Blue Section: Weed control in corn and soybean

Control of Canola. Dr. Howatt, Mettler, and Harrington. '70-50CR' canola was seeded near Fargo on May 11. Preemergence treatments were applied May 12 with 73°F 39% relative humidity, clear sky with 7 mph wind velocity at 45°and dry soil at 60°F. Four to 5 leaf treatments were applied to 5 leaf canola on June 12 with 72°F, 49% relative humidity, 0% cloud cover, 5 mph wind velocity at 60°, and dry soil at 69°F. Bolt treatments were applied to bolting canola on June 22 with 69°F, 49% relative humidity, 99% cloud cover, 2.5 mph wind velocity at 220°and dry soil at 68°F. All treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Timing	6/27 Canola	7/7 Canola	7/20 Canola
	oz ai/A		%	%	%
Clpy&Aceto&Mest	29.6	Pre	86	71	71
Atra+Clpy&Aceto&Mest	10+29.6	Pre	90	83	83
Atra&Mest&Meto	40	Pre	84	74	74
Atra&Meto&Mest&Bcpy	20.6	Pre	64	40	40
Meto&Mest&Bcpy	26	Pre	89	79	79
Mest+PO	2.7+1%	Pre	74	40	40
Clpy&Aceto&Mest+PO	16.5+1%	4-5L	85	91	91
Atra&Meto&Mest&Bcpy+PO	20.6+1%	4-5L	95	98	98
Meto&Mest&Bcpy+PO	26+1%	4-5L	86	91	91
Mest+PO	1.5+1%	4-5L	83	81	81
Clpy&Aceto&Mest+PO	16.5+1%	Bolt	23	50	55
Clpy&Aceto&Mest+PO	19.8+1%	Bolt	23	54	64
Atra&Meto&Mest&Bcpy+PO	20.6+1%	Bolt	23	48	59
Meto&Mest&Bcpy+PO	26+1%	Bolt	40	81	95
Mest+PO	1.5+1%	Bolt	28	45	56
Untreated Check	0		0	0	0
CV			6	6	7
LSD P=.05			7	7	7

Early season precipitation was very limited. Control on June 27 indicated percentage of plants controlled while later evaluations provide more of a relative biomass estimate. More precipitation likely would have improved availability of herbicides applied PRE and resulted in better control. However, most herbicides applied PRE gave good control considering the dry conditions.

Control of vegetative stage canola was best when atrazine was in the premix, 98% control. Other treatments gave better control than mesotrione alone. Control of reproductive stage canola was best with metolachlor&mesotrione&bicyclopyrone. The separation of this treatment increased as the season progressed because the plants remained very stunted and bleached while plants in other treatments added more biomass and regained more green color. The presence of atrazine at this late stage did not benefit control as the action of atrazine seemed to damage tissue and possibly reduce translocation of other products to lower parts of the plant. The two rates of clopyralid&acetochlor&mesotrione gave control similar to mesotrione alone. This was reasonable because neither clopyralid nor acetochlor is expected to control canola POST.

Table.

Herbicide				Weed control (%)[1]								
Treatment[2]		Rate	Timing[3]	2-Jun			19-Jun			5-Jul		
No.		fl oz product/A		yefo	cola	wibw	yefo	colq	wibw	yefo	colq	wibw
1	untreated check	x	x	0	0	0	0	0	0	0	0	0
	Verdict	10	PRE	58	62	27						
	Armezon Pro	14										
2	Atrazine 4L	12	POST	x	x	x	89	99	83	90	93	88
	Verdict	13	PRE	65	73	73						
3	Status	4 oz wt	POST	x	x	x	83	94	88	73	82	82
	Zidua SC	3.3	PRE	48	0	0						
	ArmezonPro	14										
4	Atrazine 4L	12	POST	x	x	x	94	99	82	96	92	81
	ArmezonPro	14										
	Atrazine 4L	12	PRE	72	50	0						
5	Status	4 oz wt	POST	x	x	x	83	94	83	77	80	70
	ArmezonPro	14										
	Atrazine 4L	12	PRE	72	58	13						
	Armezon Pro	14										
6	Destiny HC	0.5% v/v	POST	x	x	x	94	96	81	96	88	83
	SureStart	28	PRE	62	60	0						
7	Resicore	40	POST	x	x	x	95	97	83	96	97	93
	Resicore	40	PRE	68	75	13						
8	Resicore	40	POST	x	x	x	92	99	83	93	99	88
	Anthem Maxx	4.5	PRE	60	0	13						
	Callisto	3										
	Atrazine 4L	12										
9	Preference	0.25% v/v	POST	x	x	x	92	96	91	91	93	90
	Verdict	10	PRE	69	68	58						
	Status	4 oz wt										
10	Zidua SC	1.6	POST	x	x	x	80	98	90	77	94	83
	Acuron	48	PRE	68	74	13						
11	Halex GT	57.6	POST	x	x	x	83	93	78	85	93	82
C.V. (%)				15	17	123	6	7	9	4	7	10
LSD (0.05)				15	14	35	10	5	NS	7	10	NS

[1]yefo=yellow foxtail; colq=common lambsquarters; wibw=wild buckwheat.

[2]POST treatments include Roundup PowerMax at 32 fl oz/A plus AMS at 8.5 lb/100 gal.

[3]PRE=May 5; POST2=June 5.

PRE and POST Herbicide Programs in Corn 1: Richard K. Zollinger, Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and corn damage from PRE and POST herbicides. Corn was seeded on May 10, 2017. PRE treatments were applied on May 11, 2017 at 11:30 AM with 73 F air, 54 F soil, 22% RH, 10% cloud cover, 4-6 mph NW wind, and adequate soil moisture. POST treatments were applied on June 12, 2017 at 11:00 AM with 85.5 F air, 70 F soil, 31.9% RH, 0% cloud cover, 5-10 mph NE wind, and adequate soil moisture. Weeds present were: cocq 1-3" at 5/ft2, wibw 1-4" at 1/m2, and rrpw 1-4" at 1/m2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides and 17 gpa through 11002 TT nozzles for POST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

PRE application of Lumax EZ provided excellent yellow foxtail and redroot pigweed control, but poor control on all other weeds through 28 DA POST. PRE application of Corvus + Atrazine and all POST applications provided excellent control of all weeds through 28 DA POST. PRE applications of Capreno provided very poor weed control; however, following POST applications provided excellent control.

Table. PRE and POST herbicide programs in corn 1 (Zollinger, Wirth, Adams).

		Prior to POST							7 DA POST							28 DA POST						
Treatment[1]	Rate	corn	yeft	rrpw	colq	wibw	corw	cocb	corn	yeft	rrpw	colq	wibw	corw	cocb	corn	yeft	rrpw	colq	wibw	corw	cocb
	(Product/A)	-% inj-	----------% control----------						-% inj-	----------% control----------						-% inj-	----------% control----------					
(PRE) Lumax EZ	4 pt	0	99	99	53	40	45	37	0	99	99	53	40	45	37	0	99	99	47	37	42	33
(PRE) Corvus+Atrazine	5.6floz+0.56lb	0	99	99	67	60	67	63	0	99	99	96	92	96	92	0	99	99	95	90	96	98
(PRE) Corvus	5.6floz																					
(POST) Laudis+RUPM+Atrazine	3floz+32floz+0.56lb	0	99	99	60	53	60	60	0	99	99	99	99	99	99	0	99	99	99	99	99	99
+MSO+AMS	+1%v/v+8.5lb/100gal																					
(PRE) Capreno	3floz																					
(POST) RUPM+Atrazine	32floz+0.56lb	0	23	23	23	23	23	23	0	99	99	32	99	33	90	0	99	99	38	99	99	99
+PO+AMS	+1%v/v+8.5lb/100gal																					
(PRE) Capreno	3floz																					
(POST) Diflexx+RUPM+Atrazine	7.5floz+32floz+0.56lb	0	20	20	20	20	20	20	18	99	90	76	99	99	99	0	99	93	95	99	99	99
+PO+AMS	+1%v/v+8.5lb/100gal																					
(POST) Laudis+RUPM+Atrazine	3floz+32floz+0.56lb																					
+MSO+AMS	+1%v/v+8.5lb/100gal	0	0	0	0	0	0	0	99	99	99	99	72	82	99	99	99	99	99	99	99	99
(POST) Diflexx Duo+Laudis	24floz+3floz																					
+RUPM+Atrazine	+32floz+0.56lb	0	0	0	0	0	0	0	99	99	99	99	99	99	99	99	99	99	99	99	99	99
+MSO+AMS	+1%v/v+8.5lb/100gal																					
(POST) Status+RUPM+Atrazine	3oz+32floz+0.56lb																					
+AMS	+8.5lb/100gal	0	0	0	0	0	0	0	99	99	99	73	63	99	99	99	99	99	96	93	99	99
LSD		0	4	4	11	8	9	11	2	0	0	8	7	4	4	0	0	2	4	4	2	4

[1]RUPM=Roundup Powermax

PRE and POST Herbicide Programs in Corn 2: Richard K. Zollinger, Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and corn damage from PRE and POST herbicides. Corn was seeded on May 10, 2017. PRE treatments were applied on May 11, 2017 at 11:30 AM with 73 F air, 54 F soil, 22% RH, 10% cloud cover, 4-6 mph NW wind, and adequate soil moisture. POST treatments were applied on June 12, 2017 at 11:30 AM with 85.5 F air, 70 F soil, 31.9% RH, 0% cloud cover, 5-10 mph NE wind, and adequate soil moisture. Weeds present were: colq 2" at 1/m2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides and 17 gpa through 11002 TT nozzles for POST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

PRE Resicore provided the most weed control by itself 28 days after POST. Any PRE followed by POST application resulted in 99% weed control across all weeds 14 and 28 days after application.

Table. PRE and POST Herbicide Programs in Corn 2 (Zollinger, Wirth, Adams).

		7 DA Emergence							14 DA POST							28 DA POST						
Treatment[1]	Rate	corn	wimu	rrpw	colq	wibw	corw	cocb	corn	wimu	rrpw	colq	wibw	corw	cocb	corn	wimu	rrpw	colq	wibw	corw	cocb
	(Product/A)	-% inj-	----------% control----------						-% inj-	----------% control----------						-% inj-	----------% control----------					
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(PRE) Acuron Flexi	2.25qt	0	99	99	90	40	82	88	0	99	99	93	48	99	99	0	99	99	93	62	99	99
(PRE) Acuron	3qt	0	99	99	99	99	99	99	0	99	99	99	92	99	99	0	99	99	99	93	99	99
(PRE) Corvus	5.6floz	0	99	99	85	45	85	95	0	99	99	99	45	99	99	0	99	99	99	42	99	99
(PRE) SureStart II	2.5pt	0	99	99	80	55	96	99	0	99	99	80	65	99	99	0	99	99	83	82	99	99
(PRE) Instigate	5.25oz	0	99	99	99	62	77	99	0	99	99	99	55	75	99	0	99	99	99	62	77	99
(PRE) Verdict	14floz	0	99	99	77	80	82	99	0	99	99	75	99	90	99	0	99	99	73	99	93	99
(PRE) Resicore	3qt	0	99	99	99	99	99	99	0	99	99	92	99	99	99	0	99	99	99	99	99	99
(PRE) Keystone LA NXT+Hornet	1.33qt+3oz																					
(POST) Durango+AMS	1qt+8.5lb/100gal	0	99	99	99	99	99	99	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(PRE) SureStart II	2pt																					
(POST) Durango+Atrazine+AMS	1qt+0.42lb+8.5lb/100gal	0	99	99	78	99	62	99	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(PRE) SureStart II	1.75pt																					
(POST) Resicore+Durango	1.25qt+1qt	0	99	99	72	99	55	99	0	99	99	99	99	99	99	0	99	99	99	99	99	99
+Atrazine+AMS	+0.42lb+8.5lb/100gal																					
(PRE) Resicore	2qt																					
(POST) Durango+Atrazine+AMS	1qt+0.42lb+8.5lb/100gal	0	99	99	77	99	55	99	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(PRE) Verdict	14floz																					
(POST) Resicore+Atrazine	1.5qt+0.42lb	0	99	99	72	99	77	99	0	99	99	99	99	99	99	0	99	99	99	99	99	99
+POC+AMS	+1%v/v+8.5lb/100gal																					
LSD		0	0	0	6	4	6	1	0	0	0	4	4	0	0	0	0	0	2	3	2	0

[1] POC=petroleum oil concentrate

weed control and corn damage from PRE and POST herbicides. Corn was seeded on May 15, 2017. PRE treatments were applied on May 15, 2017 at 3:30 PM with 80 F air, 59 F soil, 23% RH, 75% cloud cover, 2-4 mph ENE wind, and adequate soil moisture. POST treatments were applied on June 29, 2017 at 8:00 AM with 63 F air, 63.5 F soil, 74% RH, 100% cloud cover, 2-4 mph NW wind, and adequate soil moisture. Weeds present were: colq 2-4" at 1-2/ft2, rrpw 3-5" at 3-4/ft2, wahe 3-6" at 1-2/ft2, wimu 4-6" at 1-2/yd2, wibw 4-6" at 1-2/yd2, vema 2-6" at 4-6/ft2, and yeft 2-6" at 1-2/ft2 . Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides and through 11002 TT nozzles for POST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. PRE and POST Herbicide Programs in Corn 3 (Zollinger, Wirth, Adams).

