Yellow section: **Canola, Dry Edible Bean, Fallow, Field Pea, Flax, Onion, Potato, Sunflower.**

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Canola herbicide systems evaluation. Howatt, Roach, Ciernia, and Harrington. Canola of three different herbicide resistant systems was seeded near Fargo on May 10. Treatments were applied to 3 leaf to bolting canola, 1 leaf Venice mallow, 2 leaf redroot pigweed, and 2 to 3 leaf yellow foxtail on June 18 with 71°F, 78% relative humidity, 30% cloud cover, 7 mph wind at 270°, and damp soil at 65°F. Treatments were applied with a backpack plot sprayer delivering 8.5 gpa at 35 psi through 11001 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. Canola was harvested for seed yield on August 24.

Treatment	Rate	Seed	6/28 Canola	6/28 Rrpw	6/28 Vema	6/28 Yeft	Early flowering	Flowering date	7/16 Canola	7/16 Rrpw	7/16 Vema	7/16 Yeft	8/24 Yield
							% of plot	July					bu/A
Untreated check	0	SU	0	0	0	0	16	1	0	0	0	0	18
Thif+clet-sm+NIS	0.225+1.5+0.5%	SU	4	77	72	72	16	4	0	99	94	99	19
Thif+clet-sm+NIS	0.34+1.5+0.5%	SU	6	85	78	78	6	4	0	99	93	98	22
Thif+clet-sm+NIS	0.45+1.5+0.5%	SU	7	78	75	73	8	4	0	99	95	98	23
Thif+clet-sm+Chaperone	0.225+1.5+0.25%	SU	4	77	70	77	5	4	0	99	88	99	21
Thif+clet-sm+NIS+Evergreen	0.225+1.5+0.5%+32	SU	6	80	73	75	15	4	0	99	91	99	17
Thif&trib+clet-sm+Chaperone	0.225+1.5+0.25%	SU	7	77	68	72	27	5	0	99	95	99	19
Thif&trib+clet-sm+NIS+Evergreen	0.225+1.5+0.5%+32	SU	12	82	75	73	19	5	0	99	97	99	17
Imazamox+NIS	0.5+0.5%	SU	0	67	53	67	17	2	0	99	82	99	23
Glufosinate+NIS+AMS	0.62+0.5%+48	LL	28	50	37	40	2	5	25	86	67	90	8
Glyphosate(3#/gal)+NIS+AMS	12.8+0.25%+16	RU	94	94	92	89	0	5	98	0	82	92	0
Imazamox+NIS	0.5+0.5%	CL	0	68	58	62	34	3	0	99	91	99	31
CV			25	6	6	8	126	2	24	5	9	3	6
LSD (P=0.05)			6	7	6	8	29	1	4	7	12	4	19

Early flowering relates to early emergence. Soil moisture deficit and differences across the study site resulted in delayed emergence with patches of moderate emergence before the main cohort flush. The percentage early flowering indicated the proportion of plants that emerged well before the main flush.

The RU seed sample was suspected to be LL given the response to treatment and drift in different plots. Glyphosate did not control a late flush of redroot pigweed and without canola canopy pigweed plants grew rapidly. Crop canopy gave substantial control of late emerging pigweed in the LL plots, 86% control, but other herbicide treatments must have benefitted from soil residual to reach 99% control. Glufosinate also gave less control of Venice mallow and yellow foxtail than other herbicide treatments.

Timing of SU application in canola. Howatt, Roach, Ciernia, and Harrington. SU-resistant canola was seeded near Fargo on May 10. Treatments were applied as follows:

Application code	A	B	C	D	E	F
Application date	5/30/12	6/6/12	6/12/12	6/22/12	6/28/12	7/10/12
Canola stage (leaf)	Cotyledon	2	2 to 5	4 to bolt	10 to flowering	-
Venice Mallow	-	Cotyledon	Coty to 1 leaf	2 leaf	6 inch	6 leaf/ 6 inch
Redroot pigweed	-	-	-	3 to 4 leaf	4 to 6 leaf	8 leaf
Common lambsquarters	-	-	-	-	4 to 6 leaf	8 leaf
Temperature °F	58	70	59	64	70	74
Relative humidity %	59	56	66	79	66	59
Cloud cover %	30	100	5	0	10	0
Wind mph	2	50	2	2	3	1
direction °	0	100	300	330	270	225
Soil	Dry	Dry	Damp	Wet	Dry	Dry
Soil temperature °F	51	65	56	60	65	69

Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 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. Canola was harvested for seed yield on August 24.

Treatment	Rate	6/07 Canola	6/07 Rrpw	6/07 Colq	6/07 Vema	6/07 Yeft	6/13 Canola	6/13 Rrpw	6/13 Colq	6/13 Vema	6/13 Yeft	6/27 Canola	6/27 Rrpw	6/27 Colq	6/27 Vema
	oz ai/A	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Untreated check	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A thif&trib+clet+NIS	0.225+1.5+0.5%	0	0	0	0	0	0	0	0	0	0	0	60	40	62
B thif&trib+clet+NIS	0.225+1.5+0.5%	-	-	-	-	-	0	96	93	77	92	5	99	99	93
C thif&trib+clet+NIS	0.225+1.5+0.5%	-	-	-	-	-	0	0	0	0	0	12	99	99	96
Untreated check	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
D thif&trib+clet+NIS	0.225+1.5+0.5%	-	-	-	-	-	-	-	-	-	-	4	68	53	67
E thif&trib+clet+NIS	0.225+1.5+0.5%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F thif&trib+clet+NIS	0.225+1.5+0.5%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CV		0	0	0	0	0	0	7	9	11	9	79	9	14	13
LSD (P=0.05)		0	0	0	0	0	0	1	2	2	2	4	6	9	9

Table continued

Treatment	Rate	6/27 Yeft	6/27 Early flowering	6/27 Flower Date	7/10 Bleached flower	7/10 Rrpw	7/10 Colq	7/10 Vema	7/10 Yeft	7/26 Rrpw	7/26 Colq	7/26 Vema	7/26 Yeft	8/24 Yield
	oz ai/A		% of plot	July	%	%	%	%	%	%	%	%	%	bu/A
Untreated check	0	0	3	2	0	0	0	0	0	0	0	0	0	17
A thif&trib+clet+NIS	0.225+1.5+0.5%	53	3	2	3	28	30	28	32	28	30	25	28	15
B thif&trib+clet+NIS	0.225+1.5+0.5%	95	15	5	0	99	99	92	95	99	99	93	96	22
C thif&trib+clet+NIS	0.225+1.5+0.5%	98	3	5	0	99	98	95	99	99	99	94	98	20
Untreated check	0	0	6	2	0	0	0	0	0	0	0	0	0	
D thif&trib+clet+NIS	0.225+1.5+0.5%	70	23	4	13	62	58	55	63	58	58	55	58	17
E thif&trib+clet+NIS	0.225+1.5+0.5%	-	26	1	32	52	47	43	53	63	72	72	73	14
F thif&trib+clet+NIS	0.225+1.5+0.5%	-	14	1	13	27	23	25	30	55	60	60	70	15
CV		44	168	0	151	80	78	79	84	56	55	54	51	20
LSD (P=0.05)		30	34	0	20	64	61	59	69	50	50	48	48	6

Early flowering relates to early emergence. Soil moisture deficit and differences across the study site resulted in delayed emergence with patches of moderate emergence before the main cohort flush. The percentage early flowering indicated the proportion of plants that emerged well before the main flush.

A large flush of weeds occurred when the majority of canola emerged. This was after the first application timing and residual of thifensulfuron and tribenuron was not sufficient to prevent growth. Early application prevented yield loss due to competition. Application to 2 to 4 leaf canola provided excellent weed control just before row closure when crop competition maintained clean inter row space. Late application did affect flower color and may have induced some sterility along with one period of hot, dry weather.

RR canola control. Zollinger, Richard K., Angela J. Kazmierczak, and Devin A. Wirth. Two experiments were conducted near Casselton, ND to evaluate volunteer RR canola control at stages 3.2 (beginning at bolt) and 4.1 (beginning at flowering). Pioneer RR canola was planted on April 26, 2012. An application was made at stage 3.2 on June 12, 2012 at 1:20 pm with 78 F air, 67 F soil at a four inch depth, 17% relative humidity, 0% cloud cover, 4 to 6 mph W wind, and adequate soil moisture. An application was made at stage 4.1 on June 23, 2012 at 11:00 am with 70 F air, 66.2 F soil at a four inch depth, 90% relative humidity, 60% cloud cover, 5 to 7 mph NW wind, and adequate soil moisture. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo Tee Jet nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Canola stage 3.2 = early bolting stage. Canola stage 4.1 = begin flowering. Most control ratings were lower at 4.1 stage compared to 3.2 showing that weed control will be greater the earlier that herbicides are applied. There was not a rating taken at 28 days after 4.1 stage treatment because canola had recovered from most of the herbicide phytotoxicity. Engenia is dicamba-BAPMA salt formulation. MON 76754 is a premix of glyphosate + dicamba-BAPMA salt. Engenia and MON 76754 at the three respective rates contain the same amount dicamba in the three rates of Clarity. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. RR canola control (Zollinger, Kazmierczak, Wirth).

Treatment	Rate	Canola Stage	14 DAT Canola	28 DAT Canola
	(Product/A)	3.2 or 4.1	-% control-	-% control-
Clarity + NIS + AMS	4fl oz+0.25%v/v+8.5lb/100gal	3.2	33	45
		4.1	10	—
Clarity + NIS + AMS	8fl oz+0.25%v/v+8.5lb/100gal	3.2	33	43
		4.1	20	—
Clarity + NIS + AMS	12fl oz+0.25%v/v+8.5lb/100gal	3.2	57	63
		4.1	30	—
Engenia + NIS + AMS	3.2fl oz+0.25% v/v+8.5lb/100gal	3.2	25	25
		4.1	20	—
Engenia + NIS + AMS	6.4fl oz+0.25% v/v+8.5lb/100gal	3.2	30	40
		4.1	20	—
Engenia + NIS + AMS	9.6fl oz+0.25% v/v+8.5lb/100gal	3.2	38	50
		4.1	30	—
MON76754 + NIS + AMS	12fl oz+0.25% v/v+8.5lb/100gal	3.2	33	40
		4.1	10	—
MON76754 + NIS + AMS	24fl oz+0.25% v/v+8.5lb/100gal	3.2	35	38
		4.1	20	—
MON76754 + NIS + AMS	36fl oz+0.25% v/v+8.5lb/100gal	3.2	50	53
		4.1	40	—
Status + MSO + AMS	2.5oz+1pt+8.5lb/100gal	3.2	28	42
		4.1	30	—
Armazon + MSO + AMS	0.25fl oz+1pt+8.5lb/100gal	3.2	47	53
		4.1	10	—
Armazon + MSO + AMS	0.33fl oz+1pt+8.5lb/100gal	3.2	60	73
		4.1	20	—
Armazon + MSO + AMS	0.5fl oz+1pt+8.5lb/100gal	3.2	67	77
		4.1	20	—
Status+Armazon+MSO+AMS	2.5oz+0.75fl oz+1pt+8.5lb/100gal	3.2	57	83
		4.1	30	—
LSD (0.05)		3.2	7	6
		4.1	0	—

RR canola control. Zollinger, Richard K., Angela J. Kazmierczak, and Devin A. Wirth. An experiment was conducted near Casselton, ND to evaluate volunteer RR canola control using PRE herbicides. Pioneer RR canola was planted on April 26, 2012, followed by the application of PRE treatments at 11:15 am with 43.1 F air, 51.6 F soil at a four inch depth, 20% relative humidity, 15% cloud cover, 5 to 7 mph E wind, and adequate soil moisture. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo Tee Jet nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Dry conditions before and after PRE application did not activate herbicides and generally resulted in reduced canola control. Authority First gave the best weed control. Most of the activity from this premix is coming from cloransulam (FirstRate) but Spartan is also enhancing weed control. Other herbicides giving similar control to Authority First at 42 days after treatment were Sharpen at 3 fl oz/A, Authority Assist, and Gangster FirstRate + Gangster Valor. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. RR canola control (Zollinger, Kazmierczak, Wirth).

