99	99	99	99	99	99	99	28	99	99	99	99	99	99	99
Authority Assist	8fl oz	0	99	99	99	99	95	95	99	0	99	99	99	99	95	95	99	0	99	99	99	99	95	95	99
Pummel+Metribuzin	2pt+2oz	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Pummel+Metribuzin	2pt+4oz	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
POST																									
RU PM+AMS	22fl oz+8.5lb/100gal	0	99	99	67	62	50	43	99	0	99	99	63	60	50	40	99	0	99	99	63	60	50	40	99
LSD (0.05)		2	0	0	2	2	4	4	2	2	0	0	1	2	3	5	0	2	0	0	1	2	3	5	0

* RU PM= Roundup Powermax

Tankmixes in Soybean. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy of different tankmixes in soybean. AG00832 RR soybean was planted on May 16, 2013. PRE treatments were applied on May 16, 2013 at 6:50 pm with 59.3 F air, 62.9 F soil at a four inch depth, 98% RH, 100% cloud cover, 8-10 mph N wind, and adequate soil moisture. V2-V3 treatments were applied on June 13, 2013 at 3:50 pm with 85 F air, 66 F soil at a four inch depth, 21% RH, 25% cloud cover, 2-4 mph NE wind, dry soil moisture, good crop vigor, and no dew present at V2 soybean. Weed species present at the time of V2-V3 WITH a PRE treatment were: 1-2" 1-3 (5-10/yd^2) yellow foxtail and cotyledon-1" (1-10/yd^2) common lambsquarters. Weed species present at the time of V2-V3 WITHOUT a PRE treatment were: 0.5-3" 1-4 lf (10-20/ft^2) yellow foxtail, cotyledon-4" (10-25/ft^2) common lambsquarters, cotyledon-2" (5-10/ft^2) hairy nightshade, cotyledon-2" (10-25/ft^2) redroot pigweed, 1-4" vine (1-10/yd^2) wild buckwheat, 1-3" (1-10/yd^2) common cocklebur, and cotyledon-3" (10-20/yd^2) common ragweed. V3-V4 treatments were applied on June 18, 2013 at 12:45 pm with 82 F air, 71 F soil at a four inch depth, 25% RH, 25% cloud cover, 2-4 mph N wind, dry soil moisture, good crop vigor, and no dew present at V3-V4 soybean. There were no weed species present at the time of V3-V4 application. Soil characteristics were: 29% sand, 42.7% silt, 28.3% clay, clay loam texture, 3.8% OM, and 8.2 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 TT nozzles for PRE applications and 8.5 gpa at 40 psi through 11001 TT nozzles for POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Wet conditions before and after PRE application activated PREs well resulting in increased weed control for all treatments including a PRE herbicide. At 28 DAA PRE herbicides gave all broadleaf weed efficacy while Select (clethodim) application at 2-3 trifoliate increased grass weed efficacy. At 28 DAA PRE herbicides fb glyphosate gave excellent weed control on all species. At 28 DAA a single application at 2-3 trifoliate of Flexstar GT (fomesafen + glyphosate) tankmixed with Roundup and water conditioners gave better weed control than Marvel (fomesafen + fluthiacet) tankmixed with Roundup and water conditioners. These single application tankmixes resulted in 15% soybean injury.
June 6 (14 DAE) - Conditions had been cool and wet since May 17. Only 40-50% of the weed species has emerged. Emerged weeds were only cotyledon stage. The 14 DAA evaluation was not taken because an accurate evaluation could not be made. Even though weeds were still emerging in general, all PRE treatments gave 99% weed control.

Table. Tankmixes in Soybean. (Zollinger, Wirth, Kazmierczak)

		Prior to POST								14 DAA								28 DAA							
Treatments	Rate	Soy	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb
	(Product/A)	% inj	% control							% inj	% control							% inj	% control						
PRE/2-3 Trifoliate																									
Authority First	6.4oz																								
Select	8fl oz	0	75	99	99	99	99	99	99	0	92	99	99	99	99	99	99	0	92	99	99	99	99	99	99
Authority Assist	9fl oz																								
Select	8fl oz	0	68	99	99	99	99	99	73	0	88	99	99	99	99	99	73	0	88	99	99	99	99	47	43
Authority Elite	32fl oz																								
Select	8fl oz	0	99	99	99	99	99	99	73	0	99	99	99	99	99	77	75	0	99	99	99	99	99	73	72
Anthem	10fl oz																								
Select	8fl oz	0	99	72	83	45	67	42	35	0	99	72	83	45	67	42	35	0	99	72	83	33	53	30	30
Fierce	3oz																								
Select	8fl oz	0	99	99	99	85	99	85	85	0	99	99	99	81	99	85	85	0	99	99	99	83	99	88	86
Authority First+Anthem	5oz+7fl oz																								
RU PM+NIS+AMS	22fl oz+0.25% v/v+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Authority First+Marvel	5oz+6fl oz																								
RU PM+NIS+AMS	22fl oz+0.25% v/v+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Sonic	3oz																								
Durango+NIS+AMS	24fl oz+0.25% v/v+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	85	99	99	99	99	99	99
Sonic	3oz																								
Durango+FirstRate+NIS+AMS	24fl oz+0.3oz+0.25% v/v+8.5lb/100gal	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
2-3 Trifoliate																									
Marvel+RU PM+NIS+AMS	6fl oz+22fl oz+0.25% v/v+8.5lb/100gal	0	0	0	0	0	0	0	0	25	99	99	99	99	99	99	99	15	80	99	80	80	80	80	80
Flexstar GT+RU PM+NIS+AMS	3.5pt+22fl oz+0.25% v/v+8.5lb/100gal	0	0	0	0	0	0	0	0	15	99	99	99	99	99	99	99	15	90	99	99	99	99	99	99
2-3 Trifoliate/3-4 Trifoliate																									
Marvel+RU PM+NIS+AMS	5fl oz+22fl oz+0.25% v/v+8.5lb/100gal																								
Marvel+RU PM+NIS+AMS	5fl oz+22fl oz+0.25% v/v+8.5lb/100gal	0	0	0	0	0	0	0	0	37	99	99	99	99	99	99	99	22	99	99	99	99	99	99	99
LSD (0.05)		0	4	1	1	7	1	6	7	1	3	1	1	8	1	6	7	1	3	1	1	7	1	6	6