		PTP						14 DA POST						56 DA POST					
Treatment[1]	Rate	corn	yeft	rrpw	colq	wibw	vemo	corn	yeft	rrpw	colq	wibw	vemo	corn	yeft	rrpw	colq	wibw	vemo
	(Product/A)	-% inj-	----------% control----------					-% inj-	----------% control----------					-% inj-	----------% control----------				
(PRE) Balance Flexx+Atrazine	3floz+0.56lb																		
(POST) Liberty+AMS	22floz+3lb	0	85	70	70	25	60	0	87	91	93	52	95	0	88	93	95	53	95
(PRE) Balance Flexx+Atrazine	3floz+0.56lb																		
(POST) Liberty+AMS	32floz+3lb	0	85	70	70	25	60	0	99	99	99	99	90	0	99	99	99	99	90
(PRE) Balance Flexx+Atrazine	3floz+0.56lb																		
(POST) Liberty+AMS	36floz+3lb	0	85	70	70	25	60	0	99	99	99	99	99	0	99	99	99	99	99
(PRE) Balance Flexx+Atrazine	3floz+0.56lb																		
(POST) Liberty+AMS	43floz+3lb	0	85	70	70	25	60	0	99	99	99	99	99	0	99	99	99	99	99
(PRE) Balance Flexx+Atrazine	3floz+0.56lb																		
(POST) Liberty+Laudis+AMS	22floz+3floz+3lb	0	85	70	70	25	60	0	99	99	99	99	99	0	99	99	99	99	99
(PRE) Balance Flexx+Atrazine	3floz+0.56lb																		
(POST) Liberty+Laudis+AMS	32floz+3floz+3lb	0	85	70	70	25	60	0	99	99	99	99	99	0	99	99	99	99	99
(PRE) Balance Flexx+Atrazine	3floz+0.56lb																		
(POST) Liberty+Laudis+AMS	43floz+3floz+3lb	0	85	70	70	25	60	0	99	99	99	99	99	0	99	99	99	99	99
(PRE) Balance Flexx+Atrazine	3floz+0.56lb																		
(POST) Liberty+DiFlexx+AMS	32floz+8floz+3lb	0	85	70	70	25	60	0	99	99	99	99	99	0	99	99	99	99	99
(PRE) Balance Flexx+Atrazine	3floz+0.56lb																		
(POST) Liberty+DiFlexx+AMS	43floz+8floz+3lb	0	85	70	70	25	60	0	99	99	99	99	99	0	99	99	99	99	99
(PRE) Balance Flexx+Atrazine	3floz+0.56lb																		
(POST) Liberty+Laudis	43floz+1floz	0	85	70	70	25	60	0	99	99	99	99	99	0	99	99	99	99	99
+DiFlexx+AMS	24floz+3lb																		
LSD		0	0	0	0	0	0	0	1	0	2	3	0	0	2	2	2	2	0

weed control and corn damage from PRE and POST herbicides. Corn was seeded on May 15, 2017. PRE treatments were applied on May 15, 2017 at 3:30 PM with 80 F air, 59 F soil, 23% RH, 75% cloud cover, 2-4 mph ENE wind, and adequate soil moisture. POST treatments were applied on June 20, 2017 at 8:30 AM with 62.5 F air, 62 F soil, 57% RH, 15% cloud cover, 2-5 mph N wind, and adequate soil moisture. Weeds present were: colq 1-2" at 1-2/yd2, rrpw 1-3" at 1-2/yd2, wahe 1-3" at 1-2/yd2, wimu 2-4" at 2-4/yd2 . Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides and through 11002 TT nozzles for POST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. PRE and POST herbicide programs in Corn 4 (Zollinger, Wirth, Adams).

		PTP							14 DA POST							28 DA POST						
Treatment[1]	Rate	corn	yeft	wimu	rrpw	colq	wibw	vemo	corn	yeft	wimu	rrpw	colq	wibw	vemo	corn	yeft	wimu	rrpw	colq	wibw	vemo
	(Product/A)	-% inj-	----------% control----------						-% inj-	----------% control----------						-% inj-	----------% control----------					
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(PRE) Acuron Flexi	2.25qt	0	70	99	65	67	22	35	0	70	99	67	75	23	33	0	99	99	99	99	25	33
(PRE) Acuron	3qt	0	72	83	70	70	23	42	0	73	82	72	72	23	40	0	99	83	99	99	23	33
(PRE) Corvus	5.6floz	0	75	99	71	71	25	52	0	78	99	69	72	27	53	0	83	99	74	75	28	60
(PRE) SureStart II	2.5pt	0	63	99	92	85	70	82	0	73	99	93	88	68	83	0	99	99	99	83	70	82
(PRE) Instigate	5.25oz	0	47	99	38	38	23	23	0	47	99	33	33	22	22	0	47	99	33	33	22	22
(PRE) Verdict	14floz	0	80	99	95	99	99	99	0	80	99	96	99	99	99	0	80	99	96	99	99	99
(PRE) Resicore	3qt	0	87	99	90	90	87	83	0	86	99	88	83	88	83	0	99	99	88	85	88	82
(PRE) Keystone LA NXT+Hornet	1.33qt+3oz																					
(POST) Durango+AMS	1qt+8.5lb/100gal	0	83	99	87	87	80	83	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(PRE) SureStart II	2pt																					
(POST) Durango+Atrazine+AMS	1qt+0.42lb+8.5lb/100gal	0	68	99	73	72	62	72	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(PRE) SureStart II	1.75pt																					
(POST) Resicore+Durango +Atrazine+AMS	1.25qt+1qt +0.42lb+8.5lb/100gal	0	70	99	77	71	69	69	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(PRE) Resicore	2qt																					
(POST) Durango+Atrazine+AMS	1qt+0.42lb+8.5lb/100gal	0	83	99	84	75	65	67	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(PRE) Verdict	14floz																					
(POST) Resicore+Atrazine +POC+AMS	1.5qt+0.42lb +1%v/v+8.5lb/100gal	0	87	99	99	99	99	99	0	99	99	99	99	99	99	0	99	99	99	99	99	99
LSD		0	7	1	6	5	6	6	0	6	1	3	3	3	4	0	5	1	2	2	4	3

[1] POC=petroleum oil concentrate

POST Applications in corn 1: Richard K. Zollinger, Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and corn damage from POST herbicides. Corn was seeded on May 10, 2017. POST treatments were applied on June 20, 2017 at 10:00 AM with 65 F air, 65 F soil, 41% RH, 40% cloud cover, 5-8 mph NE wind, and adequate soil moisture. Weeds present were: colq 4-8" at 2-4/ft2, corw 4-8" at 1-2/ft2, yeft 4-8" at 2-4/ft2, rrpw 4-8" at 4-6/ft2, cocb 4-8" at 1-2/yd2, and wibw 2-4" at 1-2/yd2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa through 11001 TT nozzles at 40psi. The experiment had a randomized complete block design with three replicates per treatment.

The addition of Atrizine to tank-mixes resulted in 99% weed control across all weeds 14 and 28 days after application.

Table. POST Applications in Corn (Zollinger, Wirth, Adams)

		7 DAA								14 DAA								28 & 42 DAA							
Treatment[1]	Rate	corn	yeft	rrpw	colq	hans	wibw	corw	cocb	corn	yeft	rrpw	colq	hans	wibw	corw	cocb	corn	yeft	rrpw	colq	hans	wibw	corw	cocb
	(Product/A)	-% inj-	-% control-							-% inj-	-% control-							-% inj-	-% control-						
Impact+Plexus+AMS	1floz+10floz+3lb	0	99	99	65	75	62	52	82	0	99	99	65	73	72	72	85	0	99	99	63	70	70	72	83
Shieldex+Plexus+AMS	1floz+10floz+3lb	0	99	99	27	30	27	28	52	0	99	99	73	72	43	70	99	0	99	99	72	70	42	70	99
Shieldex+Plexus+AMS	1.3floz+10floz+3lb	0	99	99	63	85	62	35	55	0	99	99	67	83	62	33	53	0	99	99	63	82	60	32	52
Callisto+Atrazine+Plexus+AMS	3floz+0.5lb+10floz+3lb	0	99	99	32	45	23	27	47	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Impact+Atrazine+Plexus+AMS	1floz+0.5lb+10floz+3lb	0	99	99	63	63	62	58	63	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
Shieldex+Atrazine+Plexus+AMS	1floz+0.5lb+10floz+3lb	0	99	99	48	55	48	58	57	0	99	99	99	99	83	99	99	0	99	99	99	99	82	99	99
Shieldex+Atrazine+Plexus+AMS	1.3floz+0.5lb+10floz+3lb	0	99	99	42	53	43	57	63	0	99	99	99	99	99	99	99	0	99	99	99	99	99	99	99
LSD		0	0	0	8	11	9	9	8	0	0	0	4	3	3	3	4	0	0	0	3	4	3	3	3

POST Applications in Corn 2. Richard K. Zollinger, Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate crop damage from POST herbicides. Corn was seeded on May 10, 2017. POST treatments were applied on May 12, 2017 at 2:15 PM with 85.5 F air, 70 F soil, 31.9% RH, 20% cloud cover, 5-10 mph NE wind, and adequate soil moisture. Weeds present were: corw 2-4" at 5/m2, yeft 1-4" at 1/m2, rrpw 2-4" at 10/ft2, colq 2-4" at 1/m2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa through 11001 TTI nozzles at 40psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. POST Applications in Corn 2 (Zollinger, Wirth, Adams)

		7 DAA							14 DAA							28 DAA						
Treatment[1]	Rate	corn	yeft	rrpw	colq	hans	corw	cocb	corn	yeft	rrpw	colq	hans	corw	cocb	corn	yeft	rrpw	colq	hans	corw	cocb
	(Product/A)	-% inj-	----------% control----------						-% inj-	----------% control----------						-% inj-	----------% control----------					
Armezon Pro+Plexus+AMS	20floz+10floz+3lb	0	99	99	72	99	63	72	0	99	99	99	99	86	99	0	99	99	99	99	88	99
Resicore+Plexus+AMS	2.5qt+10floz+3lb	0	99	99	74	99	85	82	0	99	99	92	99	93	99	0	99	99	92	99	95	99
SL573A+Atrazine	1.15qt+0.5lb																					
+Plexus+AMS	+10floz+3lb	0	99	99	99	99	99	99	0	99	99	99	99	99	99	0	99	99	99	99	99	67
SL573A+Atrazine+Pendamethalin	1.15qt+0.5lb+3.2pt																					
+Plexus+AMS	+10floz+3lb	0	99	99	99	99	99	99	0	99	99	99	99	99	99	0	99	99	99	99	63	42
LSD		0	0	0	7	0	3	6	0	0	0	3	0	3	0	0	0	0	3	0	3	7

corn damage from POST herbicides. Corn was seeded on May 15, 2017. POST treatments were applied on June 20, 2017 at 8:30 AM with 62.5 F air, 62 F soil, 57% RH, 15% cloud cover, 2-5 mph N wind, and adequate soil moisture. Weeds present were: colq 2-4"at 2-4/ft2, rrpw 2-4" at 2-4/ft2, wahe 1-3" at 1-2/yd2, wibw 2-4" at 1-2/yd2, wimu 4-8" at 8-10/ft2, yeft 2-4" at 1-2/yd2, and vema 2-4" at 4-6/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TT nozzles at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. POST Applications in Corn 3 (Zollinger, Wirth, Adams).

		7 DAA				14 & 28 DAA							42 DAA						
Treatment[1]	Rate	corn	yeft	rrpw	colq	corn	yeft	wimu	rrpw	colq	wibw	vemo	corn	yeft	wimu	rrpw	colq	wibw	vemo
	(Product/A)	-% inj-	-----% control-----			-% inj-	----------% control----------						-% inj-	----------% control----------					
Diflexx Duo+RUPM +Atrazine+AMS	32floz+32floz +0.56lb+8.5lb/100gal	0	73	73	73	0	99	99	99	99	99	99	0	99	99	99	99	99	99
Diflexx Duo+Atrazine +PO+AMS	32floz+0.56lb +1%v/v+8.5lb/100gal	0	47	47	47	0	99	99	99	99	99	69	0	99	99	99	99	99	82
Diflexx Duo+RUPM +Atrazine+AMS	24floz+32floz +0.56lb+8.5lb/100gal	0	47	47	47	0	99	99	99	99	99	69	0	99	99	99	99	99	82
Diflexx Duo+Liberty+AMS	24floz+32floz+8.5lb/100gal	0	82	82	82	0	99	99	99	99	99	62	0	99	99	99	99	99	73
Capreno+RUPM +Atrazine+AMS	3floz+32floz +0.56lb+8.5lb/100gal	0	55	55	55	0	99	99	99	99	99	99	0	99	99	99	99	99	99
Halex GT+Atrazine +NIS+AMS	57.6floz+0.56lb +0.25%v/v+8.5lb/100gal	0	40	40	40	0	99	99	99	99	99	99	0	99	99	99	99	99	99
Armezon+Outlook+RUPM +Atrazine+AMS	0.57floz+14floz+32floz +0.56lb+8.5lb/100gal	0	53	53	53	0	99	99	99	99	99	99	0	99	99	99	99	99	99
Armezon+Status+RUPM +Atrazine+AMS	0.57floz+3oz+32floz +0.56lb+8.5lb/100gal	0	67	67	67	0	99	99	99	99	99	99	0	99	99	99	99	99	99
Diflexx Duo+Laudis+RUPM +Atrazine+AMS	24floz+1oz+32floz 0.56lb+8.5lb/100gal	0	88	88	88	0	99	99	99	99	99	99	0	99	99	99	99	99	99
LSD		0	10	10	10	0	0	0	0	0	0	2	0	0	0	0	0	0	3

[1] RUPM=Roundup Powermax

Effect of spray volume on weed control in Liberty corn. (Minot). The objective of this study was to determine the effect of spray volume on weed control with Liberty. To be most effective, Liberty needs excellent spray coverage, warm temperatures, sunny conditions, and high humidity. Applying Liberty at low spray volumes will result in less spray coverage and possible inferior weed control. The study was conducted as a single rep demo. Treatments were applied June 12 to 2- to 4-inch weeds. Treatments were applied at a spray volume of 5 or 15 gpa.

Treatments applied at 15 gpa consistently provided superior weed control compared to 5 gpa. In some cases, this extra weed control may be the difference between weeds going to seed or not. This study also demonstrated the extra weed control obtained by adding AMS to Liberty.