Treatment	Rate	Canola Stage	14 DAT Canola	28 DAT Canola	42 DAT Canola
	(Product/A)	PRE	-% control-	-% control-	-% control-
Sharpen	1 fl oz		50	43	42
Sharpen	2 fl oz		80	77	68
Sharpen	3 fl oz		93	95	87
SureStart	1.5 pt		53	53	62
Resolve Q	1 oz		28	25	25
Camix	0.8 qt		20	20	20
Realm Q	4 oz		27	27	27
Authority Assist	6 fl oz		67	63	75
Authority First	2.4 oz		94	95	88
Authority MTZ	10 oz		57	53	48
Boundary	1.2 pt		53	43	35
BroadAxe	25 fl oz		47	40	40
Gangster FirstRate	0.3 oz		82	82	72
Gangster Valor	1.5 oz		23	23	27
Valor SX	2.5 oz		37	33	30
Gangster FirstRate+Gangster Valor	0.2 oz + 1oz		88	82	77
Spartan	6 fl oz		53	50	40
Zidua	1.68 oz		23	27	30
Zidua	3.36 oz		23	23	23
Zidua	5.04 oz		30	30	30
Fierce	3.75 oz		43	37	53
LSD (0.05)			10	12	15

BroadAxe in Dry Edible Bean. Zollinger, Richard K., Angela J. Kazmierczak, and Devin A. Wirth. An experiment was conducted near Thompson, ND to evaluate weed efficacy to PRE herbicide programs in dry edible bean. Navy bean was planted on May 16, 2012, followed by the application of PRE treatments at 3:00 pm with 76.5 F air, 65.5 F soil at a four inch depth, 0% relative humidity, 15% cloud cover, 7 to 9 mph SSE wind, dry soil surface, and dry subsoil. Soil characteristics were: 6.5% sand, 64.3% silt, 29.2% clay, silty clay loam texture, 5% OM and 7.8 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE treatments. The experiment had a randomized complete block design with three replicates per treatment.

BroadAxe is a premix containing metolachlor (Dual) plus sulfentrazone (Spartan). These data and other data show the combination of these two herbicides compliments each other and provides good to excellent control of weeds the each herbicide may not give adequate control alone. Dry conditions before and after PRE application may not have fully activated PRE herbicides. The soil type was light to medium and the 40 fl oz/A BroadAxe was excessive. Some dry bean injury was observed at the highest rate. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. BroadAxe in Dry Edible Bean. (Zollinger, Kazmierczak, Wirth)

Treatment	Rate	14 DAE	28 DAE	42 DAE	56 DAE	28 DAE					42 DAE					56 DAE				
		Dry Bean	Dry Bean	Dry Bean	Dry Bean	Yeft	Wimu	Rrpw	Colq	Koch	Yeft	Wimu	Rrpw	Colq	Koch	Yeft	Wimu	Rrpw	Colq	Koch
	(Prodcut/A)	-% Injury-	-%Injury-	-% Injury-	-% Injury-	----------% Control----------					----------% Control----------					----------% Control----------				
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weed-free Check		0	0	0	0	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Broadaxe	13 fl oz	0	0	0	0	96	53	68	88	60	96	53	65	83	60	96	53	65	83	60
Broadaxe	20 fl oz	0	0	0	0	99	57	98	93	99	99	57	93	93	99	99	67	93	95	99
Broadaxe	30 fl oz	0	0	0	0	99	75	99	99	99	99	85	99	99	99	99	93	99	99	99
Broadaxe	40 fl oz	10	15	15	15	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Spartan	3.5 fl oz	0	0	0	0	70	80	80	99	99	70	80	77	99	99	70	80	78	99	99
Dual II Magnum	16.54 fl oz	0	2	2	2	83	27	70	43	30	83	27	72	42	30	80	27	72	42	30
Outlook	21 fl oz	0	0	0	0	85	57	90	75	50	87	50	90	57	50	85	50	90	53	50
LSD (0.05)		0	2	2	2	5	9	7	6	3	4	8	5	5	3	1	6	4	5	3

Marvel in Dry Edible Bean. Zollinger, Richard K., Angela J. Kazmierczak, and Devin A. Wirth. An experiment was conducted near Thompson, ND to evaluate weed efficacy of POST herbicide programs in dry edible bean. Navy bean was planted on May 16, 2012, followed by a PRE application on treatment 12 at 3:10 pm with 76.6 F air, 65.5 F soil at a four inch depth, 0% relative humidity, 15% cloud cover, 7 to 9 mph SSE wind, dry soil surface, and dry subsoil. Soil characteristics were: 6.5% sand, 64.3% silt, 29.2% clay, silty clay loam texture, 5% OM and 7.8 pH. POST 2-trifoliate treatments were applied on June 18, 2012 at 10:30 am with 82.8 F air, 72.1 F soil at a four inch depth, 30% relative humidity, 10% cloud cover, 8 to 10 mph W wind, dry soil surface, dry subsoil, good crop vigor, and no dew present on 1 to 2 trifoliate dry edible bean. Weed species present at the time of POST 2-trifoliate treatments were: 0.5 to 2 inch (1 to 10/ft^2) common lambsquarters; 0.5 to 2 inch (1 to 10/ft^2) redroot pigweed; and 1 to 4 inch (1 to 5/yd^2) yellow foxtail. A POST 4-trifoliate application was made on treatment 11 on June 25, 2012 at 12:20 pm with 82.1 F air, 76.8 F soil at a four inch depth, 35% relative humidity, 15% cloud cover, 7 to 9 mph SE wind, dry soil surface, dry subsoil, good crop vigor, and no dew present on 3 to 4 trifoliate dry edible bean. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE treatments. The experiment had a randomized complete block design with three replicates per treatment.

Marvel is a premix of fomesafen (Reflex) and fluthiacet (Cadet). Both herbicides have PPO inhibitor mechanisms of action and Cadet is effective on some small broadleaf weeds, including lambsquarters. Reflex usually gives poor lambsquarters. This data shows the utility and good weed management of using a soil-applied followed by POST program. Herbicides with several mechanisms of actions were used to delay weed resistance. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. Marvel in Dry Edible Bean. (Zollinger, Kazmierczak, Wirth)

Treatment	Rate	21 DA PRE	5 DA POST	14 DA POST	30 DA POST	21 DA PRE				14 DA POST				30 DA POST			
		DEB	DEB	DEB	DEB	Yeft	Rrpw	Colq	Koch	Yeft	Rrpw	Colq	Koch	Yeft	Rrpw	Colq	Koch
		-% Injury-	-% Injury-	-% Injury-	-% Injury-	----------% Control----------				----------% Control----------				----------% Control----------			
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weed-free check		0	0	0	0	99	99	99	99	99	99	99	99	99	99	99	99
2nd Trifoliate																	
Marvel+NIS	5 fl oz+0.25% v/v	0	0	0	0	0	0	0	0	10	78	60	72	10	62	50	75
Marvel+NIS	6 fl oz+0.25% v/v	0	0	0	0	0	0	0	0	10	63	60	60	10	67	63	63
Marvel+NIS	7 fl oz+0.25% v/v	0	0	0	0	0	0	0	0	10	62	50	75	10	81	70	75
Marvel+PO	6 fl oz+1% v/v	0	0	3	3	0	0	0	0	10	85	72	83	10	83	72	83
Marvel+MSO	6 fl oz+1% v/v	0	22	12	12	0	0	0	0	10	96	89	96	10	96	83	96
Reflex+MSO	10 fl oz+1% v/v	0	0	0	0	0	0	0	0	10	98	75	93	10	98	77	93
Rezult Basagran+MSO	1pt+1%v/v	0	13	10	10	0	0	0	0	0	30	30	27	0	33	33	30
Raptor+NIS	3fl oz+0.25%v/v	0	0	0	0	0	0	0	0	92	97	92	91	94	97	95	94
2nd Trifoliate/4th Trifoliate																	
Marvel+NIS	6 fl oz+0.25% v/v																
Marvel+NIS	6 fl oz+0.25% v/v	0	10	10	10	0	0	0	0	13	92	87	93	13	92	87	93
PRE/2nd Trifoliate																	
Broadaxe	20fl oz																
Marvel+MSO	6 fl oz+1% v/v	0	25	25	25	99	99	99	99	92	99	99	99	93	99	99	99
LSD (0.05)		0	2	3	3	0	0	0	0	4	15	14	12	4	11	6	8

Warrant in black and navy bean. Zollinger, Richard K., Angela J. Kazmierczak, and Devin A. Wirth. An experiment was conducted near Hatton, ND to evaluate weed efficacy to PPI and EPOST herbicide programs in dry edible bean. On May 30, 2012 PPI treatments were applied at 11:30 am with 72 F air, 61.6 F soil at a four inch depth, 32% relative humidity, 60% cloud cover, 0.5 to 1.5 mph SE wind, moist soil surface, and moist subsoil. Eclipse black dry bean was then planted following PPI application. Soil characteristics were: 1.6% sand, 86.4% silt, 12% clay, silt loam texture, 2.5% OM and 5.8 pH. EPOST treatments were applied on June 18, 2012 at 1:25 pm with 85.5 F air, 74.2 F soil at a four inch depth, 28% relative humidity, 5% cloud cover, 1 to 3 mph W wind, dry soil surface, dry subsoil, good crop vigor, and no dew present to 1 to 2 trifoliate black bean. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

The objective of this study was to determine the tolerance of black and navy beans to Warrant (microencapsualted acetochlor) applied PPI and EPOST. EPOST application would provide 3 to 4 weeks extended residual control after activation through rainfall. Minor injury, which was very difficult to determine through visual evaluation, occurred from Warrant and Dual applied PPI but significant injury occurred EPOST. Black bean recovered from Dual but not Warrant. (Department of Plant Sciences, North Dakota State University, Fargo).