* RU PM= Roundup Powermax

POST Tank Mixes with Roundup in Soybean. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy of different tankmixes including Roundup in soybean. AG 0832 RR soybean was planted on May 16, 2013. POST treatments were applied on June 10, 2013 at 4:40 pm with 74.1 F air, 68.2 F soil at a four inch depth, 53% RH, 25% cloud cover, 5-7 mph S wind, and adequate soil moisture. Weed species present at the time of POST were: cotyledon-2.5" (1-10/ft^2) common ragweed, cotyledon-2.5" (10-20/ft^2) common lambsquarters, cotyledon-2.5" (1-3/yd^2) common cocklebur, cotyledon-2" (10-20/ft^2) redroot pigweed, cotyledon-3" diameter (1-5/yd^2) wild mustard, 0.5-3" vine (1-5/yd^2) wild buckwheat, and 0.5-2.5" 1-3 lf (1-5/yd^2) yellow foxtail. Soil characteristics were: 29% sand, 42.7% silt, 28.3% clay, clay loam texture, 3.8% OM, and 8.2 pH. 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 TT nozzles for POST applications. The experiment had a randomized complete block design with three replicates per treatment.

At 14 DAA there was significant crop injury by most treatments except Extreme with water conditioners and Roundup Powermax with water conditioners. Crop was able to grow out of most of the injury by 42 DAA except for treatment one: Rumble (fomesafen) tankmixed with Roundup Powermax and waterconditioners and treatment twelve: Cobra (lactofen) tankmixed with Roundup and water conditioners. Herbicides with several mechanisms of action were used to delay weed resistance.

Table. POST Tank Mixes with Roundup in Soybean. (Zollinger, Wirth, Kazmierczak)

		14 DAA									28 DAA									42 DAA								
Treatments	Rate	Soy	Yeft	Wimu	Rrpw	Colq	Hans	Wibw	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Hans	Wibw	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Hans	Wibw	Corw	Cocb
	(Product/A)	% inj	% control								% inj	% control								% inj	% control							
POST																												
Rumble+RU PM+NIS+AMS	1pt+22fl oz+0.25% v/v+8.5lb/100gal	33	99	99	99	99	99	99	99	99	20	99	99	75	75	75	99	99	99	10	99	99	75	75	75	99	99	99
Rumble+RU PM+NIS+AMS	1.6pt+22fl oz+0.25% v/v+8.5lb/100gal	15	99	99	99	99	99	99	99	99	0	99	99	85	85	90	99	99	99	0	99	99	85	85	90	99	99	99
Flexstar+RU PM+NIS+AMS	1pt+22fl oz+0.25% v/v+8.5lb/100gal	22	99	99	99	99	99	99	99	99	5	99	99	93	90	99	99	99	99	0	99	99	70	70	99	99	99	99
Flexstar+RU PM+NIS+AMS	1.6pt+22fl oz+0.25% v/v+8.5lb/100gal	15	99	99	99	99	99	99	99	99	5	99	99	95	93	99	99	99	99	0	99	99	80	70	99	99	99	99
Vise+RU PM+NIS+AMS	2pt+22fl oz+0.25% v/v+8.5lb/100gal	17	90	90	90	90	90	90	90	91	5	99	99	90	90	90	90	99	99	0	99	99	90	90	90	90	99	99
Prefix+RU PM+NIS+AMS	2pt+22fl oz+0.25% v/v+8.5lb/100gal	17	95	95	95	95	95	95	95	95	8	99	99	95	95	95	99	99	99	5	99	99	87	78	95	99	99	99
Pummel+RU PM+NIS+AMS	1.5pt+22fl oz+0.25% v/v+8.5lb/100gal	15	98	98	98	98	98	98	98	98	5	98	98	98	98	98	98	98	98	0	98	98	98	98	98	98	98	98
Pummel+RU PM+NIS+AMS	2pt+22fl oz+0.25% v/v+8.5lb/100gal	13	99	99	99	99	99	99	99	99	3	99	99	99	99	99	99	95	99	0	99	99	99	99	99	99	95	99
Torment+RU PM+NIS+AMS	0.75pt+22fl oz+0.25% v/v+8.5lb/100gal	22	99	99	99	99	99	99	99	99	7	99	99	95	99	99	99	99	99	0	99	99	95	99	99	99	99	99
Torment+RU PM+NIS+AMS	1pt+22fl oz+0.25% v/v+8.5lb/100gal	20	99	99	99	99	99	99	99	99	10	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Warrant+RU PM+NIS+AMS	2.25pt+22fl oz+0.25% v/v+8.5lb/100gal	5	77	77	77	77	77	77	77	77	2	77	77	77	77	77	77	77	77	0	77	77	77	77	77	77	77	77
Cobra+RU PM+NIS+AMS	6fl oz+22fl oz+0.25% v/v+8.5lb/100gal	20	85	99	99	90	88	82	88	88	18	78	99	70	70	70	70	99	99	18	78	99	70	70	70	70	99	99
RU PM+NIS+AMS	22fl oz+0.25% v/v+8.5lb/100gal	0	88	99	70	70	70	70	70	80	0	70	99	70	70	70	70	70	80	0	70	99	70	70	70	70	70	80
Extreme+NIS+AMS	42fl oz+0.25% v/v+8.5lb/100gal	0	99	99	99	99	99	99	99	99	0	99	99	85	99	99	99	99	99	0	99	99	85	99	99	99	99	99
LSD (0.05)		4	5	3	3	3	4	4	3	4	3	3	3	3	3	3	3	3	4	1	3	3	3	4	3	3	3	4