Title. Effect of spray volume on weed control in Liberty corn. (1745)

			Weed Control[c]					
			Koch		Colq		Yeft	
Treatment[ab]	Rate	Spray Volume	Jun-23	Jul-17	Jun-23	Jul-17	Jun-23	Jul-17
		gal/A	----------%----------					
Untreated			0	0	0	0	0	0
Liberty + AMS	29 oz	15	73	70	60	60	85	85
Liberty + AMS	29 oz	5	63	60	50	50	80	80
Liberty + Exp + AMS	29 oz + 8 oz	15	94	96	99	99	80	78
Liberty + Exp + AMS	29 oz + 8 oz	5	88	82	92	95	75	70
Liberty + Exp	29 oz + 8 oz	15	82	82	82	84	80	78
Liberty + Exp	29 oz + 8 oz	5	80	76	70	70	75	70

[a] *AMS applied at 4.41 gal/100 gal*

[b] *Exp=Experimental herbicide*

[c] *Koch=Kochia; Colq=Common lambsquarters; Yeft=Yellow foxtail*

Kochia control in Dicamba-resistant soybean. Dr. Howatt, Mettler, and Harrington. 'Ag03x07' Xtend soybean was seeded near Rogers, North Dakota on May 24. Preemergence treatments were applied before soybean emergence to 1 to 3 inch common ragweed, flowering dandelion, and 3 to 4 inch absinth wormwood on May 25 with 56°F, 72% relative humidity, 95% cloud-cover, 10 mph wind velocity at 215°, and dry soil at 52°F. Post treatments were applied to 2 trifoliolate soybean on June 20 with 79°F, 35% relative humidity, 30% cloud-cover, 1.5 mph wind velocity at 315°, and dry soil at 78°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TTI nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Appl Code	6/8 Kochia	6/8 Inj	6/20 Kochia	6/20 Inj	7/4 Kochia	7/17 Kochia	10/4 Yield
	oz ae/A		%	%	%	%	%	%	bu/A
Glyt4.5+Dica-C+NIS/ Glyt4.5+Dica-C+NIS	18+8+0.25%/ 18+8+0.25%	PRE/ POST	99	0	99	0	99	99	24
Glyt4.5+Imep&Pxsf&Saff+NIS/ Glyt4.5+Dica-C+NIS	18+2.3+0.25%/ 18+8+0.25%	PRE/ POST	99	0	99	0	99	99	20
Glyt4.5+Dica-C+Flum-EZ+NIS/ Glyt4.5+Dica-C+NIS	18+8+1.25+0.25%/ 18+8+0.25%	PRE/ POST	99	0	99	0	99	99	22
Glyt4.5+Dica-C+Flum&Pxsf+NIS/ Glyt4.5+Dica-C+NIS	18+8+2.28+0.25%/ 18+8+0.25%	PRE/ POST	99	0	99	0	99	99	13
Glyt4.5+Dica-C+Flum&Metr&Pxsf+NIS/ Glyt4.5+Dica-C+NIS	18+8+5.28+0.25%/ 18+8+0.25%	PRE/ POST	99	0	99	0	99	99	23
Glyt4.5+Dica-C+Flum-EZ+Metr+NIS/ Glyt4.5+Dica-C+NIS	18+8+1.25+2+0.25%/ 18+8+0.25%	PRE/ POST	99	0	99	0	99	99	23
Glyt4.5+Dica-C+Suen&Metr+NIS/ Glyt4.5+Dica-C+NIS	18+8+5+0.25%/ 18+8+0.25%	PRE/ POST	99	0	99	0	99	99	17
Glyt4.5+Dica-C+Suen&Meto+NIS/ Glyt4.5+Dica-C+NIS	18+8+22.8+0.25%/ 18+8+0.25%	PRE/ POST	99	0	99	0	99	99	20
Glyt4.5+Dica-C+Flum-EZ+NIS/ Glyt4.5+Dica-C+NIS	18+8+1+0.25%/ 18+8+0.25%	PRE/ POST	99	0	99	0	99	99	19
Untreated Check	0		0	0	0	0	99	99	10
CV			0	0	0	0	0	0	28
LSD P=.05			0	0	0	0	0	0	8

The PRE herbicide treatments controlled all emerged weeds. Weather was not conducive to subsequent flushes of weeds or vigorous soybean growth. Even the untreated check did not have much weed growth through the season. Weeds were not present in herbicide plots at POST application timing but treatments were applied to evaluate crop response, of which there was none. Even though weeds did not provide competition and none of the herbicides elicited crop response in season, yield of the plot with flumioxazin&pyroxasulfone PRE was less than some other herbicide combinations. However, the LSD was high for the low yields obtained.

Kochia Control with Dicamba as PRE to control emerged Kochia. Dr. Howatt, Mettler, and Harrington. Treatments were applied to a non-cropped field near Fargo on May 12. Kochia present at application was less than 1 inch tall. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TTI nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with 4 replicates.

Treatment	Rate	5/26 Kochia	6/9 Kochia	6/23 Kochia	7/6 Kochia
	oz ai/A	%	%	%	%
Dicamba-C+NIS	8+0.25%	86	97	98	98
Dicamba-C+Imep&Pxsf&Saff+NIS	8+2.3+0.25%	95	99	98	98
Dicamba-C+Flum-EZ+NIS	8+1.25+0.25%	95	99	99	99
Dicamba-C+Flum&Pxsf+NIS	8+2.28+0.25%	95	99	99	99
Dicamba-C+Flum&Metr&Pxsf+NIS	8+5.28+0.25%	95	99	99	99
Dicamba-C+Flum-EZ+Metr+NIS	8+1.25+2+0.25%	95	98	99	99
Dicamba-C+Suen&Metr+NIS	8+5+0.25%	95	99	99	99
Dicamba-C+Suen&Meto+NIS	8+22.8+0.25%	95	99	99	99
Dicamba-C+Flum-EZ+NIS	8+1+0.25%	95	99	99	99
Untreated Check	0	0	0	0	0
CV		2	1	1	1
LSD P=.05		2	1	1	1

Kochia control with dicamba tankmixes was better than dicamba alone on May 26 because tankmix partners each included an herbicide that typically causes rapid tissue necrosis. Kochia control was still less with dicamba alone on June 9 but the rating was 97% or better. Emergence of kochia did not occur after herbicide application, so residual activity could not be evaluated.

Weed control in soybean with Zidua and Engenia tank mixes. (Minot). The objective of the study was to evaluate Zidua and Engenia tank mixes for weed control in soybean. Treatments were applied preemergence (PRE) and/or postemergence at the 2-3 trifoliate stage.

None of the treatments caused significant crop injury. The PRE treatment alone did not provide adequate control of dandelion or yellow foxtail. POST treatments provided excellent dandelion control. Zidua Pro + Roundup applied PRE provided poor kochia control. However, adding Engenia or Metribuzin resulted in excellent kochia control. Zidua Pro + Metribuzin + Roundup did not control foxtail barley. It may be that Metribuzin is antagonizing control of foxtail barley. All treatments provided good to excellent control of lambsquarters. Roundup applied POST was necessary to control late emerging foxtail.

Title. Weed control in soybean with Zidua and Engenia tank mixes. (1737)

			Soybean			Weed Control[e]								
			Injury			Dand		Colq		Foba		Koch		Yeft
Treatment[ab]	Rate	Timing	Jun-24	Jul-1	Jul-31	Jul-1	Jul-31	Jul-1	Jul-31	Jul-1	Jul-31	Jul-1	Jul-31	Jul-31
	(oz/A)		----------						%					
Untreated			0	0	0	0	0	0	0	0	0	0	0	0
Zidua Pro + Rup[c]	4.5 + 32	PRE	0	0	0	42	45	99	84	96	94	65	40	53
Zidua Pro + Eng + Rup[c]	4.5 + 12.8 + 32	PRE	0	0	0	70	62	99	99	88	90	98	99	65
Zidua Pro + Metri + Rup[c]	4.5 + 4 + 32	PRE	0	0	0	45	30	99	99	30	23	97	96	60
Zidua SC + Eng + Rup[c]	2.13 + 12.8 + 32	PRE	0	0	0	66	60	99	92	91	87	98	99	60
Zidua SC + Eng + Rup[c] / Zidua SC + Eng + Rup[d]	2.13 + 12.8 + 32 / 2.13 + 12.8 + 32	PRE / 2-3Tri	5	4	0	94	99	99	99	99	99	99	99	91
Zidua SC + Eng + Pursuit + Rup[c]	2.74 + 12.8 + 3 + 32	PRE	0	0	0	73	73	99	96	95	98	99	97	68
Zidua SC + Eng + Pursuit + Rup[d]	2.74 + 12.8 + 3 + 32	2-3Tri	5	4	0	69	93	99	99	80	93	99	99	95
Zidua SC + Eng + Pursuit + Rup[c] / Zidua SC + Eng	2.74 + 12.8 + 3 + 32 / 2.13 + 12.8	PRE / 2-3Tri	0	0	0	88	99	99	99	94	89	99	99	62
LSD (0.05)			NS	NS	NS	8	10.8	0.3	10.1	13.1	17.1	12.8	6.3	14.4

[a]Rup = Roundup PowerMax; Eng=Engenia; Metri=Metribuzin

[b]All treatments applied with Class Act Ridion (1%)

[c]Applied with MSO (1%)

[d]Applied with NIS (0.25%)

[e]Dand=Dandelion; Colq=Common lambsquarters; Foba=Foxtail barley; Koch=Kochia; Yeft=Yellow foxtail

evaluate weed control and soybean damage from PRE and POST herbicides. Soybeans were seeded on May 10, 2017. PRE treatments were applied on May 11, 2017 at 11:30 AM with 73 F air, 54 F soil, 22% RH, 10% cloud cover, 4-6 mph NW wind, and adequate soil moisture. POST treatments were applied on June 29, 2017 at 9:45 AM with 83 F air, 63 F soil, 75% RH, 90% cloud cover, 0-2 mph NW wind, and adequate soil moisture. Weeds present were: colq 2-4" at 1-2/yd2, rrpw 2-4" at 1-2/yd2, corw 2-4" at 1-2/yd2, wimu 2-4" at 1-2/yd2, wibw 2-4" at 1-2/yd2, cocb 2-4" at 1-2/yd2, and yeft 6-8" at 4-6/ft2 . Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides and 12 gpa through 110015 TTI nozzles for POST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. PRE and POST Programs in Roundup Ready Xtend Soybean 1 (Zollinger, Wirth, Adams).

		PTP							7 DA POST							14 and 42 DA POST						
Treatment[1]	Rate	soy	yeft	wimu	rrpw	colq	corw	cocb	soy	yeft	wimu	rrpw	colq	corw	cocb	soy	yeft	wimu	rrpw	colq	corw	cocb
	(Product/A)	-% inj-	----------% control----------						-% inj-	----------% control----------						-% inj-	----------% control----------					
(PRE) Flum+Trib+Thifen	2oz+0.25oz+0.25oz																					
+AE+FeX	+22floz+22floz	0	42	99	99	94	99	99	0	99	99	99	94	99	99	0	99	99	99	99	99	99
(POST) AE+FeX	22floz+22floz																					
(PRE) Flum+Trib+Thifen	2oz+0.25oz+0.25oz																					
+AE+FeX	+22floz+22floz	0	42	99	99	99	99	99	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(POST) AE+FeX+Cinch	22floz+22floz+1pt																					
(PRE) Flum+Chlor+Thifen	2oz+0.32oz+0.5oz																					
+AE+FeX	+22floz+22floz	0	62	99	99	99	99	99	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(POST) AE+FeX	22floz+22floz																					
(PRE) Flum+Chlor+Thifen	2oz+0.32oz+0.5oz																					
+AE+FeX	+22floz+22floz	0	62	99	99	99	99	99	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(POST) AE+FeX+Cinch	22floz+22floz+1pt																					
(PRE) Flum+Trib+Thifen	2oz+0.25oz+0.25oz																					
+Tricor+AE+FeX	+4oz+22floz+22floz	0	83	99	99	99	99	99	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(POST) AE+FeX	22floz+22floz																					
LSD		0	2	0	0	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0

[1]Flum=Flumioxazin, Trib=Tribenuron, Thifen=Thifensulfuron, Chlor=Chlorimuron, AE=Abundit Edge, FeX=FeXapan

ND to evaluate weed control and soybean damage from PRE and POST herbicides. Soybeans were seeded on May 15, 2017. PRE treatments were applied on May 15, 2017 at 3:30 PM with 80 F air, 59 F soil, 23% RH, 75% cloud cover, 2-4 mph ENE wind, and adequate soil moisture. POST treatments were applied on June 29, 2017 at 8:00 AM with 63 F air, 63.5 F soil, 74% RH, 100% cloud cover, 2-4 mph NW wind, and adequate soil moisture. Weeds present were: colq 0-1" at 1-2/yd2, rrpw 0-1" at 1-2/yd2, yeft 4-8" at 1-2/ft2, wahe 0-1" at 1-2/yd2, wibw 0-1" at 1-2/yd2, wimu 0-1" at 1-2/yd2, and vema 0-1" at 1-2/yd2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides and 12 gpa through 110015 TTI nozzles for POST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. PRE and POST Programs in Roundup Ready Xtend Soybean 2 (Zollinger, Wirth, Adams).

		PTP							7, 14, and 56 DA POST						
Treatment[1]	Rate	soyb	wimu	rrpw	colq	wibw	vema	cocb	soyb	wimu	rrpw	colq	wibw	vema	cocb
	(Product/A)	-% inj-	-% control-						-% inj-	-% control-					
(PRE) Flum+Trib+Thifen	2oz+0.25oz+0.25oz														
+AE+FeX	+22floz+22floz	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(POST) AE+FeX	22floz+22floz														
(PRE) Flum+Trib+Thifen	2oz+0.25oz+0.25oz														
+AE+FeX	+22floz+22floz	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(POST) AE+FeX+Cinch	22floz+22floz+1pt														
(PRE) Flum+Chlor+Thifen	2oz+0.32oz+0.5oz														
+AE+FeX	+22floz+22floz	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(POST) AE+FeX	22floz+22floz														
(PRE) Flum+Chlor+Thifen	2oz+0.32oz+0.5oz														
+AE+FeX	+22floz+22floz	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(POST) AE+FeX+Cinch	22floz+22floz+1pt														
(PRE) Flum+Trib+Thifen	2oz+0.25oz+0.25oz														
+Tricor+AE+FeX	+4oz+22floz+22floz	0	99	99	99	99	99	99	0	99	99	99	99	99	99
(POST) AE+FeX	22floz+22floz														
LSD		0	0	0	0	0	0	0	0	0	0	0	0	0	0

[1]Flum=Flumioxazin, Trib=Tribenuron, Thifen=Thifensulfuron, Chlor=Chlorimuron, AE=Abundit Edge, FeX=FeXapan

ND to evaluate weed control and soybean damage from PRE and POST herbicides. Soybeans were seeded on May 15, 2017. PRE treatments were applied on May 15, 2017 at 3:30 PM with 80 F air, 59 F soil, 23% RH, 75% cloud cover, 2-4 mph ENE wind, and adequate soil moisture. POST treatments were applied on June 20, 2017 at 8:30 AM with 62.5 F air, 62 F soil, 57% RH, 15% cloud cover, 2-5 mph N wind, and adequate soil moisture. Weeds present were: colq 2-3"at 4-6/ft2, rrpw 2-3" at 2-4/ft2, wahe 1-2" at 1-2/yd2, wibw 1-3" at 1-2/yd2, wimu 4-6" at 2-4/yd2, yeft 4-6" at 1-2/ft2, and vema 1-2" at 4-6/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides and 12 gpa through 110015 TTI nozzles for POST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. PRE and POST Programs in Roundup Ready Xtend Soybean 3 (Zollinger, Wirth, Adams).