Table 1. Warrant in black bean. (Zollinger, Kazmierczak, Wirth)

Treatment	Rate	14 DA PRE DEB	7 DA POST DEB	14 DA POST DEB	28 DA POST DEB
	(Product/A)	-% Injury-	-% Injury-	-% Injury-	-% Injury-
PPI					
Warrant	1.5qt	0	0	3	4
Warrant	3qt	0	0	0	0
Dual II Magnum	0.67qt	0	0	0	3
EPOST					
Warrant	1.5qt	—	20	8	10
Warrant	3qt	—	35	23	22
Dual II Magnum	0.67qt	—	23	3	0
LSD (0.05)		0	5	5	5

Table 2. Warrant in navy bean. (Zollinger, Kazmierczak, Wirth)

Treatment	Rate	14 DA PRE DEB	7 DA POST DEB	14 DA POST DEB	28 DA POST DEB
	(Product/A)	-% Injury-	-% Injury-	-% Injury-	-% Injury-
PPI					
Warrant	1.5qt	0	0	0	0
Warrant	3qt	0	0	0	0
Dual II Magnum	0.67qt	0	0	0	0
EPOST					
Warrant	1.5qt	—	22	17	10
Warrant	3qt	—	37	28	17
Dual II Magnum	0.67qt	—	18	8	10
LSD (0.05)		0	5	5	5

Dry bean safety to Zidua and Warrant. Zollinger, Richard K., Angela J. Kazmierczak, and Devin A. Wirth. An experiment was conducted near Thompson, ND to evaluate Zidua and Warrant on crop safety in POST herbicide programs in dry edible bean. Two rows each of Eclipse black bean and Stampede pinto bean were planted on May 30, 2012 followed by a PRE broadcast application of Outlook at 18 fl oz/A at 12:30 pm with 72 F air, 61.6 F soil at a four inch depth, 32% relative humidity, 60% cloud cover, 0.5 to 1.5 mph SE wind, moist soil surface, and moist subsoil. Soil characteristics were: 1.6% sand, 86.4% silt, 12% clay, silt loam texture, 2.5% OM and 5.8 pH. POST treatments were applied on June 18, 2012 at 1:25 pm with 85.5 F air, 74.2 F soil at a four inch depth, 28% relative humidity, 5% cloud cover, 1 to 3 mph W wind, dry soil surface, dry subsoil, good crop vigor, and no dew present to 1 to 2 trifoliate dry edible beans. Weed species present at the time of POST were: 1 to 3 inch (1 to 10/ft^2) volunteer cereals; 1 to 3 inch (5 to10/ft^2) common lambsquarters; 2 to 3 inch (1 to 5/yd^2) wild mustard; 1 to 4 inch (1 to 5/ft^2) hairy nightshade; and 2 to 4 inch (1 to 3/yd^2) common ragweed. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

Warrant, an encapsulated formulation of acetochlor was registered for EPOST application in soybean for residual control of small-seeded broadleaf weeds and glyphosate resistant weeds like waterhemp. Degradation of Warrant and Dual is rapid and up to 4 weeks residual control is usually observed after activation. Zidua (pyroxasulfone) is the same mode of action as Warrant and Dual but of a different chemistry and residual weed control has been observed for 8 to 12 weeks. Warrant and Dual does not have any POST weed control activity but Zidua can kill small emerged weeds as shown in the POST treatments. At 7 and 14 DAT, injury was leaf burn, presumably from the added oil adjuvant. Dry bean plants were not stunted or yellow except at the high injury ratings. At 28 DAT and late season evaluation, injury was stunting and slight leaf burn. At late season evaluation, generally the crop response decreased slightly, and the weed control ratings decreased, (data not shown). (Department of Plant Sciences, North Dakota State University, Fargo).

Table. Dry bean safety in Zidua and Warrant. (Zollinger, Wirth, Kazmierczak)

		7 DAT					14 DAPOST					28 DAPOST					Late Season				
Treatments	Rate	Pinto	Black	Wimu	Colq	Hans	Pinto	Black	Wimu	Colq	Hans	Pinto	Black	Wimu	Colq	Hans	Pinto	Black	Wimu	Colq	Hans
	(Product/A)	% Inj	% Inj	% Control			% Inj	% Inj	% Control			% Inj	% Inj	% Control			% Inj	% Inj	% Control		
Dual Magnum+PO+28%UAN	1.33pt+1.5pt+2.5%v/v	17	22	0	0	0	2	7	0	0	0	2	7	0	0	0	2	5	0	0	0
Warrant+PO+28%UAN	1.5qt+1.5pt+2.5%v/v	17	25	0	0	0	3	15	0	0	0	2	18	0	0	0	2	15	0	0	0
Warrant+PO+28%UAN	2qt+1.5pt+2.5%v/v	17	32	0	0	0	7	8	0	0	0	3	13	0	0	0	3	10	0	0	0
Zidua+PO+28%UAN	1.68oz+1.5pt+2.5%v/v	22	30	0	0	0	13	18	0	0	0	17	18	0	0	0	15	7	0	0	0
Zidua+PO+28%UAN	3.36oz+1.5pt+2.5%v/v	22	22	0	0	0	13	5	47	60	50	13	12	47	60	50	7	0	47	60	50
Zidua+PO+28%UAN	5.04oz+1.5pt+2.5%v/v	28	33	0	0	0	15	17	70	70	70	17	18	70	70	70	15	8	70	70	70
Rezult Basagran+Rezult Poast+PO+28%UAN	1.6pt+1.6pt+1.5pt+2.5%v/v	10	10	99	99	99	0	0	99	99	99	0	0	99	99	99	0	0	99	99	99
Rezult Basagran+Rezult Poast+Dual Magnum+PO+28%UAN	1.6pt+1.6pt+1.33pt+1.5pt+2.5%v/v	17	18	99	99	99	2	2	70	72	70	2	7	70	72	70	2	5	70	72	70
Rezult Basagran+Rezult Poast+Warrant+PO+28%UAN	1.6pt+1.6pt+1.5qt+1.5pt+2.5%v/v	7	13	99	99	99	2	3	83	87	87	2	3	83	87	87	0	0	83	87	87
Rezult Basagran+Rezult Poast+Warrant+PO+28%UAN	1.6pt+1.6pt+2qt+1.5pt+2.5%v/v	13	15	99	99	99	2	2	96	95	92	2	2	96	95	92	0	0	96	95	92
Rezult Basagran+Rezult Poast+Zidua+PO=28%UAN	1.6pt+1.6pt+1.68oz+1.5pt+2.5%v/v	20	23	99	99	99	7	7	90	90	90	7	10	90	90	90	3	5	90	90	90
Rezult Basagran+Rezult Poast+Zidua+PO=28%UAN	1.6pt+1.6pt+3.36oz+1.5pt+2.5%v/v	25	27	99	99	99	12	15	95	95	95	13	10	95	95	95	5	5	95	95	95
Rezult Basagran+Rezult Poast+Zidua+PO=28%UAN	1.6pt+1.6pt+5.04oz+1.5pt+2.5%v/v	22	23	99	99	99	2	7	99	99	99	2	3	99	99	99	2	3	99	99	99
LSD (0.05)		5	6	0	0	0	7	7	4	2	2	5	4	4	2	2	4	2	4	2	2

Gowan 1 trial. Zollinger, Richard K., Angela J. Kazmierczak, and Devin A. Wirth. An experiment was conducted near Thompson, ND to evaluate weed efficacy to PPI and POST herbicide programs in dry edible bean. Navy bean was planted on May 16, 2012. On May 15, 2012 PPI treatments were applied at 10:45 am with 64.5 F air, 61.2 F soil at a four inch depth, 2% relative humidity, 5% cloud cover, 6 to 8 mph NW wind, dry soil surface, and dry subsoil. Soil characteristics were: 6.5% sand, 64.3% silt, 29.2% clay, silty clay loam texture, 5% OM and 7.8 pH. POST treatments were applied on June 18, 2012 at 10:40 am with 82.8 F air, 72.1 F soil at a four inch depth, 30% relative humidity, 10% cloud cover, 8 to 10 mph W wind, dry soil surface, dry subsoil, good crop vigor, and no dew present on 1 to 2 trifoliate dry edible bean. Weed species present at the time of POST were: 0.5 to 1 inch (1 to 5/ft^2) common lambsquarters; 0.5 to 1 inch (1 to 5/ft^2) redroot pigweed; and 1 to 2 inch (1 to 10/ft^2) volunteer cereals. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PPI treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

By 28 and 56 DAT, most treatments controlled weeds. This data shows the utility and good weed management of using a soil-applied followed by POST program. Herbicides with several mechanisms of actions were used to delay weed resistance. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. Gowan 1 Trial. (Zollinger, Kazmierczak, Wirth)

Treatments	Rate	14 DAE DEB	28 DAE DEB	7 DA POST DEB	14 DA POST DEB	28 DA POST DEB	56 DA POST DEB	14 DAE Yeft	14 DAE Wht	14 DAE Rrpw	14 DAE Colq	14 DAE Koch
	(Product/A)	- % Injury-	-% Injury-	-% Injury-	-% Injury-	-% Injury-	-% Injury-	----------% Control----------				
Untreated		0	0	0	0	0	0	0	0	0	0	0
PPI/POST												
Eptam	4pt											
Basagran+Raptor+MSO	1pt+2fl oz+1pt	12	5	10	10	10	10	99	75	99	99	99
Eptam+Sonalan	3.5pt+3pt											
Basagran+Raptor+MSO	1pt+2fl oz+1pt	12	5	10	10	10	10	99	96	99	99	99
Eptam+Sonalan	3pt+3p											
Basagran+Raptor+MSO	1pt+2fl oz+1pt	18	10	10	10	10	10	99	90	99	99	99
Eptam+Dual Magnum	3.5pt+1.4pt											
Basagran+Raptor+MSO	1pt+2fl oz+1pt	20	8	10	10	10	10	99	88	99	99	99
Dual Magnum	1.67pt											
Basagran+Raptor+MSO	1pt+2fl oz+1pt	8	0	12	12	12	10	99	37	99	99	99
Prowl+Outlook	3pt+14fl oz											
Basagran+Raptor+MSO	1pt+2fl oz+1pt	20	10	12	12	12	10	99	70	99	99	99
Eptam+Sonalan	4pt+3pt											
Basagran+Raptor+MSO	1pt+2fl oz+1pt	22	10	10	12	12	10	99	87	99	99	99
POST												
Basagran+Raptor+MSO	1pt+2fl oz+1pt	0	0	10	10	10	10	0	0	0	0	0
LSD (0.05)		10	4	2	3	3	NS	NS	7	NS	NS	NS