* RU PM= Roundup Powermax

POST Tank Mixes with Roundup in Soybean 2. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy of different tankmixes including Roundup in soybean. AG 0832 RR soybean was planted on May 16, 2013. POST treatments were applied on June 10, 2013 at 5:05 pm with 74.1 F air, 68.2 F soil at a four inch depth, 53% RH, 25% cloud cover, 5-7 mph S wind, and adequate soil moisture. Weed species present at the time of POST were: cotyledon-2.5" (1-10/yd^2) common ragweed, cotyledon-2.5" (10-20/ft^2) common lambsquarters, cotyledon-3" (1-5/yd^2) common cocklebur, cotyledon-2" (10-20/yd^2) redroot pigweed, cotyledon-3" vine (1-10/yd^2) wild buckwheat, cotyledon-1.5" (1-5/yd^2) hairy nightshade, and 0.5-3" 1-3 lf (1-10/yd^2) yellow foxtail. Soil characteristics were: 29% sand, 42.7% silt, 28.3% clay, clay loam texture, 3.8% OM, and 8.2 pH. 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 TT nozzles for POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Herbicides with several mechanisms of action were used to delay weed resistance. Weed control decreased from 14 DAA to 28 DAA but was similar for most treatments at 28 DAA and 42 DAA.
June 17 (7 DAA)- Weed control was not taken because weeds were too small for accurate evaluation.

Table. POST Tank Mixes with Roundup in Soybean 2. (Zollinger, Wirth, Kazmierczak)

		7 DAA	14 DAA							28 DAA							42 DAA						
Treatments	Rate	Soy	Soy	Yeft	Rrpw	Colq	Hans	Wibw	Cocb	Soy	Yeft	Rrpw	Colq	Hans	Wibw	Cocb	Soy	Yeft	Rrpw	Colq	Hans	Wibw	Cocb
	(Product/A)	% inj	% inj	% control						% inj	% control						% inj	% control					
V2-V3																							
RU PM+Warrant+AMS	32fl oz+3pt+2% w/w	0	0	95	93	93	93	93	93	0	85	85	85	85	85	85	0	85	85	85	85	85	85
RU PM+Cobra+MSO+AMS	32fl oz+7.7fl oz+1% v/v+2% w/w	32	27	95	95	95	95	95	95	17	80	73	70	80	80	80	0	80	70	70	70	70	70
RU PM+Warrant+Cobra+MSO+AMS	32fl oz+3pt+7.7fl oz+1% v/v+2% w/w	33	27	99	99	99	99	99	99	10	90	90	80	90	90	90	0	90	90	80	90	90	90
RU PM+Phoenix+MSO+AMS	32fl oz+12.8fl oz+1% v/v+2% w/w	28	25	99	95	95	95	95	95	10	85	85	85	85	85	85	0	80	70	70	70	70	70
RU PM+Warrant+Phoenix+MSO+AMS	32fl oz+3pt+7.7fl oz+1% v/v+2% w/w	25	25	99	99	99	99	99	99	20	85	85	85	85	85	85	0	85	85	85	85	85	85
RU PM+Flexstar+NIS+AMS	32fl oz+17fl oz+0.25% v/v+2% w/w	25	22	99	99	99	99	99	99	15	99	99	99	99	99	99	0	99	99	99	99	99	99
RU PM+Warrant+Flexstar+NIS+AMS	32fl oz+3pt+17fl oz+0.25% v/v+2% w/w	20	23	99	99	99	99	99	99	13	99	99	99	99	99	99	0	99	99	99	99	99	99
RU PM+Select Max+NIS+AMS	32fl oz+6.4fl oz+0.25% v/v+2% w/w	6	0	99	70	70	70	70	70	0	70	70	70	70	70	70	0	70	70	70	70	70	70
RU PM+Warrant+Select Max+NIS+AMS	32fl oz+3pt+6.4fl oz+0.25% v/v+2% w/w	10	10	99	70	70	71	70	70	5	70	70	70	71	70	70	0	70	70	70	71	70	70
RU PM+FirstRate+NIS+AMS	32fl oz+0.4oz+0.25% v/v+2% w/w	0	0	99	80	80	80	80	80	0	90	80	80	80	80	80	0	90	80	80	80	80	80
RU PM+Warrant+FirstRate+NIS+AMS	32fl oz+3pt+4oz+0.25% v/v+2% w/w	30	27	99	90	90	90	90	91	12	96	90	90	90	90	91	0	96	90	90	90	90	91
Liberty+AMS	28fl oz+2% w/w	0	0	99	99	99	99	99	99	0	70	70	70	70	70	70	0	70	70	70	70	70	70
Liberty+Warrant+AMS	28fl oz+3pt+2% w/w	0	0	99	99	99	99	99	99	0	75	75	75	75	75	75	0	75	75	75	75	75	75
LSD (0.05)		5	5	0	1	1	1	1	1	3	1	1	0	1	0	1	0	1	0	0	1	0	1