		14 & 28 DA Planting				42 & 56 DA Planting						
Treatment[1]	Rate	soyb	wimu	rrpw	colq	soyb	wimu	rrpw	colq	wibw	vema	cocb
	(Product/A)	-% inj-	-----% control-----			-% inj-	----------% control----------					
(POST) RUPM+Xtendimax+NIS	32floz+22floz+0.25%v/v	0	0	0	0	0	99	99	99	99	99	99
(PRE) Zidua Pro	4.5floz											
(POST) RUPM+Xtendimax+NIS	32floz+22floz+0.25%v/v	0	99	99	99	0	99	99	99	99	99	99
(PRE) Valor EZ	2.5floz											
(POST) RUPM+Xtendimax+NIS	32floz+22floz+0.25%v/v	0	35	35	35	0	99	99	99	99	99	99
(PRE) Fierce	3oz											
(POST) RUPM+Xtendimax+NIS	32floz+22floz+0.25%v/v	0	65	65	65	0	99	99	99	99	99	99
(PRE) Fierce MTZ	1pt											
(POST) RUPM+Xtendimax+NIS	32floz+22floz+0.25%v/v	0	62	62	62	0	99	99	99	99	99	99
(PRE) Authority MTZ	11oz											
(POST) RUPM+Xtendimax+NIS	32floz+22floz+0.25%v/v	0	99	99	99	0	99	99	99	99	99	99
(PRE) Authority Elite	26floz											
(POST) RUPM+Xtendimax+NIS	32floz+22floz+0.25%v/v	0	95	93	93	0	99	99	99	99	99	99
(PRE) Valor EZ+Metribuzin	2.5floz+0.25lb											
(POST) RUPM+Xtendimax+NIS	32floz+22floz+0.25%v/v	0	43	43	43	0	99	99	99	99	99	99
(PRE) Valor EZ	2floz											
(POST) RUPM+Xtendimax+NIS	32floz+22floz+0.25%v/v	0	33	33	33	0	99	99	99	99	99	99
(PRE) V-10425	12floz											
(POST) RUPM+Xtendimax+NIS	32floz+22floz+0.25%v/v	0	42	42	42	0	99	99	99	99	99	99
(PRE) Valor EZ+V-10463	2floz+23floz											
(POST) RUPM+Xtendimax+NIS	32floz+22floz+0.25%v/v	0	42	42	42	0	99	99	99	99	99	99
LSD		0	6	7	7	0	0	0	0	0	0	0

soybean damage from PRE, EPOST, and LPOST herbicides. Soybeans were seeded on May 10, 2017. PRE treatments were applied on May 11, 2017 at 11:30 AM with 73 F air, 54 F soil, 22% RH, 10% cloud cover, 4-6 mph NW wind, and adequate soil moisture. EPOST treatments were applied on June 12, 2017 at 1:00 PM with 85.5 F air, 70 F soil, 31.9% RH, 0% cloud cover, 5-10 mph NE wind, and adequate soil moisture. Weeds present were: colq 2-4" at 10/ft2, rrpw 1-3" at 20/ft2, corw 2-4" at 5/m2, cocb 1-4" at 5/m2, and yeft 1-2" at 5/m2. LPOST treatments were applied on June 29, 2017 at 10:00 AM with 63 F air, 63 F soil, 75% RH, 90% cloud cover, 0-2 mph NW wind, and adequate soil moisture. Weeds present were: colq 4-6" at 1-2/ft2, corw 4-6" at 2-3/ft2, rrpw 4-6" at 2-4/yd2, cocb 8-10" at 1-2/yd2, yeft 6-8" at 4-6/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides, 12 gpa through 110015 TT nozzles for EPOST herbicides, and 12 gpa through 110015 TTI nozzles for LPOST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. PRE, EPOST, and LPOST Programs in Roundup Ready Xtend Soybean 1 (Zollinger, Wirth, Adams)

		PTP							7, 14, and 28 DA LPOST						
Treatment[1]	Rate	soy	yeft	wimu	rrpw	colq	corw	cocb	soy	yeft	wimu	rrpw	colq	corw	cocb
	(Product/A)	-% inj-	-% control-						-% inj-	-% control-					
(PRE) Boundary	1.8pt														
(LPOST) RUPM+A21472	28.4floz+56.5floz	0	20	20	20	20	20	20	0	99	99	99	99	99	99
+AG13063	+1%v/v														
(PRE) Broadaxe XC	25floz														
(LPOST) RUPM+A21472	28.4floz+56.5floz	0	50	99	93	88	27	22	0	99	99	99	99	99	99
+AG13063	+1%v/v														
(PRE) Prefix	32floz														
(LPOST) RUPM+A21472	28.4floz+56.5floz	0	22	98	52	22	38	22	0	99	98	52	22	38	22
+AG13063	+1%v/v														
(PRE) Boundary	1.8pt														
(LPOST) RUPM+A21472	28.4floz+56.5floz	0	20	20	20	20	20	20	0	99	99	99	99	99	99
+Flexstar +AG13063	+12floz+1%v/v														
(PRE) Broadaxe XC	25floz														
(LPOST) RUPM+A21472	28.4floz+56.5floz	0	53	99	99	83	33	27	0	99	99	99	99	99	99
+Flexstar +AG13063	+12floz+1%v/v														
(PRE) Valor	3oz														
(LPOST) RUPM+Xtendimax	28.4floz+22floz	0	20	40	63	53	25	25	0	99	99	99	99	99	99
+AG13063	+1%v/v														
(EPOST) RUPM+A21472	28.4floz+56.5floz														
+AG13063	+1%v/v	0	0	0	0	0	0	0	0	99	99	99	99	99	99
(EPOST) RUPM+Xtendimax	28.4floz+22floz														
+AG13063	+1%v/v	0	0	0	0	0	0	0	0	99	99	99	99	99	99
(PRE) Verdict	5floz														
(LPOST) RUPM+Xtendimax	28.4floz+22floz	0	27	43	43	43	43	43	0	99	99	99	99	99	99
+AG13063	1%v/v														
(PRE) Zidua	2oz														
(EPOST) RUPM+Xtendimax	28.4floz+22floz	0	20	20	20	20	20	20	0	99	99	99	99	99	99
+AG13063	1%v/v														
LSD		0	7	4	8	6	10	7	0	1	2	2	2	2	0

[1]RUPM=Roundup Powermax

Soybean PRE Herbicide Activation

Mike Ostlie and Greg Endres

A study was conducted over the 2016 and 2017 growing season to determine the consequences of delayed herbicide activation in soybeans. The study was conducted under a center pivot irrigation system to supply 0.5" of water to some of the treatments. The study consisted of three environments; a conventional and no-till site in 2016 and a conventional till site in 2017. The weeds present were redroot pigweed, common lambsquarters and kochia (2017 only). The herbicide treatments were metribuzin, Fierce, and Spartan, representing some of the most commonly used active ingredients in soybeans. Activation strategies included watering within 24 of herbicide treatment, watering 7 days after herbicide treatment, not watering at all, or using a rotary hoe to mechanically activate the products 7 days after application. In both years, there was sufficient delay in natural rainfall to evaluate treatment differences. In 2016 there was a 16 day delay in activating rain (1.49") and 22 day delay in 2017 (0.79"). In both seasons, there were small intermittent rainfall events prior to the activation rainfall.

A common understanding about PRE activation is that smaller rainfall events totaling ~0.25" or more are not sufficient to activate a herbicide. This study provides further evidence that this is the case. In 2017, there was a rain event 6 and 7 days after herbicide application that totaled 0.19" in that 48 hour period, to go along with 0.09" total the following 7 days, yet herbicide performance was less in 2017 in treatments without irrigation water. Even though the total was 0.28", the products were not activated until the 0.79" rainfall 22 DAT.

There was no decrease in herbicide efficacy with a 7 day delay in activation (Table 1). When averaged across herbicides, there was also no difference between mechanical incorporation and no activation strategy, except that mechanical incorporation decreased redroot pigweed control.

Fierce and Spartan were the most resilient products (Table 2). Metribuzin activity varied greatly with activation strategy which resulted in overall less weed control, however, metribuzin did out-perform Spartan across activation strategies. Fierce and Spartan performed similar to each other in this comparison.

When comparing all treatment combinations there are a few contrasts that stand out. For redroot pigweed and lambsquarters, Fierce was the most consistent performer (Table 3), with little or no decline in activity. Fierce activity to kochia did decline sharply when activation was absent or done mechanically. Spartan activity also sharply declined under the same circumstances. Metribuzin was an anomaly with kochia though I think there may be an explanation. Rotary hoeing was normally a bad decision with metribuzin (see redroot pigweed and lambsquarters), but control of kochia increases with mechanical incorporation. With only a single environment with kochia, the circumstances may have been unique. As noted above, there was a total of 0.19" or rainfall between 6 and 7 days after application. Mechanical incorporation occurred 7 DAT. I believe that was enough moisture to cause kochia germination (but not the other species) so the physical disturbance terminated the kochia rather than the herbicide. For the other species, the drop in control with mechanical incorporation may be due to planting weeds seeds while also not activating the product. Overall, metribuzin performance decreased the quickest with delayed activation. Data from this trial suggests a need to revisit any recommendation relating to mechanical incorporation of herbicides, with special attention to specific weed species and soil moisture status/precipitation.

Table 1. The effect of herbicide activation strategies on weed control

Activation	Redroot Pigweed	Lambsquarters	Kochia
	% control	% control	% control
Irrigation 1 DAT	91.5	92.6	54.6
Irrigation 7 DAT	85.0	89.3	60
Rotary Hoe[2] 7 DAT	64.3	72.5	32.1
No Water	73.1	75.0	26.3
LSD (0.05)	6.8	8.3	7.3

Table 2. Herbicide performance averaged across activation strategy

Herbicide	Redroot Pigweed	Lambsquarters	Kochia
	% control	% control	% control
metribuzin	59.5	67.6	47.2
Fierce	90.1	86.7	42.8
Spartan	85.7	92.7	39.7
LSD (0.05)	5.9	8.6	6.3

Table 3. Breakdown of each treatment combination's effectiveness at weed control

Activation	Herbicide	Redroot Pigweed	Lambsquarters	Kochia
		% control	% control	% control
Irrigation 1 DAT	metribuzin	85.4	92.3	38.8
Irrigation 7 DAT	metribuzin	77.0	86.3	38.8
Rotary Hoe[2] 7 DAT	metribuzin	25.8	36.3	71.3
No Water	metribuzin	49.6	55.6	40.0
Irrigation 1 DAT	Fierce	96.1	87.5	62.5
Irrigation 7 DAT	Fierce	85.8	86.9	71.3
Rotary Hoe[2] 7 DAT	Fierce	89.9	88.1	22.5
No Water	Fierce	88.8	84.4	15.0
Irrigation 1 DAT	Spartan	92.9	98.0	62.5
Irrigation 7 DAT	Spartan	92.1	94.9	70.0
Rotary Hoe[2] 7 DAT	Spartan	77.0	93.0	2.5
No Water	Spartan	80.8	85.0	23.8
LSD (0.05)		8.4	9.7	12.7

PRE and POST Programs in Roundup Ready Soybean 1. Richard K. Zollinger, Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and soybean injury from PRE and POST herbicides. PRE treatments were applied on May 11, 2017 at 11:30 AM with 73 F air, 54 F soil at a four inch depth, 22% RH, 10% cloud cover, 4-6 mph NW wind, and adequate soil moisture. POST treatments were applied on June 20, 2017 at 10:00 AM with 65 F air, 65 F soil at a four inch depth, 41% RH, 40% cloud cover, 5-8 mph NE wind, and adequate soil moisture. Weeds present at the time of POST applications were: corw 1-2" at 1-2/yd2, yeft 4-6" at 4-8/ft2, rrpw 1-2" at 1-2/yd2, cocb 4-6" at 2-4/yd2, colq 1-2" at 1-2/yd2, wibw 1-2" at 1-2/yd2, and wimu 1-2" at 1-2/ yd2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE application and 8.5 gpa through 11001 TT nozzles for POST application all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. PRE and POST Programs in Roundup Ready Soybean 1 (Zollinger, Wirth, Adams).

		PTP							14, 28, and 42 DAA						
Treatment	Rate	soy	yeft	wimu	rrpw	colq	corw	cocb	soy	yeft	wimu	rrpw	colq	corw	cocb
	(Product/A)	-% inj-	----------% control----------						-% inj-	----------% control----------					
(PRE) Sonic	3oz														
(POST) Durango+28%N	24floz+2.5%v/v	0	45	99	99	55	27	18	0	99	99	99	99	99	99
(PRE) Sonic	4.5oz														
(POST) Durango+28%N	24floz+2.5%v/v	0	50	99	37	47	63	23	0	99	99	99	99	99	99
(PRE) Sonic	3oz														
(POST) FirstRate+Durango+28%N	0.3oz+24floz+2.5%v/v	0	22	99	99	35	23	22	0	99	99	99	99	99	99
(PRE) Surveil	2.8oz														
(POST) Durango+28%N	24floz+2.5%v/v	0	68	99	99	93	43	42	0	99	99	99	99	99	99
(PRE) Surveil	4.2oz														
(POST) Durango+28%N	24floz+2.5%v/v	0	23	99	99	85	43	38	0	99	99	99	99	99	99
LSD		0	6	0	2	9	5	3	0	0	0	0	0	0	0

evaluate weed control and soybean damage from PRE and POST herbicides. Soybeans were seeded on May 15, 2017. PRE treatments were applied on May 15, 2017 at 3:30 PM with 80 F air, 59 F soil, 23% RH, 75% cloud cover, 2-4 mph ENE wind, and adequate soil moisture. POST treatments were applied on June 29, 2017 at 8:00 AM with 63 F air, 63.5 F soil, 74% RH, 100% cloud cover, 2-4 mph NW wind, and adequate soil moisture. Weeds present were: colq 2-4"at 1-2/ft2, rrpw 3-5" at 3-4/ft2, wahe 3-6" at 1-2/ft2, wibw 4-6" at 1-2/yd2, wimu 4-6" at 1-2/yd2, yeft 2-6" at 1-2/ft2, and vema 2-6" at 4-6/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides and 8.5 gpa through 11001 TT nozzles for POST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. PRE and POST Programs in Roundup Ready Soybean 2 (Zollinger, Wirth, Adams).

		PTP				14 and 56 DA POST				
Treatment	Rate	soyb	wimu	rrpw	colq	soyb	wimu	rrpw	colq	vemo
	(Product/A)	-% inj-	----% control-----			-% inj-	---------% control---------			
(PRE) Sonic	3oz									
(POST) Durango+28%N	24floz+2.5%v/v	0	99	52	52	0	99	99	99	76
(PRE) Sonic	4.5oz									
(POST) Durango+28%N	24floz+2.5%v/v	0	99	57	55	0	99	99	99	67
(PRE) Sonic	3oz									
(POST) FirstRate+Durango+28%N	0.3oz+24floz+2.5%v/v	0	99	48	48	0	99	99	99	78
(PRE) Surveil	2.8oz									
(POST) Durango+28%N	24floz+2.5%v/v	0	99	53	53	0	99	99	99	99
(PRE) Surveil	4.2oz									
(POST) Durango+28%N	24floz+2.5%v/v	0	99	68	68	0	99	99	99	99
LSD		0	0	9	8	0	0	0	0	4

ɪmmon ragweed control with Authority MTZ and Command. Richard K. Zollinger, Devin A. Wirth, Jason W. Adams. An ɹperiment was conducted near Mayville, ND to evaluate common ragweed control using Authority MTZ and Command. ɪybeans were seeded on May 19, 2017. PRE treatments were applied on May 19, 2017 at 12:40 PM with 58.2 F air, 50 F soil a ⁻our inch depth, 17% RH, 70% cloud cover, 5-8 mph E wind, and adequate soil moisture. Soil characteristics were: 23.1% sanc ⁻% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots ⁻th a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles at 40 psi. The experiment had a randomized ɪmplete block design with three replicates per treatment.