Table. Gowan 1 Trial. (Zollinger, Kazmierczak, Wirth)

Treatments	Rate	28 DAE					14 DA POST					28 & 56 DA POST				
		Yeft	Wht	Rrpw	Colq	Koch	Yeft	Wht	Rrpw	Colq	Koch	Yeft	Wht	Rrpw	Colq	Koch
	(Product/A)	% Control					% Contol					% Control				
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PPI/POST																
Eptam	4pt															
Basagran+Raptor+MSO	1pt+2fl oz+1pt	99	80	88	88	67	99	92	99	97	99	99	92	99	97	99
Eptam+Sonalan	3.5pt+3pt															
Basagran+Raptor+MSO	1pt+2fl oz+1pt	99	92	99	98	99	99	96	99	98	99	99	96	99	98	99
Eptam+Sonalan	3pt+3pt															
Basagran+Raptor+MSO	1pt+2fl oz+1pt	99	88	99	99	99	99	91	99	99	99	99	91	99	99	99
Eptam+Dual Magnum	3.5pt+1.4pt															
Basagran+Raptor+MSO	1pt+2fl oz+1pt	99	88	99	98	99	99	90	99	98	99	99	93	99	98	99
Dual Magnum	1.67pt															
Basagran+Raptor+MSO	1pt+2fl oz+1pt	68	30	70	60	20	99	72	99	90	96	99	88	99	91	98
Prowl+Outlook	3pt+14fl oz															
Basagran+Raptor+MSO	1pt+2fl oz+1pt	99	53	72	72	32	99	77	99	86	87	99	77	99	90	87
Eptam+Sonalan	4pt+3pt															
Basagran+Raptor+MSO	1pt+2fl oz+1pt	99	88	95	95	99	99	93	99	99	99	99	95	99	99	99
POST																
Basagran+Raptor+MSO	1pt+2fl oz+1pt	0	0	0	0	0	70	72	99	77	85	70	72	99	77	85
LSD (0.05)		2	5	2	3	4	6	7	NS	5	3	6	7	NS	5	2

Gowan 2 trial. Zollinger, Richard K., Angela J. Kazmierczak, and Devin A. Wirth. An experiment was conducted near Thompson, ND to evaluate weed efficacy to PRE, PPI, EPOST, and POST herbicide programs in dry edible bean. On May 15, 2012 PPI treatments were applied at 11:00 am with 64.5 F air, 61.2 F soil at a four inch depth, 2% relative humidity, 5% cloud cover, 6 to 8 mph NW wind, dry soil surface, and dry subsoil. Navy bean was planted on May 16, 2012, followed by an application of PRE treatments at 3:20 pm with 65.5 F air, 65.5 F soil at a four inch depth, 0% relative humidity, 15% cloud cover, 7 to 9 mph SSE wind, dry soil surface, and dry subsoil.Soil characteristics were: 6.5% sand, 64.3% silt, 29.2% clay, silty clay loam texture, 5% OM and 7.8 pH. EPOST treatments were applied on June 18, 2012 at 11:00 am with 82.8 F air, 72.1 F soil at a four inch depth, 30% relative humidity, 10% cloud cover, 8 to 10 mph W wind, dry soil surface, dry subsoil, good crop vigor and no dew present at 1 to 2 trifoliate dry edible bean. Weed species present at the time of EPOST were: 1 to 2 inch (1 to3/yd^2) common lambsquarters and 1 to 3 inch (1 to 5/yd^2) wild oat. POST treatments were applied on June 25, 2012 at 12:45 pm with 82.1 F air, 76.8 F soil at a four inch depth, 35% relative humidity, 15% cloud cover, 7 to 9 mph SE wind, dry soil surface, dry subsoil, good crop vigor and no dew present at 3 to 4 trifoliate dry edible bean. Weed species present at the time of EPOST were: 2 to 8 inch (1 to 15/yd^2) wild oat. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE and PPI treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for EPOST and POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

Dry conditions before and after PRE application did not fully activate PRE herbicides and generally resulted in poor weed control. By 28 and 56 DAT, most treatments controlled weeds. This data shows the utility and good weed management of using a soil-applied followed by POST program. Herbicides with several mechanisms of actions were used to delay weed resistance. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. Gowan 2 Trial. (Zollinger, Kazmierczak, Wirth)

Treatments	Rate	28 DAE DEB	7 DA POST DEB	14 DA POST DEB	21 DA POST DEB	28 DA POST DEB	56 DA POST DEB	28 DAE Yeft	Wioa	Wimu	Rrpw	Colq	Koch
	(Product/A)	-% Injury-	-% Injury-	-% Injury-	-% Injury-	-% Injury-	-% Injury-	-% Control-					
Untreated		0	0	0	0	0	0	0	0	0	0	0	0
PPI													
Eptam+Sonalan+Permit	3pt+2pt+0.67oz	0	0	0	0	0	0	98	90	98	98	98	96
PPI/EPOST													
Eptam+Sonalan	3pt+2pt												
Permit+PO+28%UAN	0.67oz+1pt+2%v/v	0	0	0	0	0	0	99	94	99	99	98	98
Eptam+Intrro	3pt+2qt												
Basagran+Raptor+PO+28%UAN	1pt+2fl oz+1pt+2%v/v	0	0	0	0	0	0	99	92	72	91	80	90
EPOST/POST													
Permit+NIS+28%UAN	0.67oz+0.25%v/v+2%v/v												
Targa+PO	8fl oz+0.5%v/v	0	0	0	0	0	0	0	0	0	0	0	0
Permit+PO+28%UAN	0.67oz+1%v/v+2%v/v												
Targa+PO	8fl oz+0.5%v/v	0	10	10	10	5	5	0	0	0	0	0	0
Permit+Basagran+PO+28%UAN	0.67oz+1pt+1pt+2%v/v												
Targa+PO	8fl oz+0.5%v/v	0	0	3	3	0	0	0	0	0	0	0	0
Permit+Basagran+Raptor	0.67oz+1pt+2fl oz												
+PO+28%UAN	+1pt+2%v/v												
Targa+PO	8fl oz+0.5%v/v	0	10	10	10	0	0	0	0	0	0	0	0
Permit+Reflex+PO+28%UAN	0.67oz+8fl oz+1pt+2%v/v												
Targa+PO	8fl oz+0.5%v/v	0	5	5	5	0	0	0	0	0	0	0	0
Basagran+Raptor+PO+28%UAN	1pt+2fl oz+1pt+2%UAN												
Targa+PO	8fl oz+0.5%v/v	0	10	10	10	0	0	0	0	0	0	0	0
EPOST													
Permit+Rezult Basagran	0.67oz+0.8pt												
+Rezult Poast+PO+28%UAN	+0.8pt+1pt+2%v/v	0	5	5	5	0	0	0	0	0	0	0	0
PRE/EPOST													
Intrro	3qt												
Basagran+Raptor+PO+28%UAN	1pt+2fl oz+1pt+2%v/v	0	8	8	8	0	0	87	37	30	67	50	25
LSD (0.05)		0	1	3	3	0	0	3	4	2	3	3	3

Table. Gowan 2 Trial. (Zollinger, Kazmierczak, Wirth)

Treatments	Rate	14 DA POST					21 DA POST					28 DA POST					56 DAPOST				
		Wioa	Wimu	Rrpw	Colq	Koch	Wioa	Wimu	Rrpw	Colq	Koch	Wioa	Wimu	Rrpw	Colq	Koch	Wioa	Wimu	Rrpw	Colq	Koch
	(Product/A)	% Control					% Control					% Control					% Control				
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PPI																					
Eptam+Sonalan+Permit	3pt+2pt+0.67oz	88	99	95	88	82	80	99	95	88	82	80	99	95	88	82	82	99	95	90	82
PPI/EPOST																					
Eptam+Sonalan Permit+PO+28%UAN	3pt+2pt 0.67oz+1pt+2%v/v	73	99	96	92	82	77	99	96	92	82	78	99	96	93	83	78	99	96	93	83
Eptam+Intrro Basagran+Raptor+PO+28%UAN	3pt+2qt 1pt+2fl oz+1pt+2%v/v	92	99	98	98	90	93	99	98	98	90	98	99	99	99	90	98	99	99	99	90
EPOST/POST																					
Permit+NIS+28%UAN Targa+PO	0.67oz+0.25%v/v+2%v/v 8fl oz+0.5%v/v	63	99	50	50	50	93	99	50	50	50	93	99	60	60	50	93	99	60	60	50
Permit+PO+28%UAN Targa+PO	0.67oz+1%v/v+2%v/v 8fl oz+0.5%v/v	83	99	67	57	50	92	99	67	57	50	93	99	70	60	50	93	99	70	60	50
Permit+Basagran+PO+28%UAN Targa+PO	0.67oz+1pt+1pt+2%v/v 8fl oz+0.5%v/v	70	99	50	50	50	95	99	50	50	50	95	99	70	70	70	95	99	70	70	70
Permit+Basagran+Raptor +PO+28%UAN Targa+PO	0.67oz+1pt+2fl oz +1pt+2%v/v 8fl oz+0.5%v/v	80	99	99	95	63	95	99	99	95	63	95	99	99	95	80	95	99	99	95	80
Permit+Reflex+PO+28%UAN Targa+PO	0.67oz+8fl oz+1pt+2%v/v 8fl oz+0.5%v/v	73	99	82	70	83	95	99	82	70	83	95	99	82	70	78	95	99	82	70	78
Basagran+Raptor+PO+28%UAN Targa+PO	1pt+2fl oz+1pt+2%UAN 8fl oz+0.5%v/v	73	99	99	87	70	95	99	99	87	70	95	99	99	92	83	95	99	99	92	83
EPOST																					
Permit+Rezult Basagran +Rezult Poast+PO+28%UAN	0.67oz+0.8pt +0.8pt+1pt+2%v/v	27	99	70	70	63	27	99	70	70	63	27	99	70	70	63	27	99	70	70	63
PRE/EPOST																					
Intrro Basagran+Raptor+PO+28%UAN	3qt 1pt+2fl oz+1pt+2%v/v	87	99	99	95	90	93	99	99	95	90	95	99	99	98	93	95	99	99	98	93
LSD (0.05)		11	0	4	5	5	8	0	4	5	5	8	0	3	5	5	7	0	3	4	5

Gowan 3 trial. Zollinger, Richard K., Angela J. Kazmierczak, and Devin A. Wirth. An experiment was conducted near Thompson, ND to evaluate weed efficacy to PRE and EPOST herbicide programs in dry edible bean. Navy bean was planted on May 16, 2012, followed by the application of PRE treatments at 3:12 pm with 76.5 F air, 65.5 F soil at a four inch depth, 0% relative humidity, 15% cloud cover, 7 to 8 mph SE wind, dry soil surface, and dry subsoil. Soil characteristics were: 6.5% sand, 64.3% silt, 29.2% clay, silty clay loam texture, 5% OM and 7.8 pH. EPOST treatments were applied on June 18, 2012 at 10:30 am with 82.8 F air, 72.1 F soil at a four inch depth, 30% relative humidity, 10% cloud cover, 8 to 10 mph W wind, dry soil surface, dry subsoil, good crop vigor, and no dew present to 1 to 2 trifoliate dry edible bean. Weed species present at the time of EPOST were: 1 to 3 inch (1 to 5/yd^2) yellow foxtail; 1 to 2 inch (1 to 2/yd^2) common lambsquarters; 1 to 2 inch (1 to 2/yd^2) redroot pigweed; and 2 to 4 inch (1 to 10/ft^2) wild oat. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for EPOST treatments. The experiment had a randomized complete block design with three replicates per treatment.