* RU PM= Roundup Powermax

Roundup Management Systems in Soybean. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy using different Roundup tankmix application timings in soybean. AG00832 RR soybean was planted on May 16, 2013. 1-2" treatments were applied on May 28, 2013 at 5:10 pm with 75.6 F air, 57.6 F soil at a four inch depth, 50% RH, 50% cloud cover, 8-10 mph S wind, adequate soil moisture, good crop vigor, and no dew present at cracking soybean. Weeds present at the time of 1-2" application were: 1-2" (10-25/ft²) common lambsquarters, 1-1.5" (5-15/ft²) wild mustard, 1-1.5" (5-15/ft²) redroot pigweed, and 1-2" (5-15/ft²) yellow foxtail. 3-4" treatments were applied on June 18, 2013 at 12:25 pm with 82 F air, 71 F soil at a four inch depth, 25% RH, 50% cloud cover, 2-4 mph N wind, dry soil moisture, good crop vigor, and no dew present at V2 soybean. Weed species present at the time of 3-4" treatments were: 1-4" (10-25/ft²) common lambsquarters, 1-3" (10-25/ft²) redroot pigweed, 3-5" (1-5/yd²) wild mustard, 1-3" 1-4 lf (10-20/ft²) yellow foxtail, 1-4" vine (1-5/yd²) wild buckwheat, 1-4" (1-5/yd²) common cocklebur, and 1-4" (5-10/yd²) common ragweed. 5-6" treatments were applied on July 1, 2013 at 1:00 pm with 85 F air, 80.1 F soil at a four inch depth, 21% RH, 20% cloud cover, 1-5 mph N wind, adequate soil moisture, good crop vigor, and no dew present at V4 soybean. Weed species present at the time of 5-6" treatments were: 3-7" 8-10/ft²) common cocklebur, 2-12" (25-30/ft²) yellow foxtail, 5-7" (5-6/ft²) wild buckwheat, 3-14" (15-20/ft²) wild mustard, 3-6" (8-10/ft²) common lambsquarters, and 4-6" (8-10/ft²) hairy nightshade. Soil characteristics were: 29% sand, 42.7% silt, 28.3% clay, clay loam texture, 3.8% OM, and 8.2 pH. 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 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

This data also shows that tankmixing multiple herbicide mechanisms of action is beneficial. Herbicides with several mechanisms of action were used to delay weed resistance. At 28 DA POST, all treatments at 1-2"/14 DAA and 5-6" weed timings gave excellent weed control.
June 11 - All ratings that were less than 99% was because of new flushes of weeds. All treatments controlled all emerged weeds at initial application.

Table. Roundup Management Systems in Soybean. (Zollinger, Wirth, Kazmierczak)