ɪe addition of Command slightly increased common ragweed control. As rates of Authority MTZ and Command increased, so ɖ common ragweed control.

ble. Common ragweed control with Authority MTZ and Command (Zollinger, Wirth, Adams)

		14 DAA			14 DA Emergence			28, 42, and 56 DA Emergence		
ɛatment	Rate	rrpw	colq	corw	rrpw	colq	corw	rrpw	colq	corw
	(Product/A)	------% control------			------% control------			------% control------		
⁻thority MTZ	10oz	99	99	35	72	72	28	87	87	28
242-1	9.5floz	99	99	35	70	60	27	90	90	27
⁻thority MTZ	14oz	99	99	45	92	70	33	90	90	43
242-1	13.5floz	99	99	47	90	75	27	90	92	35
ɪthority MTZ+Command	10oz+6.5floz	99	99	57	75	75	55	90	90	40
ɪthority MTZ+Command	14oz+6.5floz	99	99	70	99	99	70	99	99	73
ɪthority MTZ+Command	10oz+13floz	99	99	73	99	99	70	99	99	68
ɪthority MTZ+Command	14oz+13floz	99	99	76	99	99	83	99	99	72
ɪthority MTZ+Command	10oz+20floz	99	99	73	99	99	82	99	99	82
ɪthority MTZ+Command	14oz+20floz	99	99	83	99	99	88	99	99	90
D		0	0	7	4	5	5	2	2	5

Glufosinate Programs in Liberty Link Soybean 1: Richard K. Zollinger, Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and soybean damage from PRE, EPOST, and LPOST herbicides. Soybeans were seeded on May 10, 2017. PRE treatments were applied on May 11, 2017 at 11:30 AM with 73 F air, 54 F soil, 22% RH, 10% cloud cover, 4-6 mph NW wind, and adequate soil moisture. EPOST treatments were applied on June 12, 2017 at 11:30 AM with 85.5 F air, 70 F soil, 31.9% RH, 0% cloud cover, 5-10 mph NE wind, and adequate soil moisture. Weeds present were: corw 1-3" at 3-4/ft2, yeft 1-3" at 20/ft2, and rrpw 1-2" at 3/m2. LPOST treatments were applied on June 29, 2017 at 10:00 AM with 83 F air, 63 F soil, 75% RH, 90% cloud cover, 0-2 mph NW wind, and adequate soil moisture. Weeds present were: corw 1-3" at 3-4/ft2, yeft 1-3" at 20/ft2, and rrpw 1-2" at 1-2/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides, 17 gpa through 11002 TT nozzles for POST and LPOST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Liberty is week on grasses as observed in this trial. However, Authority MTZ and Authority First followed by Liberty applications resulted in 99% yellow foxtail control.

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

		10 DA Emergence						10 DA EPOST							10 DA LPOST						
Treatment[1]	Rate	soy	yeft	wimu	rrpw	colq	corw	soy	yeft	wimu	rrpw	colq	corw	cocb	soy	yeft	wimu	rrpw	colq	corw	cocb
	(Product/A)	-% inj-	-% control-					-% inj-	-% control-						-% inj-	-% control-					
(PRE) Authority First	6.5oz																				
(EPOST) Liberty+AMS	32floz+3lb	0	50	99	99	99	99	0	57	99	99	99	99	99	0	57	99	99	99	99	99
(LPOST) Liberty+AMS	32floz+3lb																				
(PRE) Authority First	6.5oz																				
(EPOST) Liberty+AMS	43floz+3lb	0	50	99	99	99	99	0	23	99	99	99	99	99	0	99	99	99	99	99	99
(LPOST) Liberty+AMS	43floz+3lb																				
(PRE) Authority First	6.5oz																				
(EPOST) Liberty+AMS	32floz+3lb	0	50	99	99	99	99	0	73	92	99	99	99	99	0	73	92	99	99	99	99
(PRE) Authority First	6.5oz																				
(EPOST) Liberty+AMS	43floz+3lb	0	50	99	99	99	99	0	88	99	99	99	99	99	0	88	99	99	99	99	99
(PRE) Authority First	6.5oz																				
(EPOST) Liberty+Warrant+AMS	32floz+3pt+3lb	0	50	99	99	99	99	0	58	99	99	99	99	99	0	58	99	99	99	99	99
(PRE) Authority First	6.5oz																				
(EPOST) Liberty+Outlook+AMS	32floz+21floz+3lb	0	50	99	99	99	99	0	77	99	99	99	99	99	0	77	99	99	99	99	99
(PRE) Authority First	6.5oz																				
(EPOST) Liberty+Dual II Mag+AMS	32floz+2pt+3lb	0	50	99	99	99	99	0	88	99	99	99	99	99	0	88	99	99	99	99	99
(PRE) Authority First	6.5oz																				
(EPOST) Liberty+AMS	32floz+3lb	0	50	99	99	99	99	0	30	20	99	99	52	43	33	99	99	99	99	99	99
(LPOST) Liberty+AMS	43floz+3lb																				
LSD		0	0	0	0	0	0	0	13	8	0	0	2	2	2	8	8	0	0	0	0

Glufosinate Programs in Liberty Link Soybean 2: Richard K. Zollinger, Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and soybean damage from PRE, EPOST, and LPOST herbicides. Soybeans were seeded on May 10, 2017. PRE treatments were applied on May 11, 2017 at 1:30 PM with 73 F air, 54 F soil, 22% RH, 10% cloud cover, 4-6 mph NW wind, and adequate soil moisture. POST treatments were applied on June 12, 2017 at 2:00 PM with 85.5 F air, 70 F soil, 31.9% RH, 0% cloud cover, 5-10 mph NE wind, and adequate soil moisture. Weeds present were: colq 2-4" at 2/ft2, wimu 2-4" at 2/ft2, corw 2-4" at 5/ft2, and yeft 1-2" at 20/ft2. LPOST treatments were applied on June 29, 2017 at 10:00 AM with 83 F air, 63 F soil, 75% RH, 90% cloud cover, 0-2 mph NW wind, and adequate soil moisture. Weeds present were: colq 1-2" at 1-2/ft2, corw 2-4" at 1-2/ft2, yeft 3-4" at 20/ft2, and wimu 2-4" at 3-4/ft2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides, 17 gpa through 11002 TT nozzles for POST and LPOST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Glufosinate Programs in Liberty Link Soybean 2 (Zollinger, Wirth, Adams).

		Prior to POST						42 DA Emergence						56 DA Emergence					
Treatment	Rate	soy	yeft	wimu	rrpw	colq	corw	soy	yeft	wimu	rrpw	colq	corw	soy	yeft	wimu	rrpw	colq	corw
	(Product/A)	-% inj-	----------% control----------					-% inj-	----------% control----------					-% inj-	----------% control----------				
(EPOST) Liberty+AMS	29floz+2.5lb																		
(LPOST) Liberty+Select Max	29floz+9floz	0	0	0	0	0	0	25	99	99	99	99	99	18	99	99	99	99	99
+NIS+AMS	+0.25%v/v+2.5lb																		
(PRE) Fierce	3 oz																		
(EPOST) Liberty+AMS	29floz+2.5lb																		
(LPOST) Liberty+Select Max	29floz+9floz	0	28	99	99	99	23	0	99	99	99	99	99	0	99	99	99	99	99
+NIS+AMS	+0.25%v/v+2.5lb																		
(EPOST) Liberty+Resource	29floz+4floz																		
+NIS+AMS	+0.25%v/v+2.5lb																		
(LPOST) Liberty+Select Max	29floz+9floz	0	0	0	0	0	0	30	99	99	99	99	99	23	99	99	99	99	99
+NIS+AMS	+0.25%v/v+2.5lb																		
(EPOST) Liberty+Cobra	29floz+12.5floz																		
+NIS+AMS	+0.25%v/v+2.5lb																		
(LPOST) Liberty+Select Max	29floz+9floz	0	0	0	0	0	0	0	99	99	99	99	99	0	99	99	99	99	99
+NIS+AMS	+0.25%v/v+2.5lb																		
LSD		0	3	0	0	0	3	0	0	0	0	0	0	3	0	0	0	0	0

Glufosinate Programs in Liberty Link Soybean 3. Richard K. Zollinger, Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control and soybean injury from PRE, EPOST, and LPOST herbicides. Soybeans were planted on May 10, 2017. PRE treatments were applied on May 11, 2017 at 11:30 AM with 73 F air, 54 F soil at a four inch depth, 22% RH, 10% cloud cover, 4-6 mph NW wind, and adequate soil moisture. EPOST treatments were applied on June 12, 2017 at 2:00 PM with 85.5 F air, 70 F soil at a four inch depth, 31.9% RH, 0% cloud cover, 5-10 mph NE wind, and adequate soil moisture. Weeds present at the time of EPOST applications were: WIMU 2-4" at 5/ft2, corw 2-4" at 5/ft2, yeft 1-3" at 5/ft2, and colq 1-2" at 5/ft2. LPOST treatments were applied on June 29, 2017 at 10:00 AM with 83 F air, 63 F soil at a four inch depth, 75% RH, 90% cloud cover, 0-2 mph NW wind, and adequate soil moisture. Weeds present at the time of LPOST were: wimu 2-4" at 1-2/ft2, corw 2-4" at 2-4/ft2, yeft 2-4" at 20/ft2, colq 1-3" at 2-4/ft2, and cocb 1-3" at 1-2/yd2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE and 11002 TT nozzles for EPOST and LPOST, all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Glufosinate Programs in Liberty Link Soybean 2 (Zollinger, Wirth, Adams).

		42 DA PRE								56 DA PRE							
Treatment[1]	Rate	soy	yeft	wimu	rrpw	colq	hans	corw	cocb	soy	yeft	wimu	rrpw	colq	hans	corw	cocb
	(Product/A)	-% inj-	----------% control----------							-% inj-	----------% control----------						
(EPOST) Liberty+AMS	29floz+2.5lb																
(LPOST) Liberty+Select Max	29floz+9floz	0	65	82	80	79	91	79	70	20	99	99	99	99	99	99	99
+NIS+AMS	+0.25%v/v+2.5lb																
(PRE) Fierce	3oz																
(EPOST) Liberty+AMS	29floz+2.5lb																
(LPOST) Liberty+Select Max	29floz+9floz	0	81	99	99	99	99	99	99	0	99	99	99	99	99	99	99
+NIS+AMS	+0.25%v/v+2.5lb																
(PRE) Boundary	2pt																
(EPOST) Liberty+AMS	29floz+2.5lb																
(LPOST) Liberty+Select Max	29floz+9floz	0	77	99	99	99	99	99	99	0	99	99	99	99	99	99	99
+NIS+AMS	+0.25%v/v+2.5lb																
(PRE) Authority Elite	25floz																
(EPOST) Liberty+AMS	29floz+2.5lb																
(LPOST) Liberty+Select Max	29floz+9floz	0	72	72	99	99	99	73	73	0	99	99	99	99	99	99	99
+NIS+AMS	+0.25%v/v+2.5lb																
(PRE) Zidua Pro	4.5floz																
(EPOST) Liberty+AMS	29floz+2.5lb																
(LPOST) Liberty+Select Max	29floz+9floz	0	72	99	99	99	99	99	99	0	99	99	99	99	99	99	99
+NIS+AMS	+0.25%v/v+2.5lb																
(PRE) Fierce MTZ	1pt																
(EPOST) Liberty+AMS	29floz+2.5lb																
(LPOST) Liberty+Select Max	29floz+9floz	0	83	99	99	99	99	99	99	0	99	99	99	99	99	99	99
+NIS+AMS	+0.25%v/v+2.5lb																
(PRE) Fierce	3.75oz																
(EPOST) Liberty+AMS	29floz+2.5lb																
(LPOST) Liberty+Select Max	29floz+9floz	0	87	99	99	99	99	99	99	0	99	99	99	99	99	99	99
+NIS+AMS	+0.25%v/v+2.5lb																
LSD		0	13	3	0	1	3	4	2	0	0	0	0	0	0	0	0

weed control and soybean damage from PRE and POST herbicides. Soybeans were seeded on May 15, 2017. PRE treatments were applied on May 15, 2017 at 3:30 PM with 80 F air, 59 F soil, 23% RH, 75% cloud cover, 2-4 mph ENE wind, and adequate soil moisture. POST treatments were applied on June 12, 2017 at 3:15 PM with 82.4 F air, 70 F soil, 27% RH, 25% cloud cover, 5-10 mph NE wind, and adequate soil moisture. Weeds present were: colq 1-2" at 5/ft2, rrpw 1-2" at 1/ft2, yeft 1-2" at 10/ft2, and wahe 1-3" at 1-2/yd2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides and 17gpa through 11002 TT nozzles for POST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates per treatment.

Table. Glufosinate Programs in Liberty Link Soybean 4 (Zollinger, Wirth, Adams).

		PTP					14 DA POST					28 & 42 DA POST				
Treatment[1]	Rate	soyb	wimu	rrpw	colq	vemo	soyb	wimu	rrpw	colq	vemo	soyb	wimu	rrpw	colq	vemo
	(Product/A)	-% inj-	----------% control----------				-% inj-	----------% control----------				-% inj-	----------% control----------			
(PRE) Chlor+Thifen+Flum	0.32oz+0.5oz+2oz															
(POST) Liberty+Cinch+AMS	29floz+1pt+3lb	0	75	75	72	57	0	99	99	99	99	0	99	99	99	99
(PRE) Chlor+Thifen+Flum	0.32oz+0.5oz+2oz															
+Zidua	+1.5oz	0	99	98	98	65	0	99	98	98	99	0	99	98	98	99
(POST) Liberty+Cinch+AMS	29floz+1pt+3lb															
(PRE) Chlor+Thifen+Flum	0.32oz+0.5oz+2oz															
+Metri	+6oz	0	99	95	88	63	0	99	99	99	99	0	99	99	99	99
(POST) Liberty+Cinch+AMS	29floz+1pt+3lb															
(PRE) Thifen+Trib+Flum	0.25oz+0.25oz+2oz															
(POST) Liberty+AMS	29floz+3lb	0	68	77	70	47	0	99	99	99	99	0	99	53	53	32
(PRE) Thifen+Trib+Flum	0.25oz+0.25oz+2oz															
(POST) Liberty+Cinch+AMS	29floz+1pt+3lb	0	99	82	72	45	0	99	99	99	99	0	99	99	70	42
(PRE) Thifen+Trib+Flum	0.25oz+0.25oz+2oz															
+Zidua	+1.5oz	0	99	90	87	52	0	99	99	99	99	0	99	99	99	99
(POST) Liberty+Cinch+AMS	29floz+1pt+3lb															
(PRE) Thifen+Trib+Flum	0.375oz+0.375oz+3oz															
(POST) Liberty+Cinch+AMS	29floz+1pt+3lb	0	99	70	70	55	0	99	99	99	99	0	99	99	99	78
(PRE) Authority Elite	25floz															
(POST) Liberty+Cinch+AMS	29floz+1pt+3lb	0	53	53	53	28	0	99	99	99	99	0	86	93	73	77
LSD		0	8	8	8	13	0	0	1	1	0	0	1	3	2	4

[1] Chlor=chlorimuron, Thifen=Thifensulfuron, Flum=Flumioxazin, Metri=Metribuzin, Trib=Tribenuron

Weed control with increased Liberty rates in soybean. (Minot). The objective of the study was to evaluate weed control with Liberty applied at different timings, rates, and tank mixes. Treatments were applied preemergence (PRE), to 3-inch weeds, 6-inch weeds, or prior to bloom.