Dry conditions before and after PRE application did not fully activate PRE herbicides and generally resulted in poor weed control. By 28 and 56 DAT, most treatments controlled weeds. This data shows the utility and good weed management of using a soil-applied followed by POST program. Herbicides with several mechanisms of actions were used to delay weed resistance. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. Gowan 3 Trial. (Zollinger, Kazmierczak, Wirth)

Treatments	Rate	28 DAE DEB	7 DA POST DEB	14 DA POST DEB	28 DA POST DEB	56 DA POST DEB
	(Product/A)	-% Injury-	-% Injury-	-% Injury-	-% Injury-	-% Injury-
Untreated		0	0	0	0	0
PRE/EPOST						
Outlook Rezult Basagran+Rezult Poast +Raptor+Reflex+MSO	20fl oz 0.6pt+0.6pt +1fl oz+3fl oz+1.25pt	0	0	0	0	0
Permit Basagran+Raptor+MSO	0.67oz 1pt+2fl oz+1pt	0	10	10	10	10
Permit+Spartan Charge Basagran+Raptor+MSO	0.67oz+4.75fl oz 1pt+2fl oz+1pt	0	10	10	10	10
Spartan Charge Basagran+Raptor+MSO	4.75fl oz 1pt+2fl oz+1pt	10	10	10	10	10
EPOST						
Basagran+Raptor+MSO	1pt+2fl oz+1pt	0	10	10	10	10
LSD (0.05)		0	0	0	0	0

Table. Gowan 3 Trial. (Zollinger, Kazmierczak, Wirth)

Treatments	Rate	28 DAE				14 DA POST					28 DA POST					56 DAPOST				
		Wimu	Rrpw	Colq	Koch	Wioa	Wimu	Rrpw	Colq	Koch	Wioa	Wimu	Rrpw	Colq	Koch	Wioa	Wimu	Rrpw	Colq	Koch
	(Product/A)	----------% Control----------				----------% Control----------					----------% Control----------					----------% Control----------				
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PRE/EPOST																				
Outlook	20fl oz																			
Rezult Basagran+Rezult Poast	0.6pt+0.6pt																			
+Raptor+Reflex+MSO	+1fl oz+3fl oz+1.25pt	40	77	67	33	80	99	99	91	95	82	99	99	92	95	82	99	99	92	95
Permit	0.67oz																			
Basagran+Raptor+MSO	1pt+2fl oz+1pt	99	88	82	90	83	99	99	96	99	83	99	99	96	99	83	99	99	96	99
Permit+Spartan Charge	0.67oz+4.75fl oz																			
Basagran+Raptor+MSO	1pt+2fl oz+1pt	99	92	83	92	89	99	98	98	99	91	99	98	98	99	91	99	98	98	99
Spartan Charge	4.75fl oz																			
Basagran+Raptor+MSO	1pt+2fl oz+1pt	82	85	85	90	78	93	99	95	99	83	95	99	96	99	83	95	99	96	99
EPOST																				
Basagran+Raptor+MSO	1pt+2fl oz+1pt	0	0	0	0	90	99	99	87	83	90	99	99	88	85	90	99	99	88	85
LSD (0.05)		2	7	8	5	11	2	2	7	2	7	0	2	7	4	7	0	2	7	4

Fall-applied herbicides for dandelion control, Carrington, 2012. Greg Endres. A field study was conducted at the NDSU Carrington Research Extension Center to examine dandelion control with fall-applied herbicides in idle cropland. Experimental design was a randomized complete block with four replications. Herbicides were applied with a CO_2-pressurized plot sprayer delivering 17 gal/A at 35 psi through 8001 flat fan nozzles to the center 5 ft of 8- by 20-ft plots on September 22, 2011 at 53 F, 57% RH and 4 mph wind to rosette-stage dandelion.

Dandelion control initially was 85 to 94% with tank mixtures of glyphosate with 2,4-D and Valor, and glyphosate with Sharpen one month after treatment (MAT) (Table). In May, 2012 (8 MAT), Express provided 89% control of dandelion, with other herbicide treatments providing 68 to 80% control. In July (10 MAT), dandelion control was good (82%) with Express, while control with other herbicide treatments was poor (>60%).

Table.

Herbicide		Dandelion control			
Treatment[1]	Rate	17-Oct-11	10-May-12	18-Jun-12	19-Jul-12
			%		
RU PM	22 fl oz/A				
Class Act NG	2.5% v/v	63	70	20	0
2,4-D	16 fl oz/A	69	69	65	50
Express DF	0.33 oz/A				
Class Act NG	2.5% v/v	33	89	86	82
RU PM	22 fl oz/A				
2,4-D	16 fl oz/A				
Class Act NG	2.5% v/v	73	68	28	24
RU PM	22 fl oz/A				
2,4-D	16 fl oz/A				
Express DF	0.33 oz/A				
Class Act NG	2.5% v/v	75	80	65	58
RU PM	22 fl oz/A				
2,4-D	16 fl oz/A				
Valor	2 oz/A				
Class Act NG	2.5% v/v	85	74	28	10
RU PM	22 fl oz/A				
2,4-D	16 fl oz/A				
Valor	3 oz/A				
Class Act NG	2.5% v/v	88	77	55	43
RU PM	22 fl oz/A				
Sharpen	2 fl oz/A				
Destiny HC	12 fl oz/A				
Class Act NG	2.5% v/v	94	75	33	30
CV (%)		5.5	4.0	39.5	55.9
LSD (0.05)		6	4	27	30

[1]RU PM=Roundup PowerMax; Class Act NG= surfactant&AMS, and Destiny HC=high surfactant oil concentrate (Winfield Solutions); 2,4-D=LV4.

Weed control in dry pea with BroadAxe. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate broadleaf and grass weed control in dry pea with BroadAxe compared to other labeled products. BroadAxe is a premix of Spartan + Dual. All treatments listed in the table below were applied preemergence. Select was applied POST to all treatments except the untreated. No crop injury was observed with any treatment. All BroadAxe and Spartan treatments provided excellent control of pigweed. Dual and Outlook provided poor pigweed control. Foxtail was effectively controlled by the PRE treatments followed by Select.

Table. Weed control in dry pea with BroadAxe. (1217)

		Dry Pea				Weed Control[b]				Harvest	
		Injury	Density	Height		Foxtail		Rrpw		Yield	TW
Treatment[a]	Rate	2-Jun	13-Jun	13-Jun	9-Jul	26-Jun	17-Jul	26-Jun	17-Jul	6-Aug	
		----%----	--plnt/m--	-------cm-------		----------%----------				lb/A	lb/bu
Untreated		0	8.7	23.1	63.8	0	0	0	0	1607	64.5
BroadAxe	19 fl oz	0	9.0	21.2	60.1	99	99	94	93	2585	65.2
BroadAxe	25 fl oz	0	9.0	20.6	61.4	99	99	99	95	2499	64.9
BroadAxe	35 fl oz	0	8.3	20.4	58.2	99	99	99	95	2347	64.3
BroadAxe + Dual	19 fl oz + 6 fl oz	0	8.6	20.2	54.1	98	99	93	92	2396	63.8
Spartan + Prowl	3 fl oz + 2 pt	0	9.0	21.4	56.9	97	99	99	95	2306	64.7
Prowl H_2O	3 pt	0	8.8	22.4	64.2	99	99	85	84	2739	64.8
Dual II Magnum	16.54 fl oz	0	8.7	21.7	57.2	99	99	47	43	2363	64.6
Outlook	21 fl oz	0	9.1	20.7	54.6	99	99	40	40	2306	64.8
LSD (0.05)		NS	NS	2	NS	3	0	14	14	NS	NS
CV		0	8	4	9	2	0	11	11	11	1

[a] *Select + COC (8 fl oz + 1%) was applied POST to all treatments except UNT; Dual=Dual II Magnum*

[b] *Rrpw=Redroot Pigweed*

Fluthiacet use in field pea. Howatt, Roach, Ciernia, and Harrington. 'Arvika' field pea was seeded near Fargo on May 1. Treatments were applied to 6 to 10 inch tall field pea that had flower buds present on June 1 with 58°F, 63% humidity, 50% cloud cover, 5 mph wind at 180° and dry soil at 55°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi 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	June 4 Fpea	June 8 Fpea	June 15 Fpea	June 22 Fpea
	oz ai/A	%	%	%	%
Fluthiacet+NIS	0.057+0.25%	28	40	34	14
Fluthiacet+NIS	0.085+0.25%	39	43	40	21
Fluthiacet+NIS	0.1+0.25%	50	48	43	26
Fluthiacet+MSO	0.057+1%	58	63	50	30
Fluthiacet+MSO	0.085+1%	69	65	55	38
Fluthiacet+MSO	0.1+1%	78	74	64	55
Fluthiacet+MSO	0.16+1%	78	76	63	53
Bentazon+MSO	8+20	3	3	0	0
CV		12	11	13	21
LSD (P=0.05)		9	8	8	9

Fluthiacet caused a t least 28% damage observed as rapid necrosis of leaves and stems 3 days after application. Injury was enhanced with MSO adjuvant compared with NIS, and injury approached 80% with higher rates of fluthiacet included. Injury on June 8 was 40 to 75% and damaged tissue was falling from the plant. Growth of new shoots occurred from leaf axil meristems but plants remained shorter and had less canopy mass than plants treated with bentazon or in the untreated border between plots. Fluthiacet does not appear to be a reasonable herbicide for field pea because of excessive damage.