Treatments	Rate	14 DAA								28 DAA								14 DA POST								28 DA POST							
		Yeft	Wimu	Rrpw	Colq	Wlbw	Hans	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Wlbw	Hans	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Wlbw	Hans	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Wlbw	Hans	Corw	Cocb
	(Product/A)	% control								% inj	% control								% inj	% control								% inj	% control							
1-2"																																				
RU PM+Destiny HC	32fl oz+1pt	63	63	63	63	63	63	63	63	0	20	20	20	20	20	20	20	20	0	20	20	20	20	20	20	20	20	0	20	20	20	20	20	20	20	20
Cobra+RU PM+Destiny HC	12.5fl oz+32fl oz+1pt	90	90	90	90	90	90	91	90	0	70	70	70	70	70	70	70	70	0	30	50	50	50	50	50	50	63	0	30	50	50	50	50	50	50	63
First Rate+RU PM+Destiny HC	0.3oz+32fl oz+1pt	80	95	95	95	95	95	95	95	0	80	95	95	95	95	95	95	95	0	80	95	95	95	95	95	95	95	0	60	95	95	95	95	95	95	95
Marvel+RU PM+Destiny HC	7fl oz+32fl oz+1pt	80	95	95	95	95	95	95	95	0	70	70	70	70	70	70	70	70	0	70	70	70	70	70	70	70	70	0	50	50	50	50	50	50	50	50
Flexstar+RU PM+Destiny HC	0.75pt+32fl oz+1pt	80	95	95	95	95	95	95	95	10	80	80	80	80	80	80	80	80	10	70	80	80	80	80	80	80	80	0	99	90	90	90	90	90	90	90
Raptor+RU PM+Destiny HC	4fl oz+32fl oz+1pt	80	95	95	95	95	95	95	95	0	70	70	70	70	70	70	70	70	0	70	70	70	70	70	70	70	70	0	50	50	50	50	50	50	50	50
Rezult B+Rezult G+RU PM+Destiny HC	1.6pt+1.6pt+32fl oz+1pt	80	95	95	95	95	95	95	95	0	20	20	20	20	20	20	20	20	0	20	20	20	20	20	20	20	20	0	20	20	20	20	20	20	20	20
Rezult B+Rezult G+Raptor+Flexstar+RU PM+Destiny HC	0.5pt+0.5pt+1fl oz+2fl oz+32fl oz+1pt	80	95	95	95	95	95	95	95	10	70	70	70	70	70	70	70	70	10	70	70	70	70	70	70	70	70	0	70	70	70	70	70	70	70	70
1-2"/14 DAA																																				
Rezult B+Rezult G+Raptor+Flexstar+RU PM+Destiny HC	0.5pt+0.5pt+1fl oz+2fl oz+32fl oz+1pt																																			
Rezult B+Rezult G+Raptor+Flexstar+RU PM+Destiny HC	0.5pt+0.5pt+1fl oz+2fl oz+29fl oz+1pt	80	95	95	95	95	95	95	95	20	99	99	99	99	99	99	99	99	20	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
3-4"																																				
RU PM+Destiny HC	32fl oz+1pt									0	99	99	99	99	99	99	99	99	0	87	87	87	87	87	87	87	87	0	87	50	50	50	50	50	50	50
Cobra+RU PM+Destiny HC	12.5fl oz+32fl oz+1pt									25	99	99	99	99	99	99	99	99	25	99	99	99	99	99	99	99	99	15	99	80	80	80	80	80	80	93
First Rate+RU PM+Destiny HC	0.3oz+32fl oz+1pt									0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Marvel+RU PM+Destiny HC	7fl oz+32fl oz+1pt									35	99	99	99	99	99	99	99	99	35	99	99	99	99	99	99	99	99	0	70	99	70	70	70	70	70	70
Flexstar+RU PM+Destiny HC	0.75pt+32fl oz+1pt									25	99	99	99	99	99	99	99	99	25	80	80	80	80	80	80	80	80	15	80	80	80	80	80	80	80	80
Raptor+RU PM+Destiny HC	4fl oz+32fl oz+1pt									15	99	99	99	99	99	99	99	99	15	99	99	99	99	99	99	99	99	5	80	80	80	80	80	80	80	80
Rezult B+Rezult G+RU PM+Destiny HC	1.6pt+1.6pt+32fl oz+1pt									20	80	80	80	80	80	80	80	80	20	95	95	95	95	95	95	95	95	10	60	60	60	60	60	60	60	60
Rezult B+Rezult G+Raptor+Flexstar+RU PM+Destiny HC	0.5pt+0.5pt+1fl oz+2fl oz+32fl oz+1pt									25	99	99	99	99	99	99	99	99	25	99	99	99	99	99	99	99	99	15	99	99	99	99	99	99	99	99
5-6"																																				
RU PM+Destiny HC	32fl oz+1pt																		0	40	40	40	40	40	40	40	40	0	99	99	99	99	99	99	99	99
Cobra+RU PM+Destiny HC	12.5fl oz+32fl oz+1pt																		25	20	60	60	60	60	60	60	60	0	99	99	99	99	99	99	99	99
First Rate+RU PM+Destiny HC	0.3oz+32fl oz+1pt																		0	40	40	40	40	40	40	40	40	0	99	99	99	99	99	99	99	99
Marvel+RU PM+Destiny HC	7fl oz+32fl oz+1pt																		35	70	60	70	70	70	70	70	70	0	99	90	80	80	80	80	80	80
Flexstar+RU PM+Destiny HC	0.75pt+32fl oz+1pt																		30	20	40	50	50	50	50	50	50	0	99	99	99	99	99	99	99	99
Raptor+RU PM+Destiny HC	4fl oz+32fl oz+1pt																		0	30	43	43	43	43	43	43	43	0	99	99	99	99	99	99	99	99
Rezult B+Rezult G+RU PM+Destiny HC	1.6pt+1.6pt+32fl oz+1pt																		15	30	30	30	30	30	30	30	30	0	99	99	99	99	99	99	99	99
Rezult B+Rezult G+Raptor+Flexstar+RU PM+Destiny HC	0.5pt+0.5pt+1fl oz+2fl oz+32fl oz+1pt																		20	50	50	50	50	50	50	50	50	5	99	99	99	70	75	99	70	99
LSD (0.05)		3	3	3	3	3	3	3	3	0	0	0	0	0	0	0	0	0	2	4	4	4	4	5	4	5		0	5	0	0	0	0	0	0	5