Treatments with late POST applications or split POST applications provided excellent control of all weeds. A PRE followed by a single early POST application provided fair to good weed control.

Title. Weed control with increased Liberty rates in soybean. (1736)												
			Soybean		Weed Control[b]							
			Injury		Colq		Howe		Wibw		Yeft	
Treatment[ab]	Rate	Timing	Jul-2	Jul-31	Jul-2	Jul-31	Jul-2	Jul-31	Jul-2	Jul-31	Jul-2	Jul-31
			——%——		----------%----------							
Untreated			0	0	0	0	0	0	0	0	0	0
Spartan Ch / Liberty / Liberty	5 oz / 32 oz / 32 oz	PRE / <3" weeds / <3" weeds	4	0	98	99	95	99	98	99	83	99
Spartan Ch / Liberty / Liberty	5 oz / 43 oz / 43 oz	PRE / 6" weeds / prior bloom	9	0	87	99	84	99	95	99	77	99
Spartan Ch / Liberty	5 oz / 32 oz	PRE / <3" weeds	3	0	99	93	98	81	99	99	85	76
Spartan Ch / Liberty	5 oz / 43 oz	PRE / 6" weeds	8	0	89	86	86	99	95	99	76	91
Spartan Ch / Liberty + Warrant	5 oz / 32 oz + 3 pt	PRE / <3" weeds	5	0	96	91	87	84	99	99	81	75
Spartan Ch / Liberty + Outlook	5 oz / 32 oz + 21 oz	PRE / <3 weeds	17	0	98	94	99	90	99	99	91	78
Spartan Ch / Liberty + Dual II Mag	5 oz / 32 oz + 2 pt	PRE / <3" weeds	25	0	98	99	93	96	98	99	86	76
Spartan Ch / Liberty / Liberty	5 oz / 32 oz / 43 oz	PRE / 6" weeds / prior bloom	7	0	88	99	81	99	95	99	77	99
LSD (0.05)			3.6	NS	5.9	13.6	12.1	10.3	1.5	NS	3.2	4.8
[a]*Liberty applied with AMS (8.2 gal/100 gal)*												
[b]*Spartan Ch=Spartan Charge*												
[c]*Colq=Common lambsquarters; Howe=Horseweed; Wibw=Wild buckwheat; Yeft=Yellow foxtail*												

yphosate Resistant Common Ragweed Control with Glufosinate Programs. Richard K. Zollinger, Devin A. Wirth, Jason W. lams. An experiment was conducted near Mayville, ND to evaluate weed control and soybean injury from PRE and POST ıfosinate herbicides. Soybeans were planted on May 19, 2017. PRE treatments were applied on May 19, 2017 at 12:35 PM th 58.2 F air, 50 F soil at a four inch depth, 17% RH, 70% cloud cover, 5-8 mph E wind, and adequate soil moisture. POST ɜatments were applied on June 20, 2017 at 2:15 PM with 72 F air, 80 F soil at a four inch depth, 43% RH, 30% cloud cover, 2-3 ɔh NNE wind, and adequate soil moisture. Weeds present at the time of POST applications were: corw 2-4" at 1-3/yd2, and lq 1-2" at 1-2/yd2. Soil characteristics were: 23.1% sand, 52% silt, 24.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments ɜre applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa through 110(l nozzles for PRE and POST applications all at 40 psi. The experiment had a randomized complete block design with three plicates per treatment.

'P and PRE applications followed by all POST applications provided excellent weed control.

ɔle. Glyphosate Resistant Common Ragweed Control with Glufosinate Programs (Zollinger, Wirth, Adams).

		Prior to EPOST			28 DA EPOST			42 DA EPOST		
ɜatment	Rate	rrpw	colq	corw	rrpw	colq	corw	rrpw	colq	corw
	(Product/A)	------% control------			-----% control-----			------% control-----		
'P) Panther Pro	12floz									
ɔST) Cheetah+Warrant+AMS	29floz+48floz+3lb	99	99	93	99	99	98	99	99	98
ɪE) Authority Assist	8floz									
ɔST) Cheetah+Warrant+AMS	29floz+48floz+3lb	95	95	66	99	99	94	99	99	94
ɪE) Panther Pro	12floz									
ɔST) Cheetah+Warrant+AMS	29floz+48floz+3lb	99	99	96	99	99	98	99	99	98
ɪE) Panther Pro	12floz									
ɔST) Cheetah+AMS	29floz+3lb	99	99	96	99	99	99	99	99	99
'OST) Cheetah+AMS	29floz+3lb									
ɪE) NUP-17039	12floz									
ɔST) Cheetah+Warant+AMS	29floz+48floz+3lb	99	99	98	99	99	98	99	99	98
ɔ		4	4	3	0	0	2	0	0	2

PO Herbicide Applications on Suspected PPO Resistant Common Ragweed . Richard K. Zollinger, Devin A. Wirth, Jason W. dams. An experiment was conducted near Mapleton, ND to evaluate PPO herbicide applications on suspected PPO resistant mmon ragweed. PRE treatments were applied on May 5, 2017 at 9:50 AM with 77.2 F air, 48 F soil, 28% RH, 10% cloud cover 10 mph W wind, and adequate soil moisture. EPOST treatments were applied on June 16, 2017 at 11:50 AM with 83 F air, 54 il, 47% RH, 25% cloud cover, 3-4 mph WNW wind, and adequate soil moisture. Weeds present were: corw 2" at 2-3/yd2. OST treatments were applied on June 29, 2017 at 1:30 PM with 75 F air, 64F soil, 72% RH, 90% cloud cover, 1-2 mph NW ind, and adequate soil moisture. Weeds present were: corw 1-4" at 0-3/yd2. Soil characteristics were: 23.1% sand, 52% silt, 4.9% clay, Silt Loam, 4.5% OM, and 7.7 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a ckpack-type plot sprayer delivering 17 gpa through 11002 TTI nozzles for PRE herbicides and 17 gpa through 11002 TT nozzle r EPOST, and LPOST herbicides all at 40 psi. The experiment had a randomized complete block design with three replicates pe eatment.

arpen provided excellent common ragweed control. Flexstar and Cobra both provided poor weed control alone. EPOST llowed by LPOST applications resulted in excellent common ragweed control.

ble. PPO herbicide applications on suspected PPO resistant common ragweed (Zollinger, Wirth, Adams).

		Prior to LPOST	14 DA LPOST
eatment[1]	Rate	Corw	Corw
	(Product/A)	-% control-	-% control-
RE) Authority MTZ+Command	15oz+2pt	3	10
RE) Valor EZ+Metribuzin+Command	2.5floz+0.33lb+2pt	12	12
POST) RUPM+AMS	32floz+8.5lb/100gal	13	77
POST) Permit+MSO	0.67oz+1.5pt	0	23
PSOT) FirstRate+MSO	0.75oz+1.5pt	0	33
POST) Flexstar+MSO	1pt+1.5pt	35	42
POST) Cobra+MSO	12.5floz+1.5pt	50	52
PSOT) Sharpen+MSO	3floz+1.5pt	95	99
POST) RUPM+Flexstar+HSOC+AMS	32floz+1pt+1.5pt+8.5lb/100gal		
POST) RUPM+Flexstar+HSOC+AMS	32floz+1pt+1.5pt+8.5lb/100gal	28	99
POST) RUPM+Cobra+HSOC+AMS	32floz+12.5floz+1.5pt+8.5lb/100gal		
POST) RUPM+Cobra+HSOC+AMS	32floz+12.5floz+1.5pt+8.5lb/100gal	37	99
POST) RUPM+Sharpen+HSOC+AMS	32floz+3floz+1.5pt+8.5lb/100gal		
POST) RUPM+Sharpen+HSOC+AMS	32floz+3floz+1.5pt+8.5lb/100gal	95	99
POST) RUPM+Cobra+HSOC+AMS	32floz+12.5floz+1.5pt+8.5lb/100gal		
POST) RUPM+Flexstar+HSOC+AMS	32floz+1pt+1.5pt+8.5lb/100gal	63	99
D		9	6

UPM = Roundup Powermax; HSOC = Hybrid HSMOC

Adjuvant enhancement of PGR-technologies for ragweed control. Dr. Howatt, Mettler, and Harrington. Treatments were applied in an non-cropped area to 4 to 6 inch Venice mallow, 8 to 12 inch wild buckwheat, 6 to 10 inch common lambsquarters, flowering wild mustard, and 6 to 8 inch common ragweed on June 26 with 63°F, 58% relative humidity, 0% cloud cover, 3.5 mph wind velocity at 280°, and dry soil at 60°F. Treatments were applied with a backpack sprayer delivering 12 gpa at 40 psi through TTI 110015 nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with 4 replicates.

Treatment	Rate	7/03 wimu	7/03 wibw	7/03 corw	7/03 colq	7/03 vema	7/06 wimu	7/06 wibw	7/06 corw	7/06 colq	7/06 vema
	oz ae/A	%	%	%	%	%	%	%	%	%	%
Dica-E+Glyt-4.5	8+12	85	80	70	70	65	88	84	80	85	83
Dica-E+Glyt-4.5+817Z	8+12+0.25%	85	80	70	70	65	91	84	80	83	81
Dica-E+Glyt-4.5+817H	8+12+0.25%	85	80	70	70	65	90	84	80	85	81
Dica-E+Glyt-4.5+NIS	8+12+0.25%	85	80	70	70	65	95	85	80	86	83
Dica-E+Glyt-4.5+Destiny HC	8+12+1%	85	80	70	70	65	92	85	80	86	83
CV		0	0	0	0	0	2	3	0	3	3
LSD P=.05		.	.	.	.	.	3	4	.	4	3

Treatment	Rate	7/12 wimu	7/12 wibw	7/12 corw	7/12 colq	7/12 vema	7/18 wimu	7/18 wibw	7/18 corw	7/18 colq	7/18 vema
	oz ae/A	%	%	%	%	%	%	%	%	%	%
Dica-E+Glyt-4.5	8+12	98	96	96	96	88	99	95	91	93	89
Dica-E+Glyt-4.5+817Z	8+12+0.25%	99	96	95	97	91	99	98	96	97	93
Dica-E+Glyt-4.5+817H	8+12+0.25%	99	95	93	97	91	99	97	92	93	91
Dica-E+Glyt-4.5+NIS	8+12+0.25%	99	94	95	98	91	99	97	94	97	89
Dica-E+Glyt-4.5+Destiny HC	8+12+1%	98	97	96	97	94	99	98	94	97	93
CV		1	4	2	2	4	0	2	2	2	2
LSD P=.05		1	5	3	3	5	.	2	3	3	3

Control was similar across treatments within species 1 week after application. Control ranged from 65% for Venice mallow to 85% for wild mustard. Control across treatments with adjuvant were generally similar. At later evaluation, control by herbicides with adjuvant was slightly better than without adjuvant. Treatment that contained 817Z consistently provided the highest control on July 18. Control of each species did not change for two more evaluation dates.

Adjuvant enhancement of PGR-Technologies on waterhemp. Dr. Howatt, Mettler, and Harrington. '30208LL' soybean were seeded near Fargo on May 19. Treatments were applied to 2 trifoliolate soybean, 4 to 5 inch common lambsquarters, 4 inch waterhemp, 5 to 6 inch yellow foxtail, and 6 to 8 inch wild mustard on June 20 with 63°F, 62% relative humidity, 0% cloud cover, 4 mph wind velocity at 0° and damp soil at 64°F. Treatments were applied with a backpack sprayer delivering 12 gpa at 40 psi through 110015 TTI nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with 3 replicates.

Treatment	Rate	6/27 Wahe	6/27 Colq	6/27 Rrpw	6/27 Wimu	6/27 Vema	6/30 Wahe	6/30 Colq	6/30 Rrpw	6/30 Wimu	6/30 Vema
Dicamba-E+Glyt-4.5	8+12	90	75	95	90	70	90	80	95	99	85
Dicamba-E+Glyt-4.5+817Z	8+12+0.25%	90	75	95	90	70	90	80	95	99	85
Dicamba-E+Glyt-4.5+817H	8+12+0.25%	90	75	95	90	70	90	80	95	99	85
Dicamba-E+Glyt-4.5+NIS	8+12+0.25%	90	75	95	90	70	90	80	95	99	85
Dicamba-E+Glyt-4.5+Destiny HC	8+12+1%	90	75	95	90	70	90	80	95	99	85
CV		0	0	0	0	0	0	0	0	0	0
LSD P=.05		.	.	.	.	.	.	.	.	.	.

Treatment	Rate	7/04 Wahe	7/04 Colq	7/04 Rrpw	7/04 Wimu	7/04 Vema	7/12 Wahe	7/12 Colq	7/12 Rrpw	7/12 Wimu	7/12 Vema	7/19 All
Dicamba-E+Glyt-4.5	8+12	97	97	99	99	97	98	96	96	99	96	99
Dicamba-E+Glyt-4.5+817Z	8+12+0.25%	97	97	99	99	97	98	98	97	99	96	99
Dicamba-E+Glyt-4.5+817H	8+12+0.25%	97	97	99	99	97	98	96	97	99	94	99
Dicamba-E+Glyt-4.5+NIS	8+12+0.25%	97	97	99	99	97	98	98	95	99	96	99
Dicamba-E+Glyt-4.5+Destiny HC	8+12+1%	97	97	99	99	97	98	96	98	99	96	99
CV		0	0	0	0	0	1	2	2	0	2	0
LSD P=.05		.	.	.	.	.	3	3	4	.	3	.

Control ratings were very consistent across treatments within a species and evaluation date. Adjuvants did not improve control of dicamba and glyphosate, although control with the base treatment was exceptional.