Florasulam use in flax. Howatt, Roach, Ciernia, and Harrington. 'Carter' flax was seeded near Fargo on May 1. Treatments were applied to 6 to 10 inch tall flax on June 15 with 72°F, 62% relative humidity, 0% cloud cover, 7 mph wind at 315°, and moist soil at 63°F. The treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 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	June 21 Flax	June 29 Flax
	oz ai/A	%	%
Pinoxaden&florasulam+NIS	0.93+0.25%	29	34
Pinoxaden&florasulam+MCPA+NIS	0.93+5+0.25%	36	33
Pinoxaden&florasulam+NIS	0.66+0.25%	29	45
Pinoxaden&florasulam+MCPA+NIS	0.66+4+0.25%	38	41
Clopyralid+clethodim+PO	1.5+1.5+20	2	11
Clopyralid&MCPA+clethodim+PO	9.75+1.5+20	15	2
Bromoxynil&MCPA5+clethodim+PO	7.2+1.5+20	12	10
Untreated Check	0	1	0
CV		20	58
LSD (P=0.05)		6	18

Florasulam applied PRE or POST caused minimal injury to flax in a previous study. In this study, florasulam applied POST caused about 30 to 40% injury regardless of rate. Chlorosis at the apical meristem and substantial stunting was observed and attributed to florasulam. Addition of MCPA resulted in very prominent horizontal stem development for about 1 inch and then the stem grew vertical again. This increased injury rating on June 21 by about 8 percentage points but was not a factor in injury rating by June 29. MCPA in other treatments also caused the "shepherds-crook" growth deformation. None of the herbicide treatments were completely safe to flax. Additional work will be conducted for the PRE use of florasulam.

Preharvest desiccation in Flax. Howatt, Roach, Ciernia, and Harrington. 'Carter' flax was seeded May 1. Treatments were applied to mature flax in approximately 30% moisture stage of seed, 18 to 24 inch tall yellow foxtail, vining wild buckwheat, and redroot pigweed and wild oat both at 30 inches tall on August 20 with 71°F, 37% relative humidity, 0% cloud cover, 21 mph wind at 350° and dry soil at 64°F. Treatments were applied with a sprayer mounted on a 4X4 all terrain vehicle delivering 8.5 gpa at 50 psi through 8001 flat fan nozzles to a 7-ft-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		Aug 23					Aug 27					Sept 5
Treatment	Rate	Flax	Yeft	Rrpw	Colq	Wibw	Flax	Yeft	Rrpw	Colq	Wibw	Flax
	oz ai/A	%	%	%	%	%	%	%	%	%	%	%
Saff+MSO+AMS	0.36+1%+22	75	70	30	0	20	73	60	53	17	53	73
Saff+MSO+AMS	0.72+1%+22	75	70	30	0	20	75	75	62	20	37	74
Saff+MSO+AMS	1.44+1%+22	75	70	30	0	20	77	80	53	17	35	74
Glyt4.5[a] +MSO+AMS	12+1%+22	75	70	30	0	20	77	77	67	33	53	75
Saff+glyt4.5+MSO+AMS	0.36+12+1%+22	75	70	30	0	20	77	85	72	37	32	75
Carf+MSO+AMS	0.5+1%+22	75	70	30	0	20	70	80	53	23	57	71
2,4-D amine+NIS+AMS	16+0.25%+22	75	70	30	0	20	73	57	37	30	47	73
Untreated	0	75	70	30	0	20	70	50	23	3	10	71
CV		0	0	0	0	0	2	7	12	30	19	3
LSD 0.05		0	0	0	0	0	3	7	11	12	17	3

[a] Abbreviation glyt4.5=4.5 lb ae/gal glyphosate as PowerMax from Monsanto Corp.

Treatments did not appreciably promote flax desiccation, not even glyphosate which has demonstrated great utility in previous studies. Rapid desiccation was not observed on any weed species with any of the herbicides. On Aug 27, increased rate of saflufenacil increased the control of yellow foxtail to 80% but did not improve the control of other weeds. Carfentrazone also improved desiccation of yellow foxtail to 80% control, which was similar to effect of treatments containing glyphosate. Control of broadleaf weeds was highly variable and generally similar across herbicide treatments. Treatment differences for weed control on Sept 5 were not relevant and were of less degree than on Aug 27. Treatments may have removed some plant biomass but were not effective for improved harvest ease in this study.

Fine Tuning Microrates for Early Season Broadleaf Weed Control in Onion. Harlene Hatterman-Valenti and Collin Auwarter. Weed control in onion is essential to produce marketable bulbs and is compounded by the crop's notoriously competitive nature, especially during establishment when onion can take anywhere from 4-10 weeks to reach the 2-leaf stage. Broadleaf weeds such as common lambsquartes and redroot pigweed gain a competitive advantage over the establishing onion crop if they are not controlled before onion seedlings reach the 2-leaf stage. PRE and POST herbicide options prior to the 2-leaf stage are few, and often ineffective. This study was conducted at the Oakes Irrigation Research Facility near Oakes, ND to compare early-season weed control of bromoxynil (Buctril) and oxyfluorfen (GoalTender) applied at microrates to a standard pre-emergence treatment of DCPA (Dacthal) or ethofumesate (Nortron) in onion. 'Sedona' onion was planted May 14 with 18" centers and a planting population of 175,000 seeds/a. PRE treatments included 1 and 2 lb/a ethofumesate and 13.33 lb/a DCPA, which were applied 8 DAP. Microrate applications began between the onion flag and 1-leaf stage, 21 DAP, or when the weed seedlings were at the cotyledon to 1-leaf stage. Bromoxynil and oxyfluorfen were applied at 0.25 and 0.13X the lowest labeled rate along with 0.031 lb/a clethodim (Select) and applied in four or five sequential applications of 7 day intervals. Petroleum oil-surfactant (Herbimax) (1 pt/a) was tank mixed with the microrate application. The pre-emergence treatments received Buctril at 1 pt and Goal at 2 pt/a during the 5 leaf stage. Treatments.

Trt No	Trt Name	Rate	Rate Unit/A	App Code	Trt No	Trt Name	Rate	Rate Unit/A	App Code	Trt No	Trt Name	Rate	Rate Unit/A	App Code
1	Buctril	4	floz	B	4	Buctril	4	Floz	B	9	Buctril	2	Floz	B
	Select Max	4	floz	B		Select Max	4	Floz	B		Select Max	4	Floz	B
	Herbimax	1	pt	B		Herbimax	1	Pt	B		Herbimax	1	Pt	B
	Buctril	4	floz	C		Buctril	4	Floz	C		Buctril	2	Floz	C
	Select Max	4	floz	C		Select Max	4	Floz	C		Select Max	4	Floz	C
	Herbimax	1	pt	C		Herbimax	1	Pt	C		Herbimax	1	Pt	C
	Buctril	2	floz	D		Buctril	4	Floz	D		Buctril	2	Floz	D
	Goal Tender	2	floz	D		Select Max	4	Floz	D		Goal Tender	2	Floz	D
	Select Max	4	floz	D		Herbimax	1	Pt	D		Select Max	4	Floz	D
	Herbimax	1	pt	D		Buctril	4	Floz	E		Herbimax	1	Pt	D
	Buctril	2	floz	E		Select Max	4	Floz	E		Buctril	2	Floz	E
	Goal Tender	2	floz	E		Herbimax	1	Pt	E		Goal Tender	2	Floz	E
	Select Max	4	Floz	E		Buctril	4	Floz	F		Select Max	4	Floz	E
	Herbimax	1	Pt	E		Select Max	4	Floz	F		Herbimax	1	Pt	E
2	Buctril	2	Floz	B		Herbimax	1	Floz	F	10	Buctril	4	Floz	B
	Select Max	4	Floz	B	5	Goal Tender	2	Floz	B		Select Max	4	Floz	B
	Herbimax	1	Pt	B		Select Max	4	Floz	B		Herbimax	1	Pt	B
	Buctril	2	Floz	C		Herbimax	1	Pt	B		Buctril	4	Floz	C
	Select Max	4	Floz	C		Goal Tender	2	Floz	C		Select Max	4	Floz	C
	Herbimax	1	Pt	C		Select Max	4	Floz	C		Herbimax	1	Pt	C
	Buctril	2	Floz	D		Herbimax	1	Pt	C		Buctril	4	Floz	D
	Select Max	4	Floz	D		Goal Tender	2	Floz	D		Goal Tender	2	Floz	D
	Herbimax	1	Pt	D		Select Max	4	Floz	D		Select Max	4	Floz	D
	Buctril	2	Floz	E		Herbimax	1	Pt	D		Herbimax	1	Pt	D
	Goal Tender	2	Floz	E		Goal Tender	2	Floz	E		Buctril	4	Floz	E
	Select Max	4	Floz	E		Select Max	4	Floz	E		Goal Tender	2	Floz	E
	Herbimax	1	Pt	E		Herbimax	1	Pt	E		Select Max	4	Floz	E
	Buctril	2	Floz	F		Goal Tender	2	Floz	F		Herbimax	1	Pt	E
	Goal Tender	2	Floz	F		Select Max	4	Floz	F	11	Buctril	4	Floz	B
	Select Max	4	Floz	F		Herbimax	1	Pt	F		Select Max	4	Floz	B
	Herbimax	1	Pt	F	6	Dacthal	10	Lb	A		Herbimax	1	Pt	B
3	Goal Tender	1	Floz	B		Buctril	1	Pt	F		Buctril	4	Floz	C
	Buctril	2	Floz	B		Goal	2	Pt	F		Select Max	4	Floz	C
	Select Max	4	Floz	B		Select Max	12	Floz	F		Herbimax	1	Pt	C
	Herbimax	1	Pt	B		Herbimax	1	Pt	F		Buctril	4	Floz	D
	Goal Tender	1	Floz	C	7	Nortron	4	Pt	A		Select Max	4	Floz	D
	Buctril	2	Floz	C		Buctril	1	Pt	F		Herbimax	1	Pt	D
	Select Max	4	Floz	C		Goal	2	Pt	F		Buctril	4	Floz	E
	Herbimax	1	Pt	C		Select Max	12	Floz	F		Goal Tender	2	Floz	E
	Goal Tender	1	Floz	D		Herbimax	1	Pt	F		Select Max	4	Floz	E
	Buctril	2	Floz	D	8	Nortron	2	Pt	A		Herbimax	1	Pt	E
	Select Max	4	Floz	D		Buctril	1	Pt	F		Buctril	4	Floz	F
	Herbimax	1	Pt	D		Goal	2	Pt	F		Goal Tender	2	Floz	F
	Goal Tender	1	Floz	E		Select Max	12	Floz	F		Select Max	4	Floz	F
	Buctril	2	Floz	E		Herbimax	1	Pt	F		Herbimax	1	Pt	F
	Select Max	4	Floz	E						12	Untreated			
	Herbimax	1	Pt	E										
	Goal Tender	1	Floz	F										
	Buctril	2	Floz	F										
	Select Max	4	Floz	F										
	Herbimax	1	Pt	F										

Application information.

Date:		5/22/12	6/4/12	6/12/12	6/21/12	6/27/12	7/2/12
TIme:		A	B	C	D	E	F
Sprayer:	GPA:	20	20	20	20	20	20
	PSI:	40	40	40	40	40	40
	Nozzle:	11002	8002	8002	8002	11002	11002
Air Temperature(F):		63	72	50	63	78	93
Relative Humidity (%):		53	60	81	73	74	53
Soil Moisture:		Adequate	Adequate	Adequate	Adequate	Adequate	Adequate
Wind (MPH):		11	6	4	8	9	5
Cloud Cover (%):		40	5	0	60	50	0
Onion Stage:		Seed Cracking	1 leaf	2 leaf	3 leaf	4 leaf	5 leaf

Weed and injury ratings.