* RU PM= Roundup Powermax

Application timing in Libery Link Soybean. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy of different tankmixes in soybean. L03-12N Pederson Farm LL soybean was planted on May 16, 2013. PRE treatments were applied on May 17, 2013 at 10:00 am with 70.6 F air, 60.5 F soil at a four inch depth, 27% RH, 25% cloud cover, 8-10 mph SE wind, and dry soil moisture. EPOST treatments were applied on June 13, 2013 at 4:20 pm with 85 F air, 66 F soil at a four inch depth, 21% RH, 25% cloud cover, 2-4 mph NE wind, dry soil moisture, good crop vigor, and no dew present at V2 soybean. Weed species present at the time of EPOST WITH a PRE treatment were: cotyledon-2" (1-15/yd²) common ragweed, 1-3" 2-4 lf (1-5/yd²) wild oat, cotyledon-1.5" (1-10/yd²) common lambsquarters, and 1-3" (1-10/yd²) common cocklebur. Weed species present at the time of EPOST WITHOUT a PRE treatment were: 1-4" 2-4 lf (1-5/yd²) wild oat, 1-3" 2-4 lf (1-5/ft²) yellow foxtail, cotyledon-3" (10-25/ft²) common lambsquarters, cotyledon-1.5" (1-10/ft²) hairy nightshade, cotyledon-2" (5-15/ft²) redroot pigweed, 1-3" vine (1-5/yd²) wild buckwheat, 1-3" (1-10/yd²) common cocklebur, and cotyledon-3" (5-15/ft²) common ragweed. MPOST treatments were applied on July 1, 2013 at 1:00 pm with 85 F air, 80.1 F soil at a four inch depth, 21% RH, 20% cloud cover, 1-5 mph N wind, dry soil moisture, good crop vigor, and no dew present at V3 soybean. Weed species present at the time of MPOST treatments were: 1-3" (5-6/ft²) common lambsquarters, 1-4" (5-6/ft²) common ragweed, 2-3" (2-3/ft²) redroot pigweed, and 1-4" (5-6/ft²) yellow foxtail. Soil characteristics were: 29% sand, 42.7% silt, 28.3% clay, clay loam texture, 3.8% OM, and 8.2 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 TT nozzles for PRE applications and 8.5 gpa at 40 psi through 11001 TT nozzles for POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Wet conditions before and after PRE application activated PREs well resulting in increased weed control for all treatments including a PRE herbicide. At 56 DA 2PO all treatments did excellent with little crop injury.
June 6 (14 DAE) - Conditions had been cool and wet since May 17. Only 40-50% of the weed species has emerged. Emerged weeds were only cotyledon stage. The 14 DAA evaluation was not taken because an accurate evaluation could not be made. Even though weeds were still emerging in general, all PRE treatments gave 99% weed control.

Table. Application timing in Soybean. (Zollinger, Wirth, Kazmierczak)

		28 DAE									7 DA 2PO									56 DA 2PO								
Treatments	Rate	Soy	Yeft	Wimu	Rrpw	Colq	Hans	Wibw	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Hans	Wibw	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Hans	Wibw	Corw	Cocb
	(Product/A)	% inj	% control								% inj	% control								% inj	% control							
PRE/MPOST/Pre-Bloom																												
Authority XL	7oz																											
Liberty+AMS	29floz+8.5lb/100gal																											
Liberty+AMS	29floz+8.5lb/100gal	10	99	99	99	99	99	99	99	73	0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
Valor XLT	7oz																											
Liberty+AMS	29floz+8.5lb/100gal																											
Liberty+AMS	29floz+8.5lb/100gal	10	99	99	99	99	99	99	99	99	2	99	99	99	99	99	99	99	99	2	99	99	99	99	99	99	99	99
Authority First	6.5oz																											
Liberty+Dual II Magnum+AMS	29fl oz+1.33pt+8.5lb/100gal																											
Liberty+Select Max+AMS	29fl oz+6fl oz+8.5lb/100gal	0	75	99	99	99	99	99	72	99	3	99	99	99	99	99	99	99	99	2	99	99	99	99	99	99	99	99
Authority MTZ	10oz																											
Liberty+Dual II Magnum+AMS	29fl oz+1.33pt+8.5lb/100gal																											
Liberty+Select Max+AMS	29fl oz+6fl oz+8.5lb/100gal	0	30	30	20	30	60	30	30	30	3	99	99	99	99	99	99	99	99	2	99	99	99	99	99	99	99	99
PRE/EPOST/Pre-Bloom																												
Valor	2oz																											
Liberty+Zidua+AMS	29fl oz+2oz+8.5lb/100gal																											
Liberty+AMS	29fl oz+8.5lb/100gal	20	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99	99
EPOST/MPOST																												
Liberty+Prefix+AMS	29fl oz+32fl oz+8.5lb/100gal																											
Liberty+Zidua+AMS	29fl oz+2oz+8.5lb/100gal	27	99	99	99	99	99	99	99	99	3	99	99	99	99	99	99	99	99	2	99	99	99	99	99	99	99	99
Liberty+Dual II Magnum+AMS	36fl oz+1.33pt+8.5lb/100gal																											
Liberty+Outlook+Select Max+AMS	29fl oz+14fl oz+6fl oz+8.5lb/100gal	18	78	78	78	78	78	78	78	78	10	99	99	99	99	99	99	99	99	5	99	99	99	99	99	99	99	99
Liberty+Select Max+AMS	36fl oz+6fl oz+8.5lb/100gal																											
Liberty+Warrant+AMS	29fl oz+3pt+8.5lb/100gal	8	99	99	99	99	99	99	99	99	10	99	99	99	99	99	99	99	99	5	99	99	99	99	99	99	99	99
Liberty+Warrant+AMS	36fl oz+3pt+8.5lb/100gal																											
Liberty+Select Max+AMS	29fl oz+6fl oz+8.5lb/100gal	13	99	99	99	99	99	99	99	99	3	99	99	99	99	99	99	99	99	2	99	99	99	99	99	99	99	99
LSD (0.05)		7	8	4	4	4	4	4	6	6	7	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0