Dicamba-E (Engenia) antagonism of Clethodim. Dr. Howatt, Mettler, and Harrington. Treatments were applied to V2 to V3 volunteer corn on June 20 with 62°F, 69% relative humidity, 0% cloud cover, 4 mph wind velocity at 0°, and dry soil at 63°F. A second set of treatments was applied to V5-6 volunteer corn on June 26 with 64°F, 47% relative humidity, 0% cloud cover, 4 mph wind velocity at 315°, and dry soil at 60°F. Treatments were applied with a backpack sprayer delivering 12 gpa at 40 psi through 110015 TTI nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with three replicates

Treatment	Rate	7/4 V3	7/4 V6	7/19 V3	7/19 V6
	oz ai/A	%	%	%	%
Clet+HSOC+Trio+Intact	0.75+1%+32 fl oz/100G+0.5%	93	80	99	96
Clet+Dica-E+HSOC+ Trio+Intact	0.75+8+1%+ 32 fl oz/100G+0.5%	93	77	98	84
Clet+Dica-E+HSOC+Trio+Intact	1+8+1%+32 fl oz/100G+0.5%	90	78	97	92
Clet+Dica-E+HSOC+ Trio+Intact	1.5+8+1%+ 32 fl oz/100G+0.5%	94	87	99	97
H1331aa+HSOC+ Trio+Intact	1.125+1%+ 32 fl oz/100G+0.5%	93	68	99	94
H1331aa+Dica-E+HSOC+ Trio+Intact	1.125+8+1%+ 32 fl oz/100G+0.5%	92	72	91	77
H1331aa+Dica-E+HSOC+ Trio+Intact	1.5+8+1%+ 32 fl oz/100G+0.5%	98	68	99	75
H1331aa+Dica-E+HSOC+ Trio+Intact	2.25+8+1%+ 32 fl oz/100G+0.5%	96	83	99	95
CV		3	4	4	4
LSD P=.05		5	6	3	7

Better control was achieved with application to smaller plants and control across treatments applied to V3 corn was consistent and at 90% or more. Control with H1331aa was generally less than control with clethodim at similar rate when applied to V6 corn. This was accentuated at the low and mid rates of grass herbicide by dicamba antagonism of grass control. Antagonism from dicamba resulted in 84% control with clethodim at the low rate but as low as 75% with the mid rate of H1331aa. Antagonism was overcome by using the high rate of either grass herbicide. Treatment evaluation on July 24 was similar to July 19.

Dicamba-X (Xtendimax) antagonism of Clethodim. Dr. Howatt, Mettler, and Harrington. Treatments were applied to V3 volunteer corn on June 20 with 62°F, 58% relative humidity, 0% cloud cover, 5.5 mph wind velocity at 15°, and dry soil at 63°F. A second set of treatments was applied to V5-6 volunteer corn on June 26 with 64°F, 47% relative humidity, 0% cloud cover, 3.5 mph wind velocity at 215°, and dry soil at 60°F. All treatments were applied with a backpack sprayer delivering 12 gpa at 40 psi through 110015 TTI to 7 foot wide areas the length of 10 by 30 foot plots. The experiment was a randomized complete block design with three replicates.

Treatment	Rate	7/4 V3	7/4 V6	7/19 V3	7/19 V6
	oz ai/A	%	%	%	%
Clet+HSOC+Trio+Intact	0.75+1%+32 fl oz/100G+0.5	94	85	99	97
Clet+Dica-X+HSOC+ Trio+Intact	0.75+8+1%+ 32 fl oz/100G+0.5%	90	62	87	67
Clet+Dica-X+HSOC+ Trio+Intact	1+8+1%+ 32 fl oz/100G+0.5%	93	68	96	87
Clet+Dica-X+HSOC+ Trio+Intact	1.5+8+1%+ 32 fl oz/100G+0.5%	96	78	98	89
H1331aa+HSOC+ Trio+Intact	1.125+1%+ 32 fl oz/100G+0.5%	96	67	98	82
H1331aa+Dica-X+HSOC+ Trio+Intact	1.125+8+1%+ 32 fl oz/100G+0.5%	94	67	94	65
H1331aa+Dica-X+HSOC+ Trio+Intact	1.5+8+1%+ 32 fl oz/100G+0.5%	95	63	96	82
H1331aa+Dica-X+HSOC+ Trio+Intact	2.25+8+1%+ 32 fl oz/100G+0.5%	96	86	96	92
CV		3	4	2	5
LSD P=.05		5	5	3	7

Better control was achieved with application to smaller plants and control across treatments applied to V3 corn was consistent and at 90% or more. Control with H1331aa alone was less than control with clethodim alone when applied to V6 corn. This difference was evened out at the low and mid rates of grass herbicide by dicamba antagonism of grass control. Antagonism from dicamba resulted in 67% control with clethodim at the low rate and 65% with the low rate of H1331aa. Antagonism of clethodim was not overcome by increasing the clethodim rate, but the high rate of H1331aa more than compensated for the antagonism by dicamba. Treatment evaluation on July 24 was similar to July 19.

Weed control in dicamba-tolerant soybean, Carrington, 2017. Greg Endres and Mike Ostlie. The trial was conducted at the NDSU Carrington Research Extension Center in cooperation with BASF to evaluate dicamba-tolerant soybean weed control with PRE/POST or POST only treatments utilizing POST Engenia or XtendiMax. Experimental design was a randomized complete block with three replicates. The field trial was established on a conventionally-tilled Heimdal-Emrick loam soil. Asgrow 'AG03X7' dicamba-tolerant soybean was planted on May 15 in 22-inch rows. A hand-held boom sprayer was used delivering 17 gpa for PRE treatments at 35 psi through flat fan 80015 nozzles, and POST treatments at 40 psi through TeeJet TTI11002 nozzles to the center 6.7 ft of 10- by 30-ft plots. PRE treatments were applied on May 15 with 77 F, 14% RH, and 11 MPH wind. Following PRE herbicide application, 0.3 inch of rain occurred on May 16. POSTA treatments were applied on June 12 with 73 F, 35% RH, and 5 mph wind to first trifoliate (V1) stage soybean, 1- to 4-inch tall (4-leaf to tillering) foxtail (primarily yellow but also green), 0.5- to 6-inch tall common lambsquarters, and 0.5- to 2-inch tall redroot and prostrate pigweed. POSTB treatments were applied on June 19 with 60 F, 75% RH, and 10 mph wind to second trifoliate (V2) stage soybean, 0.5- to 4-inch tall (3-leaf to tillering) foxtail, 1- to 8-inch tall common lambsquarters, and 1- to 4-inch tall redroot and prostrate pigweed.

No soybean injury was noted during visual evaluation of weed control. Use of PRE/POSTB treatments provided 97-99% weed control 28 and 42 days after POST application (DAPA) compared to generally reduced weed control with POSTA treatments. Common lambsquarters control when evaluated June 5 (prior to POSTB treatments) with PRE Verdict plus Outlook (trt 2) was excellent while Authority MTZ (trt 3) provided suppression (Table). Also PRE Verdict plus Outlook and Authority MTZ suppressed foxtail while weeds were not controlled with PRE Warrant (trt 4). POSTA treatments Engenia plus Zidua, and XtendiMax plus Dual Magnum tank-mixed with RU PowerMax (trts 5-6) generally provided excellent weed control. POSTA Engenia plus RU PowerMax (trt 8) provided only poor to fair weed control 28 and 42 DAPA.

Table.

Herbicide				Weed control (%)[1]											
	Treatment[2]	Rate	Application timing[3]	5-Jun		Days after POST treatments 14			28			42		
No.		fl oz product/A		fota	colq	fota	colq	piwe	fota	colq	piwe	fota	colq	piwe
1	check	x	x	0	0	0	0	0	0	0	0	0	0	0
	Verdict	5												
	Outlook	8	PRE	72	93									
	Engenia	12.8												
2	Zidua SC	2.1	POSTB	x	x	98	99	99	98	99	99	99	99	99
	Authority MTZ	12 oz wt	PRE	72	77									
	XtendiMax	22												
	Dual Magnum	16												
3	RU PowerMax	32	POSTB	x	x	98	99	99	98	99	99	97	99	99
	Warrant Ultra	48	PRE	0	0									
	XtendiMax	22												
	Warrant	48												
4	RU PowerMax	32	POSTB	x	x	99	99	99	98	99	99	98	99	99
	Engenia	12.8												
	Zidua	2.1												
5	RU PowerMax	32	POSTA	x	x	96	97	99	94	95	98	88	93	99
	XtendiMax	22												
	Dual Magnum	16												
6	RU PowerMax	32	POSTA	x	x	97	99	99	95	93	97	91	81	93
	XtendiMax	22												
	Warrant	48												
7	RU PowerMax	32	POSTA	x	x	93	96	99	85	83	85	73	75	77
	Engenia	12.8												
8	RU PowerMax	32	POSTA	x	x	77	92	83	49	70	59	53	67	60
C.V. (%)				11.6	4.9	1.9	2.1	4.5	7.4	3.4	7.9	4.6	5.4	10.8
LSD (0.05)				8	4	3	3	9	10	5	15	8	9	15

[1]fota=primarily yellow foxtail, and green foxtail; colq=common lambsquarters; piwe=redroot and prostrate pigweed.

[2]RU=Roundup. All POST treatments include Induce (NIS) at 0.25% v/v.

[3]PRE=May 15; POSTA=June 12; POSTB=June 19.

Soybean Dicamba Tolerance by Variety

Mike Ostlie

This past summer, PGR (plant growth regulator) symptoms showed up in many soybean fields. A lot of confusion ensued regarding the cause of the symptoms and whether there would be yield loss as a result. In many cases, dicamba drift was the likely cause of the PGR symptoms being expressed. Even though the new dicamba formulations were designed to have less volatility, it is clear that there were issues with vapor (volatility) drift, more so than particle drift. Dicamba is one of the older chemistries that we use, so why was there so much more drift than in the past? The application rate of dicamba to dicamba-tolerant soybeans is 4x the rate applied to cereals in past. Soybeans are also the #1 crop by acres in North Dakota. Soybeans are the most sensitive crop to dicamba in North Dakota. Soybeans are ~10x more sensitive to dicamba than grapes are to 2,4-D. The increased acreage, and increased rates, coupled with an extremely sensitive crop, have led us to the current point of widespread PGR symptom expression.

While some instances of drift injury were clear, with severe stunting, delayed maturity, and reduced yields, many instances were less severe with leaf cupping, alligator skin, but no growing point damage. The difficult task this winter will be for many people to determine if there was any yield damage due to the less severe symptoms. Several factors have made this challenging, including whole fields with symptom expression, possible multiple dicamba exposures, and differences in variety tolerance to dicamba. This latter factor was surprising to learn and may not be noticed outside of variety trials. At the CREC there was a great opportunity to observe varietal differences in PGR symptoms. In 2017 there were irrigated and dryland versions of conventional, Liberty Link, and RR (plus DT) trials. Each plot in these trials was given a rating of 0-9 based on the severity of PGR symptoms observed in mid-August. A 0 indicated a perfectly healthy plant, while a 9 indicated severe growing point damage. In these trials, damage was relatively light in most cases, with the only a handful of varieties reaching a score of up to 5. At a 5, there was severe leaf cupping, along with some leaf necrosis along the edges, but no growing point damage.

None of the irrigated trials displayed more than very minor leaf cupping. There is not any correlation between symptoms and yield in those trials. The dryland trials had more symptoms. In each trial, there were several plot and varieties with no symptoms. The highest percent of PGR-affected plots was in the Liberty Link trial, where 83% of plots displayed symptoms, compared to the low of 66% of plots in the conventional trial. Roughly half of all plots which had symptoms were categorized as having only minor leaf cupping (a score of 1).

It is difficult to estimate the effects of symptoms on soybean yields by only looking at a single year. In Figure 1 it appears that yield is gradually increasing as the severity of symptoms increases. This initially indicates that the expression of symptoms has caused a yield increase. However, a more accurate method to test the effects of symptoms would be to compare 2017 to historical data. There were several varieties tested in 2016 and 2017. For each year we compared a variety's mean performance with the trial average (to get a % yield). We then determined if the performance increased or decreased compared to the trial mean. This was plotted against symptom severity in 2017 (Figure 2). With this comparison, there was no relationship between symptom severity and change in yield. If anything, there are more varieties with lower relative performance than increased performance. But statistically, this indicates that varieties that had more symptoms did not perform different than

varieties without symptoms. In Figure 1, yields seems to increase with symptom severity, but this could be linked to inherent production potential. Varieties that were more affected by PGR symptoms may have been varieties that were growing more vigorously at the time of symptom expression, thus more prone to any factor causing a PGR response. Essentially, dicamba exposure was not increasing yields but rather varieties with higher yield potential were more susceptible to the effects of dicamba and the level of injury was not enough to decrease yield.

If dicamba symptoms were more severe, such as plants with growing point injury and/or stunted growth, yields would surely decline. Even though varieties in our trials differed in the expression of PGR symptoms, with only leaf cupping and blistering, there did not appear to be any consistent positive or negative yield response based on variety.

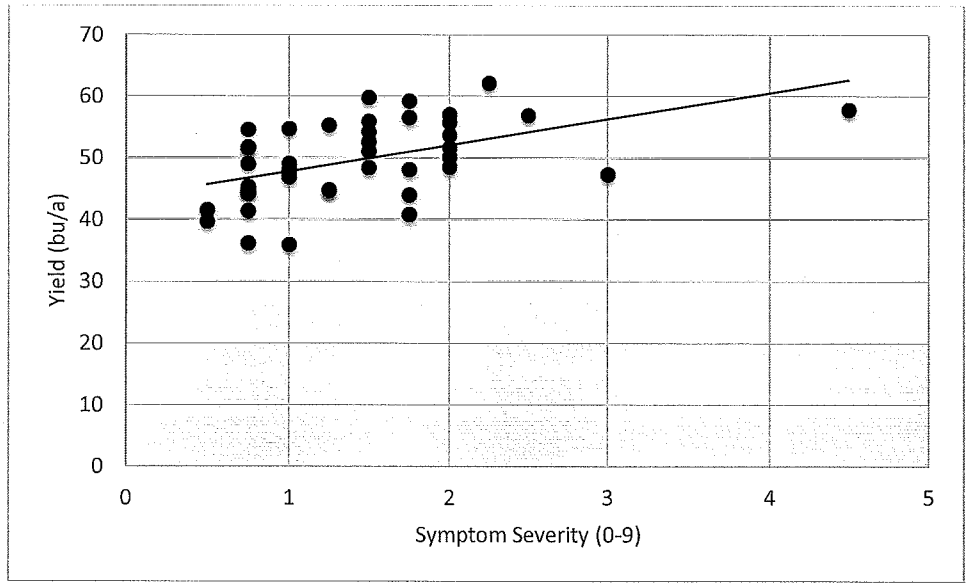

Figure 1. Soybean variety performance compared to plant growth regulator (PGR) symptom severity

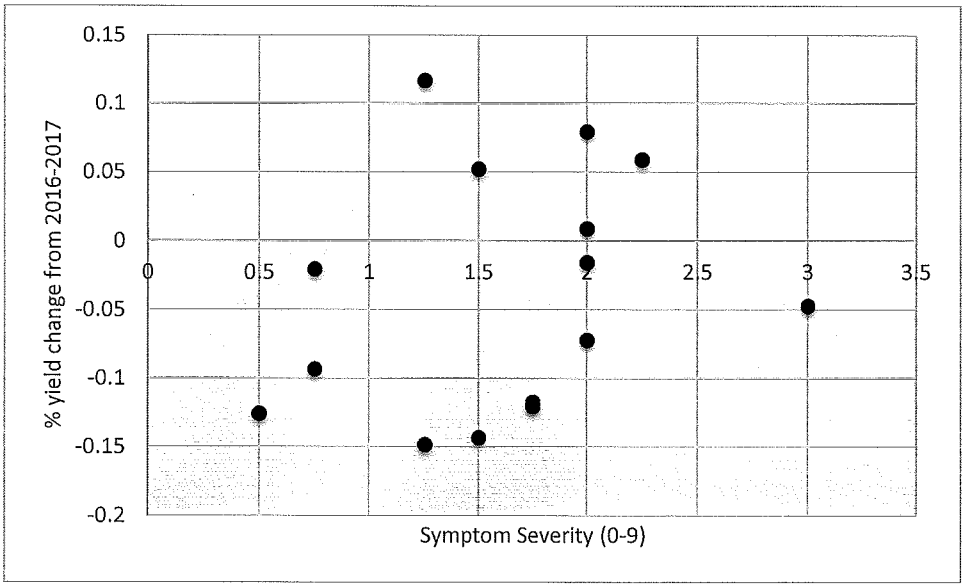

Figure 2. Year to year change in variety performance based on PGR symptom expression

Dicamba effect in soybean seed. Howatt, Mettler, Harrington.