	% CONTROL											
Trt	6/12/2012			6/21/2012			6/27/2012			7/9/2012		
No	CHEAL	AMARE	Injury	CHEAL	AMARE	Injury	CHEAL	AMARE	Injury	CHEAL	AMARE	Injury
1	88 ab	94 a	18 a	94 ab	99 a	15 a	94 a	89 a	6 ab	93 ab	99 a	0 a
2	80 ab	91 ab	13 a	86 bc	96 a	11 a	88 ab	91 b	5 ab	93 ab	100 a	0 a
3	71 b	85 c	14 a	81 cd	95 a	9 a	78 c	98 a	2 b	89 b	100 a	0 a
4	94 a	95 a	15 a	98 a	96 a	12 a	96 a	99 a	6 ab	100 a	100 a	0 a
5	86 ab	94 a	16 a	84 c	100 a	12 a	84 bc	98 a	4 ab	89 b	100 a	0 a
6	88 ab	86 bc	16 a	71 e	76 b	13 a	94 a	95 ab	9 a	94 ab	98 a	0 a
7	90 a	93 a	20 a	75 de	94 a	14 a	95 a	95 ab	7 ab	99 a	100 a	0 a
8	88 ab	94 a	16 a	73 e	90 a	10 a	95 a	95 ab	6 ab	96 ab	99 a	0 a
9	78 ab	90 abc	13 a	89 abc	94 a	10 a	84 bc	94 ab	3 b	90 b	98 a	0 a
10	95 a	95 a	15 a	96 a	96 a	11 a	96 a	99 a	3 b	100 a	100 a	0 a
11	93 a	94 a	15 a	98 a	99 a	11 a	96 a	96 a	5 ab	98 a	98 a	0 a
12	0 c	0 d	0 b	0 f	0 c	0 b	0 d	0 c	0 c	0 c	0 c	0 a
LSD(P=.05)	11.7	4.4	6.1	6.3	8.5	6.4	6.0	3.3	5.2	5.0	3.4	0.0

Yield results.

	2 Double Rows X 6'												
Trt	<1"		-1" – 2.25"-		-2.25" – 3"-		---3" – 4" ---		----- >4" -----		----Total----		
No	#	Lbs	#	Lbs	#	Lbs	#	Lbs	#	Lbs	#	Lbs	CWT/A
1	0 a	0 a	1 ab	0.2 ab	9 ab	3.8 a	15 abc	11 bc	0.5 a	0.6 a	26.3 b	15.4 bc	372 bc
2	0 a	0 a	3 ab	0.4 ab	14 ab	5.3 a	20 ab	14 abc	0.3 a	0.3 a	36.5 ab	20.4 abc	493 abc
3	0 a	0 a	7 ab	1.1 ab	16 a	5.2 a	5 cd	3 cd	0.0 a	0.0 a	28.0 ab	9.75 c	236 c
4	0 a	0 a	2 ab	0.4 ab	9 ab	3.3 a	18 abc	14 abc	1.8 a	2.2 a	31.0 ab	20.1 abc	485 abc
5	0 a	0 a	5 ab	0.8 ab	15 a	5.5 a	9 bcd	5 cd	0.0 a	0.0 a	29.0 ab	11.5 c	278 c
6	0 a	0 a	3 ab	0.5 ab	10 ab	3.6 a	15 abc	12 bc	2.0 a	2.7 a	29.0 ab	18.5 abc	447 abc
7	0 a	0 a	1 ab	0.2 ab	5 bc	2.0 ab	18 abc	14 abc	1.3 a	1.6 a	25.8 b	17.3 abc	418 abc
8	0 a	0 a	2 ab	0.4 ab	5 bc	2.0 ab	24 a	19 ab	2.0 a	2.4 a	32.8 ab	23.2 ab	562 ab
9	0 a	0 a	11 a	1.5 a	9 ab	3.2 a	7 bcd	4 cd	0.0 a	0.0 a	25.5 b	8.8 c	213 c
10	0 a	0 a	1 ab	0.1 ab	9 ab	3.5 a	28 a	23 a	0.8 a	1.0 a	38.3 a	27.1 a	655 a
11	0 a	0 a	2 ab	0.4 ab	12 ab	4.6 a	16 abc	11 bc	0.0 a	0.0 a	30.0 ab	16.0 abc	387 abc
12	0 a	0 a	0 b	0.0 b	0 c	0 b	0 d	0 d	0.0 a	0.0 a	0.0 c	0.0 d	0 d
LSD (P=.05)	0	0	5.9	0.8	5.4	2.1	8.9	6.8	2.0	2.5	7.3	7.2	175

Treatments that included bromoxynil during at least one of the application timings provided better common lambsquarters control throughout the trial compared to treatments without bromoxynil. In contrast, the treatment with oxyfluorfen applied alone had poor common lambsquarters control. However, applying bromoxynil at the 0.0625 lb/A followed by tank mixes of bromoxynil and oxyfluorfen at 0.0625 lb/A provided the best common lambsquarters control compared to all other treatments. Applying bromoxynil at the 0.031 lb/A followed by tank mixes of bromoxynil and oxyfluorfen at the 0.0625 lb/A had significantly less control of common lambsquarters.

The highest yielding treatment was when bromoxynil was applied at 0.0625 lb/A followed by tank mixes of bromoxynil and oxyfluorfen at 0.0625 lb/A with 655 CWT/A. The lowest yielding treatment besides the untreated, which didn't produce anything, was when bromoxynil was applied at 0.031 lb/A followed by tank mixes of bromoxynil and oxyfluorfen at 0.0625 lb/A with 213 CWT/A. The preemergence conventional treatment of ethofumesate at 1 lb/A had the second highest yield of 562 CWT/A.

Effect of Simulated Glyphosate Drift to Four Potato Processing Cultivars. Harlene Hatterman-Valenti and Collin Auwarter.

This study was conducted at the Northern Plains Potato Grower's Irrigation Research site near Inkster, ND to evaluate glyphosate drift at three growth stages on Bannock, Ranger Russet, Russet Burbank, and Umatilla. Corn was the previous crop. Plots were 4 rows by 20 ft arranged in a randomized complete block design with four replicates. Seed pieces (2 oz) were planted on 36 inch rows and 12 inch spacing. Treatments were applied on July 24 (tuber initiation), August 9 (early tuber bulking), and September 4 (late tuber bulking) to the middle 2 rows with a modified ATV sprayer. Potatoes were machine harvested and graded a few weeks later. Treatment, application, environmental, and crop data are listed below:

Trt	Treatment		Rate	App
No	Name	Rate	Unit	Code
1	Untreated			
2	Roundup WeatherMax	2.75	floz/a	A
	AMS	4	lbs/100 gal	A
3	Roundup WeatherMax	1.375	floz/a	A
	AMS	4	lbs/100 gal	A
4	Roundup WeatherMax	0.6875	floz/a	A
	AMS	4	lbs/100 gal	A
5	Roundup WeatherMax	2.75	floz/a	B
	AMS	4	lbs/100 gal	B
6	Roundup WeatherMax	1.375	floz/a	B
	AMS	4	lbs/100 gal	B
7	Roundup WeatherMax	0.6875	floz/a	B
	AMS	4	lbs/100 gal	B
8	Roundup WeatherMax	5.5	floz/a	C
	AMS	4	lbs/100 gal	C
9	Roundup WeatherMax	2.75	floz/a	C
	AMS	4	lbs/100 gal	C
10	Roundup WeatherMax	1.375	floz/a	C
	AMS	4	lbs/100 gal	C

Date:		7/24/2012	8/9/2012	9/4/2012
App Code:		A	B	C
Sprayer:	GPA:	20	20	20
	PSI:	40	40	40
	Nozzle:	8002	8002	8002
Air Temperature (F):		78	69	80
Relative Humidity (%):		53	63	46
Wind (MPH):		10	7	9
Cloud Cover (%):		25	10	10
Potato Stage:		Tuber Initiation	Early Tuber Bulking	Late Tuber Bulking

Bannock Yield.

Trt	Glyphosate	Rate	App	----------CWT/A----------					
No	Rate	Unit/a	Code	<4 oz	4-6 oz	6-10 oz	>10 oz	Total	>4 oz
1	untreated			41 b	53 a	129 a	158 ab	381 a	340 ab
2	0.09	lbae	A	86 a	84 a	143 a	78 bc	391 a	305 b
3	0.05	lbae	A	36 b	51 a	140 a	186 a	414 a	378 a
4	0.02	lbae	A	41 b	57 a	146 a	155 ab	399 a	358 ab
5	0.09	lbae	B	105 a	50 a	79 b	65 c	299 b	194 c
6	0.05	lbae	B	48 b	53 a	119 ab	116 abc	336 ab	288 b
7	0.02	lbae	B	40 b	60 a	118 ab	141 ab	360 ab	320 ab
8	0.18	lbae	C	39 b	64 a	125 a	147 ab	375 ab	336 ab
9	0.09	lbae	C	40 b	46 a	121 ab	153 ab	359 ab	319 ab
10	0.05	lbae	C	53 b	62 a	114 ab	118 abc	347 ab	295 b
			LSD (P=.05)	27.1	23.1	30.5	51.6	51.5	45.8

Bannock Tuber Counts.

Trt	Glyphosate	Rate	App	----------Tuber Counts/20'----------					
No	Rate	Unit/a	Code	<4 oz	4-6 oz	6-10 oz	>10 oz	Total	% >4 oz
1	untreated			39 c	24 a	36 ab	27 ab	124 abc	69 a
2	0.09	lbae	A	82 b	37 a	41 a	14 bc	173 a	54 b
3	0.05	lbae	A	32 c	22 a	40 a	30 a	124 abc	75 a
4	0.02	lbae	A	38 c	25 a	41 a	25 ab	129 abc	71 a
5	0.09	lbae	B	112 a	22 a	23 b	11 c	168 ab	34 c
6	0.05	lbae	B	44 c	23 a	34 ab	19 abc	120 bc	63 ab
7	0.02	lbae	B	40 c	27 a	34 ab	23 ab	123 abc	68 a
8	0.18	lbae	C	38 c	28 a	34 ab	25 ab	125 abc	70 a
9	0.09	lbae	C	34 c	20 a	34 ab	24 ab	111 c	69 a
10	0.05	lbae	C	46 c	27 a	33 ab	20 abc	125 abc	63 ab
			LSD (P=.05)	25.4	10.2	8.7	8.2	32.1	8.9

Bannock Injury.