Liberty Link Management Systems in Soybean. Zollinger, Richard K., Devin A. Wirth, and Angela J. Kazmierczak. An experiment was conducted near Prosper, ND to evaluate weed efficacy using different Liberty tankmix application timings in soybean. Pederson Farms L03-12N LL soybean was planted on May 16, 2013. 1-2" treatments were applied on May 28, 2013 at 5:10 pm with 75.6 F air, 57.6 F soil at a four inch depth, 50% RH, 50% cloud cover, 8-10 mph S wind, adequate soil moisture, good crop vigor, and no dew present at cracking soybean. Weeds present at the time of 1-2" application were: 1-2" (10-25/ft²) common lambsquarters, 1-1.5" (1-10/ft²) wild mustard, 1-1.5" (5-15/ft²) redroot pigweed, 1-2" (1-10/ft²) yellow foxtail, and 1-1.5" (1-5/ft²) common ragweed. 3-4" treatments were applied on June 18, 2013 at 12:25 pm with 82 F air, 71 F soil at a four inch depth, 25% RH, 50% cloud cover, 2-4 mph N wind, dry soil moisture, good crop vigor, and no dew present at V2 soybean. Weed species present at the time of 3-4" treatments were: 1-4" (10-25/ft²) common lambsquarters, 1-3" (10-25/ft²) redroot pigweed, 3-5" (1-5/yd²) wild mustard, 1-3" 1-4 lf (10-20/ft²) yellow foxtail, 1-4" vine (1-5/yd²) wild buckwheat, 1-4" (1-5/yd²) common cocklebur, and 1-4" (5-10/yd²) common ragweed. 5-6" treatments were applied on July 1, 2013 at 1:00 pm with 85 F air, 80.1 F soil at a four inch depth, 21% RH, 20% cloud cover, 1-5 mph N wind, adequate soil moisture, good crop vigor, and no dew present at V4 soybean. Weed species present at the time of 5-6" treatments were: 4-6" (5-10/ft²) yellow foxtail, 6-12" (3-5/ft²) wild mustard, 2-6" (8-10/ft²) common lambsquarters, and 2-5" (15-20/ft²) hairy nightshade. Soil characteristics were: 29% sand, 42.7% silt, 28.3% clay, clay loam texture, 3.8% OM, and 8.2 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 TT nozzles. The experiment had a randomized complete block design with three replicates per treatment.

This data also shows that tankmixing multiple herbicide mechanisms of action is beneficial. Herbicides with several mechanisms of action were used to delay weed resistance. At 28 DA POST, 1-2"/14 DAA treatment gave excellent weed control. At 28 DA POST, 5-6" gave excellent weed control on most weeds.
June 11 - All ratings that were less than 99% was because of new flushes of weeds. All treatments controlled all emerged weeds at initial application.

Table. Liberty Link Management Systems in Soybean. (Zollinger, Wirth, Kazmierczak)