Overarching Objective: Determine the concentration of dicamba and the characteristics of soybean progeny when developed under dicamba exposure.

Completed Work: 'RG 607' soybean was seeded near Casselton, ND on May 15, 2016. Dicamba at 8 oz ae/A was applied to corn when surrounding soybean was 4 to 6 trifoliolate on June 29. Treatments were applied to a 10-foot-wide area the length of 10 by 50 foot plots. The experiment was a randomized complete block design with four replicates. Injury was rated on August 11. Seed harvest was on September 28. Uppercase letter designations are for area location of soybean relative to treated plot. A was adjacent upwind, B was adjacent downwind, C was adjacent downwind under tarp during application to catch physical drift, D was 30 feet downwind under tarp, E was 30 feet downwind, and F was 70 feet downwind. Seed harvested from soybean was used to generate data on progeny seed and plant characteristics.

Table 1. Injury and yield of soybean exposed to dicamba

	Injury						Seed yield					
Dicamba	A	B	C	D	E	F	A	B	C	D	E	F
	0=no symptom : 9=dead						bu/A					
Untreated	0	0	0	0	0	0	36	36	36	39	35	32
Treated	1	5	3	0	3	1	32	18	21	28	27	24
LSD ⍰=0.05	1	1	1	0	1	1	10	10	12	12	12	5

Table 2. Seed characteristics of progeny from plants exposed to dicamba.

	Seed Weight by % of Sample				Weight per seed				Weight per 200 seeds all sizes included	Oil Content	Protein Content
	No. of Sieve Size				No. of Sieve Size						
Dicamba	<12 >10	<15 >12	<18 >15	> 18	<12 >10	<15 >12	<18 >15	> 18			
	Percent %				Grams				Grams	Percent	Percent
	Location A										
Untreated	0.0	2.4	84.2	13.0	0.047	0.108	0.168	0.201	34.9	20.9	39.1
Treated	0.0	4.5	89.9	5.5	0.041	0.109	0.160	0.201	32.3	21.4	38.6
	Location B										
Untreated	*0.0	2.3	82.2	15.5	0.041	0.104	0.164	0.199	*35.7	20.7	39.2
Treated	*0.1	12.6	82.8	4.5	0.062	0.111	0.173	0.202	*31.2	20.5	39.7
	Location C										
Untreated	0.0	2.6	84.1	*13.3	0.043	0.109	0.171	0.202	*35.1	20.8	39.1
Treated	0.1	13.1	83.7	*3.1	0.049	0.108	0.170	0.178	*30.1	21.2	39.0
	Location D										
Untreated	0.0	2.5	83.4	*14.0	0.047	0.102	0.159	0.193	34.9	20.7	39.3
Treated	0.1	8.4	85.3	*6.2	0.045	0.111	0.167	0.191	31.7	21.6	38.5
	Location E										
Untreated	0.0	2.4	81.4	*16.2	0.048	0.120	0.174	0.204	*34.8	*20.9	39.0
Treated	0.0	9.5	86.9	*3.6	0.042	0.102	0.153	0.192	*30.0	*21.5	38.4
	Location F										
Untreated	0.0	2.2	83.9	13.8	0.049	0.116	0.170	0.204	34.8	21.1	38.5
Treated	0.1	8.6	85.4	5.9	0.040	0.115	0.159	0.201	32.5	21.4	38.5

* Denotes difference between the treated and untreated within a location identified in t-test with α=0.05.

Table 3. Plant characteristics of progeny from plants exposed to dicamba.

	ND State Seed Lab Results				Greenhouse Experiment - Germination				Greenhouse Experiment - Height			
	Number per 100 Seed Germination Test				<12 >10	<15 >12	<18 >15	> 18	<12 >10	<15 >12	<18 >15	> 18
Dicamba	Normal	Abnormal	Hard	Accel. Aging	Percent %				Centimeters			
					Location A							
Untreated	95.3	4.5	0.3	67.5	39.8	*98.0	96.0	98.0	4.9	7.3	10.3	11.4
Treated	93.5	4.8	1.8	66.5	28.8	*93.0	98.0	98.0	5.3	8.1	9.7	11.6
					Location B							
Untreated	96.0	3.5	0.5	56.0	*31.3	91.0	98.0	96.0	4.8	8.4	11.1	10.2
Treated	88.8	6.0	5.3	69.8	*65.8	96.0	97.8	99.0	5.2	8.1	11.0	11.3
					Location C							
Untreated	94.0	5.3	0.8	61.0	23.5	94.0	96.0	98.0	5.0	7.5	10.0	11.3
Treated	88.5	6.5	5.0	52.0	51.0	91.3	100.0	97.0	5.5	8.0	9.5	10.6
					Location D							
Untreated	94.3	5.5	0.3	*78.0	29.8	*98.0	96.0	97.0	5.1	7.6	10.1	10.5
Treated	92.8	4.3	3.0	*46.3	38.0	*85.8	98.0	99.0	5.0	7.5	9.8	10.7
					Location E							
Untreated	95.5	4.0	0.5	*79.5	32.3	93.0	98.0	95.0	5.2	7.9	10.8	10.5
Treated	92.3	5.5	2.0	*45.0	37.3	96.0	100.0	98.0	5.1	7.6	9.5	11.1
					Location F							
Untreated	94.5	5.0	0.3	80.0	26.5	96.0	98.0	*94.0	5.1	7.9	*10.9	10.6
Treated	93.8	4.5	1.8	47.3	48.0	92.0	97.0	*98.0	5.3	7.5	*9.5	10.6

* Denotes difference between the treated and untreated within a location identified in t-test with α=0.05.

Preliminary Results

Soybean in the field expressed mild to severe leaf cupping and apical meristem damage depending on the proximity to dicamba application and whether the plants were covered by tarp (Table 1). Although treatment effect resulted in wide variance when comparing most areas, symptom expression was associated with less yield. Weight of 200 seeds was less from around treated areas because less seed was retained above an 18/64 screen but more was retained between the 12/64 and 15/64 sizes (Table 2). Weight per seed was similar between treatments within a size category, which indicated density of the seed was not affected. Oil content tended to be greater in seed from around treated plots but protein was very similar and variable in rank between the two at each location. Germination tended to be less and hard seed more prevalent for seed from near treated plots, although differences were not identified (Table 3). Germination within seed size was generally variable for treatment rank. Height and growth stage of progeny grown in the greenhouse was very similar within size category.

Work to be Completed

Dicamba residue results have not been received from South Dakota Agriculture Laboratories.

Dicamba Drift Injury Thresholds for Dry Beans, and Field Peas: an Update

Mike Ostlie, Greg Endres, Harlene Hatterman-Valenti, Richard Zollinger, Andrew Robinson, and Brian Jenks

Dicamba injury to soybeans was a hot topic in 2017. Prior to that research was conducted in 2015 and 2016 to evaluate the injury to several specialty crops including dry beans and field peas. Soybeans are the most dicamba-sensitive crop grown in North Dakota. However, the above crops are sensitive to dicamba and yield loss can occur with far fewer symptoms than soybeans. Because of this, the following studies were conducted in to determine how well visual injury after a drift event corresponds to yield loss and whether a tissue test can be used predict yield damage.

Simulated drift was studied with the application of 2.5-25% of Clarity (0.6-6% of the new dicamba formulations) and 0.45-4.5% of a RoundUp Powermax (or equivalent) application alone and together. This would be the same product ratio that is used for Extend soybeans. The applications were made just prior to flowering for each crop. Injury was rated 10 and 20 days after the drift event and tissue samples were taken at the same time. Plots were harvested and grain was sent for residue analysis and tested for germination.

Field Peas. Field peas received as much as 26% injury 10 days after treatment (DAT), but finished with 17% (Table 1). This only occurred with the highest rate of the combination of the two products. Dicamba caused more injury than glyphosate at the rates used. Glyphosate applied alone did not cause significant injury in the trials.

Leaf tissue analysis revealed that glyphosate was detected in some treatments but that none of the treatments differed statistically from the check. Dicamba was detected at more meaningful levels both 10 and 20 days after treatment. When combined across site-years, the 10 and 20 DAT data do not differ much. Dicamba was present in tissue at the middle and high rates that were used.

Yield was affected by the combination of glyphosate and dicamba at the two highest rates. Yield reductions of 8 and 17% were observed with the middle and high rate of the combined products. No yield reduction was realized with either product alone. Protein was not affected by any treatment. In grain samples, seed germination was not affected by any treatment combination, nor was any significant herbicide residue detected

Dry Beans. Dry beans were affected heavily by the rates used in this study. Dry bean injury ranged from 5-40% when combined across site-years (Table 2). Both glyphosate and dicamba were damaging to dry beans. Only the lowest rates used did not significantly injure plants.

Dicamba and glyphosate leaf residue data was very difficult to interpret due to the variability. Glyphosate concentrations received from the lab were sometimes several times higher than they should be. At times, the check plots would read several thousand ppm even though no visible injury occurred. Dicamba was less erratic but suffered a similar result. With either product, there was no consistent meaningful correlation between visual injury and ppb.

Visual injury was more related to final yield data. Yield reductions of up to 80% occurred with the highest rates of both products. Even each product individually caused unacceptably high levels of injury at the highest rates. Only the lowest rates of each product alone and together produced yields similar to the check.

Germination was reduced in the highest rate of dicamba alone and dicamba plus glyphosate. Unfortunately, dicamba was also detected in the grain of the highest rate of dicamba plus glyphosate. However, the yield of that treatment was reduced to the point that it is unlikely a farmer would harvest the crop (14% of the maximum).

Table 1. Field pea injury, leaf residue levels, and yield following dicamba and glyphosate applications

		Phytotoxicity		Residue Level 10 DAT		Residue Level 20 DAT			
Treatment	Rate	10 DAT	20 DAT	Dicamba	Glyphosate	Dicamba	Glyphosate	Yield	Protein
	fl oz/a	%	%	ppb	ppb	ppb	ppb	%	%
Check		0	0	0	0	0	0	0.90	29.74
Dicamba	0.05	1	0.3	3.1	0	2.4	5.9	0.89	29.62
Dicamba	0.25	5.5	3.4	8.7	0	8.9	0	0.88	29.81
Dicamba	0.5	12	6.9	11.4	0	17.9	0	0.86	29.84
Glyphosat	0.1	0.6	0.6	0.4	0	0	0	0.89	29.89
Glyphosat	0.5	0.8	1.3	0.3	3.3	0	0	0.91	30.13
Glyphosat	1	3.4	2.8	0.8	0	0	5.2	0.88	29.92
Glyphosat	0.1 + 0.05	1.4	0.9	2.7	4.7	3.1	0	0.92	29.85
Glyphosat	0.5 + 0.25	13	8.1	10.5	0	11.7	0	0.82	29.81
Glyphosat	1 + 0.5	26.6	17.1	18.4	14.7	17.0	4.5	0.73	29.90
LSD (0.05)		5.2	3.0	5.2	NS	6.3	NS	0.06	NS

Table 2. Dry bean injury, leaf residue levels, and yield following dicamba and glyphosate applications

		Phytotoxicity		Residue Level 10 DAT		Residue Level 20 DAT		
Treatment	Rate	10 DAT	20 DAT	Dicamba	Glyphosate	Dicamba	Glyphosate	Yield
	fl oz/a	%	%	ppb	ppb	ppb	ppb	%
Check		0	0	0	0	0	0	0.91
Dicamba	0.05	4.6	5.5	7	0	62	0	0.83
Dicamba	0.25	19.5	21	22	6	1204	1	0.72
Dicamba	0.5	22.8	26.4	259	253	625	30	0.33
Glyphosat	0.1	6.2	5.4	15	11	305	5	0.74
Glyphosat	0.5	20.6	16.1	65	1037	414	143	0.54
Glyphosat	1	24.6	25.3	121	510	145	75	0.40
Glyphosat	0.1 + 0.05	11.4	11.4	8	258	49	108	0.78
Glyphosat	0.5 + 0.25	29.3	23.8	85	541	628	38	0.48
Glyphosat	1 + 0.5	33.4	39.3	262	676	509	185	0.14
LSD (0.05)		9.1	11.6	192	930	586	100	0.26

Summary. The levels of herbicide concentration with this study should be sufficient to measure causality, however, the highest detected concentrations many times do not correspond to the highest application rates. Once again, the relationships between ppb and yield are only moderate at best across herbicide dose and species. Overall dicamba was more predictive of

response than glyphosate, but only when averaged across sites. Sometimes there was little or no correlation between dicamba leaf concentration and yield at an individual site. When averaged across sites and species, glyphosate did not accumulate to a consistent concentration in leaf tissues. However, dicamba concentration in the leaves, tended to be higher when applied with glyphosate than alone. Overall, without the visual injury and yield information, the herbicide residue data would not mean much in this study, representing a challenging situation to producers who may have been affected by drift. Instead of relying on tissue testing, it will be necessary to use that data as supporting evidence only, in determining if a drift situation has occurred.

With the information generated from this study, we were able to identify visual injury and leaf concentration values that indicate when yield loss begins as a result to dicamba drift. Due to the variability in dry bean data, there is a wide range of possible responses (Table 3). Both dry beans and field pea could begin to see yield losses at similar leaf concentrations of dicamba. However, with dry beans a significant yield response did not occur until 25% yield loss, whereas the same concentration caused a 6% yield loss in field peas. This indicates that dry beans are more sensitive to dicamba drift than field peas. More Information about residue sampling procedures will be found on page 111 of the 2018 ND Weed Control Guide.

Table 3. Dicamba leaf concentration and visual injury that caused a yield loss in field peas and dry beans

	Ppb	ppm	Visual injury	Yield Reduction	Crop
Dicamba	30-130	0.03-0.13	21-33%	≥25%	Dry Bean
Dicamba	20-30	0.02-0.03	10-22%	≥6%	Field Peas