Treatments	Rate	14 DAA								28 DAA								14 DA POST								28 DA POST							
	(Product/A)	Yeft	Wimu	Rrpw	Colq	Wibw	Hans	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Wibw	Hans	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Wibw	Hans	Corw	Cocb	Soy	Yeft	Wimu	Rrpw	Colq	Wibw	Hans	Corw	Cocb
		% control								% inj	% control								% inj	% control								% inj	% control							
1-2"																																				
Liberty+Destiny HC	32fl oz+1pt	60	60	60	60	60	60	60	60	0	60	60	60	60	60	60	60	60	0	30	30	30	30	30	30	30	30	0	30	30	30	30	30	30	30	30
Cobra+Liberty+Destiny HC	12.5fl oz+32fl oz+1pt	70	95	95	95	95	95	95	95	15	70	70	70	70	70	70	70	70	15	40	50	50	50	70	50	50	50	0	40	50	50	50	70	50	50	50
First Rate+Liberty+Destiny HC	0.3oz+32fl oz+1pt	70	95	95	95	95	95	95	95	0	70	95	95	95	95	95	60	95	0	70	95	95	95	95	95	60	95	0	70	95	95	95	95	95	60	95
Marvel+Liberty+Destiny HC	7fl oz+32fl oz+1pt	70	95	95	95	95	95	95	95	10	70	75	75	75	75	75	75	75	10	70	75	75	75	75	75	75	75	0	70	75	75	75	75	75	75	75
Flexstar+Liberty+Destiny HC	0.75pt+32fl oz+1pt	70	95	95	95	95	95	95	95	7	72	95	95	95	95	95	95	95	7	75	90	90	95	90	90	90	90	2	75	90	90	95	90	90	90	90
Raptor+Liberty+Destiny HC	4fl oz+32fl oz+1pt	70	95	95	95	95	95	95	95	0	95	95	95	75	95	95	60	95	0	95	95	95	75	95	95	60	95	0	95	95	95	75	95	95	80	95
Rezult B+Rezult G+Liberty+Destiny HC	1.6pt+1.6pt+32fl oz+1pt	70	95	95	95	95	95	95	95	0	70	70	70	70	70	70	60	70	0	70	50	50	50	50	50	50	50	0	70	50	50	50	50	50	43	50
Rezult B+Rezult G+Raptor+Flexstar+Liberty+Destiny HC	0.5pt+0.5pt+1fl oz+2fl oz+32fl oz+1pt	70	95	95	95	95	95	95	95	0	70	70	70	70	70	70	57	70	0	70	50	50	50	50	50	50	50	0	70	50	50	50	50	50	50	50
1-2"/14 DAA																																				
Rezult B+Rezult G+Raptor+Flexstar+Liberty+Destiny HC	0.5pt+0.5pt+1fl oz+2fl oz+32fl oz+1pt																																			
Rezult B+Rezult G+Raptor+Flexstar+Liberty+Destiny HC	0.5pt+0.5pt+1fl oz+2fl oz+29fl oz+1pt	70	95	95	95	95	95	95	95	0	70	95	95	95	95	95	95	95	20	95	95	95	95	95	95	95	95	0	99	99	99	99	99	99	99	99
3-4"																																				
Liberty+Destiny HC	32fl oz+1pt	.	.	.	.	.	.	.	.	0	70	95	95	95	95	95	95	95	0	70	95	95	95	95	95	95	95	0	70	95	95	95	95	95	95	95
Cobra+Liberty+Destiny HC	12.5fl oz+32fl oz+1pt	.	.	.	.	.	.	.	.	30	70	95	95	95	95	95	95	95	25	75	95	95	95	95	95	95	95	15	75	95	95	95	95	95	95	95
First Rate+Liberty+Destiny HC	0.3oz+32fl oz+1pt	.	.	.	.	.	.	.	.	0	70	95	95	95	95	95	95	95	0	70	95	95	95	95	95	95	95	15	70	95	95	95	95	95	95	95
Marvel+Liberty+Destiny HC	7fl oz+32fl oz+1pt	.	.	.	.	.	.	.	.	35	80	95	95	95	95	95	95	95	35	80	95	95	70	95	95	95	95	15	80	95	95	70	95	95	95	95
Flexstar+Liberty+Destiny HC	0.75pt+32fl oz+1pt	.	.	.	.	.	.	.	.	35	95	95	95	96	95	95	95	95	20	95	95	95	60	95	95	95	95	0	95	95	95	30	95	95	95	95
Raptor+Liberty+Destiny HC	4fl oz+32fl oz+1pt	.	.	.	.	.	.	.	.	15	75	95	95	95	95	95	95	95	15	95	95	95	95	95	95	95	95	15	95	95	95	75	95	95	85	95
Rezult B+Rezult G+Liberty+Destiny HC	1.6pt+1.6pt+32fl oz+1pt	.	.	.	.	.	.	.	.	25	70	70	70	70	70	70	70	70	25	70	70	70	70	70	70	70	70	15	70	70	70	30	70	70	70	70
Rezult B+Rezult G+Raptor+Flexstar+Liberty+Destiny HC	0.5pt+0.5pt+1fl oz+2fl oz+32fl oz+1pt	.	.	.	.	.	.	.	.	30	70	70	70	70	70	70	70	70	20	95	95	95	95	95	95	95	95	15	70	70	70	30	70	70	70	70
5-6"																																				
Liberty+Destiny HC	32fl oz+1pt	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	30	30	30	30	30	30	30	30	0	99	99	99	70	99	99	99	99
Cobra+Liberty+Destiny HC	12.5fl oz+32fl oz+1pt	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	35	50	50	50	50	50	50	50	50	15	99	99	99	70	99	99	99	99
First Rate+Liberty+Destiny HC	0.3oz+32fl oz+1pt	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	50	50	50	50	50	50	50	50	0	99	99	99	70	99	99	95	99
Marvel+Liberty+Destiny HC	7fl oz+32fl oz+1pt	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	35	60	60	60	60	60	60	60	60	16	99	99	99	70	99	99	99	99
Flexstar+Liberty+Destiny HC	0.75pt+32fl oz+1pt	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	30	60	60	60	60	60	60	60	60	30	99	99	99	70	99	99	99	99
Raptor+Liberty+Destiny HC	4fl oz+32fl oz+1pt	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	50	50	50	50	50	50	50	50	10	99	99	99	80	99	99	99	99
Rezult B+Rezult G+Liberty+Destiny HC	1.6pt+1.6pt+32fl oz+1pt	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	30	30	30	30	30	30	30	30	0	99	99	99	80	99	99	99	99
Rezult B+Rezult G+Raptor+Flexstar+Liberty+Destiny HC	0.5pt+0.5pt+1fl oz+2fl oz+32fl oz+1pt	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	30	50	50	50	50	50	50	50	50	0	99	99	99	95	99	99	99	99
LSD (0.05)		0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	2	0	1	0	0	0	0	0	0	0	0	1	0	0	0	6	0	0	4	1