Trt	Glyphosate	Rate	App	----------% Glyphosate Injury----------			
No	Rate	Unit/a	Code	4-6 oz	6-10 oz	>10 oz	Total
1	untreated			2.5 bc	0.5 b	1.0 b	1.4 b
2	0.09	lbae	A	16.5 b	17.4 ab	15.3 ab	16.3 b
3	0.05	lbae	A	1.3 c	4.8 b	2.5 b	3.1 b
4	0.02	lbae	A	0.0 c	4.3 b	1.3 b	2.3 b
5	0.09	lbae	B	37.7 a	25.8 a	27.3 a	31.8 a
6	0.05	lbae	B	28.8 a	13.1 ab	10.2 ab	17.0 b
7	0.02	lbae	B	6.0 bc	7.8 b	6.4 ab	6.9 b
8	0.18	lbae	C	4.0 bc	1.0 b	3.7 b	2.9 b
9	0.09	lbae	C	6.1 bc	4.4 b	6.9 ab	5.5 b
10	0.05	lbae	C	0.0 c	2.5 b	4.3 b	2.2 b
			LSD (P=.05)	10.1	13.4	14.7	11.1

Ranger Yields.

Trt	Glyphosate	Rate	App	----------CWT/A----------					
No	Rate	Unit/a	Code	<4 oz	4-6 oz	6-10 oz	>10 oz	Total	>4 oz
1	untreated			72 a	87 a	165 a	113 a	437 a	364 a
2	0.09	lbae	A	77 a	94 a	144 a	143 a	458 a	381 a
3	0.05	lbae	A	55 a	101 a	158 a	135 a	450 a	395 a
4	0.02	lbae	A	73 a	75 a	133 a	120 a	401 a	328 a
5	0.09	lbae	B	71 a	95 a	153 a	133 a	452 a	381 a
6	0.05	lbae	B	65 a	86 a	132 a	149 a	432 a	367 a
7	0.02	lbae	B	71 a	90 a	157 a	135 a	451 a	381 a
8	0.18	lbae	C	78 a	97 a	163 a	105 a	443 a	366 a
9	0.09	lbae	C	71 a	94 a	133 a	137 a	454 a	363 a
10	0.05	lbae	C	76 a	87 a	163 a	135 a	461 a	385 a
			LSD (P=.05)	29.5	32.2	40.2	49.5	49.3	46.7

Ranger Tuber Counts.

Trt	Glyphosate	Rate	App	----------Tuber Counts/20'----------					
No	Rate	Unit/a	Code	<4 oz	4-6 oz	6-10 oz	>10 oz	Total	% >4 oz
1	untreated			69 a	38 a	47 a	19 a	173 a	60 a
2	0.09	lbae	A	75 a	42 a	42 a	22 a	180 a	60 a
3	0.05	lbae	A	56 a	45 a	46 a	22 a	168 a	68 a
4	0.02	lbae	A	69 a	33 a	39 a	20 a	160 a	57 a
5	0.09	lbae	B	66 a	42 a	44 a	22 a	173 a	63 a
6	0.05	lbae	B	62 a	38 a	38 a	23 a	160 a	61 a
7	0.02	lbae	B	72 a	40 a	45 a	22 a	178 a	60 a
8	0.18	lbae	C	77 a	43 a	47 a	17 a	183 a	59 a
9	0.09	lbae	C	67 a	42 a	38 a	21 a	167 a	61 a
10	0.05	lbae	C	72 a	38 a	46 a	23 a	179 a	60 a
			LSD (P=.05)	27.5	14.3	11.8	7.1	34.1	9.1

Ranger Injury.

Trt	Glyphosate	Rate	App	----------% Glyphosate Injury----------			
No	Rate	Unit/a	Code	4-6 oz	6-10 oz	>10 oz	Total
1	untreated			1.5 ab	4.2 b	3.9 a	3.1 b
2	0.09	lbae	A	3.2 ab	6.2 ab	3.1 a	4.4 b
3	0.05	lbae	A	1.7 ab	2.2 b	2.2 a	2.0 b
4	0.02	lbae	A	0.0 b	3.9 b	5.1 a	2.7 b
5	0.09	lbae	B	8.8 a	14.4 a	13.5 a	12.2 a
6	0.05	lbae	B	5.6 ab	9.7 ab	14.5 a	9.0 ab
7	0.02	lbae	B	4.5 ab	6.5 ab	5.9 a	5.4 b
8	0.18	lbae	C	1.6 ab	2.7 b	0.0 a	2.0 b
9	0.09	lbae	C	2.4 ab	5.5 ab	8.6 a	4.9 b
10	0.05	lbae	C	1.7 ab	2.2 b	1.7 a	2.2 b
			LSD (P=.05)	4.7	6.8	8.9	4.8

Umatilla Yields.

Trt	Glyphosate	Rate	App	----------CWT/A----------					
No	Rate	Unit/a	Code	<4 oz	4-6 oz	6-10 oz	>10 oz	Total	>4 oz
1	untreated			109 a	84 a	110 a	88 a	392 a	283 a
2	0.09	lbae	A	110 a	89 a	97 a	67 a	362 a	253 a
3	0.05	lbae	A	131 a	96 a	113 a	79 a	418 a	288 a
4	0.02	lbae	A	94 a	94 a	158 a	97 a	443 a	349 a
5	0.09	lbae	B	125 a	80 a	100 a	97 a	402 a	277 a
6	0.05	lbae	B	84 a	70 a	103 a	96 a	352 a	269 a
7	0.02	lbae	B	93 a	103 a	117 a	81 a	395 a	301 a
8	0.18	lbae	C	100 a	91 a	123 a	83 a	398 a	298 a
9	0.09	lbae	C	103 a	96 a	130 a	85 a	414 a	311 a
10	0.05	lbae	C	95 a	103 a	125 a	95 a	418 a	323 a
			LSD (P=.05)	33.7	25.2	56.0	60.5	98.4	95.8

Umatilla Tuber Counts.

Trt	Glyphosate	Rate	App	----------Tuber Counts/20'----------					
No	Rate	Unit/a	Code	<4 oz	4-6 oz	6-10 oz	>10 oz	Total	% >4 oz
1	untreated			103 a	38 a	32 a	14 a	186 a	45 a
2	0.09	lbae	A	107 a	39 a	29 a	11 a	185 a	42 a
3	0.05	lbae	A	129 a	43 a	33 a	12 a	217 a	41 a
4	0.02	lbae	A	89 a	42 a	46 a	17 a	193 a	55 a
5	0.09	lbae	B	126 a	36 a	28 a	15 a	204 a	40 a
6	0.05	lbae	B	86 a	31 a	31 a	15 a	162 a	47 a
7	0.02	lbae	B	88 a	46 a	34 a	14 a	182 a	52 a
8	0.18	lbae	C	88 a	41 a	36 a	14 a	178 a	50 a
9	0.09	lbae	C	97 a	43 a	37 a	14 a	191 a	50 a
10	0.05	lbae	C	86 a	45 a	36 a	16 a	183 a	53 a
			LSD (P=.05)	34.1	11.0	12.9	9.2	40.6	10.9

Umatilla Injury.

Trt	Glyphosate	Rate	App	----------% Glyphosate Injury----------			
No	Rate	Unit/a	Code	4-6 oz	6-10 oz	>10 oz	Total
1	untreated			0.0 b	0.6 b	6.7 b	1.9 b
2	0.09	lbae	A	3.8 b	3.6 b	0.0 b	3.1 b
3	0.05	lbae	A	7.7 b	7.4 b	10.1 b	8.2 b
4	0.02	lbae	A	3.5 b	0.0 b	1.0 b	1.6 b
5	0.09	lbae	B	41.5 a	50.8 a	61.2 a	49.2 a
6	0.05	lbae	B	16.4 b	17.3 b	16.8 b	17.6 b
7	0.02	lbae	B	3.1 b	0.7 b	2.5 b	2.0 b
8	0.18	lbae	C	1.7 b	8.5 b	7.1 b	5.4 b
9	0.09	lbae	C	5.1 b	3.2 b	2.8 b	4.1 b
10	0.05	lbae	C	0.7 b	1.4 b	2.2 b	1.3 b
			LSD (P=.05)	10.2	13.5	12.6	10.2

Russet Burbank Yields.

Trt	Glyphosate	Rate	App	----------CWT/A----------					
No	Rate	Unit/a	Code	<4 oz	4-6 oz	6-10 oz	>10 oz	Total	>4 oz
1	untreated			50 a	67 a	111 a	144 ab	372 a	322 a
2	0.09	lbae	A	42 a	53 a	100 a	167 ab	362 a	320 a
3	0.05	lbae	A	38 a	55 a	94 a	112 ab	299 a	261 a
4	0.02	lbae	A	51 a	63 a	117 a	121 ab	351 a	301 a
5	0.09	lbae	B	36 a	45 a	98 a	110 ab	290 a	253 a
6	0.05	lbae	B	51 a	64 a	111 a	154 ab	380 a	329 a
7	0.02	lbae	B	56 a	78 a	114 a	69 b	318 a	261 a
8	0.18	lbae	C	50 a	56 a	86 a	92 ab	285 a	234 a
9	0.09	lbae	C	53 a	54 a	124 a	199 a	431 a	378 a
10	0.05	lbae	C	53 a	64 a	128 a	139 ab	385 a	332 a
LSD (P=.05)				19.1	21.3	37.5	68.9	98.8	93.4

Russet Burbank Tuber Counts.

Trt	Glyphosate	Rate	App	----------Tuber Counts/20'----------					
No	Rate	Unit/a	Code	<4 oz	4-6 oz	6-10 oz	>10 oz	Total	% >4 oz
1	untreated			50 a	30 a	32 a	20 ab	131 a	63 a
2	0.09	lbae	A	44 a	23 a	28 a	27 ab	122 a	64 a
3	0.05	lbae	A	37 a	25 a	27 a	18 ab	106 a	65 a
4	0.02	lbae	A	51 a	28 a	34 a	20 ab	131 a	61 a
5	0.09	lbae	B	40 a	20 a	28 a	18 ab	105 a	62 a
6	0.05	lbae	B	51 a	28 a	31 a	24 ab	134 a	62 a
7	0.02	lbae	B	58 a	35 a	33 a	12 b	137 a	58 a
8	0.18	lbae	C	52 a	25 a	24 a	15 ab	117 a	55 a
9	0.09	lbae	C	54 a	24 a	35 a	31 a	143 a	63 a
10	0.05	lbae	C	52 a	28 a	36 a	23 ab	138 a	63 a
LSD (P=.05)				18.5	9.3	10.5	10.3	31.9	9.1

Russet Burbank Injury.

Trt	Glyphosate	Rate	App	----------% Glyphosate Injury----------			
No	Rate	Unit/a	Code	4-6 oz	6-10 oz	>10 oz	Total
1	untreated			4.2 b	2.9 bc	6.9 c	4.1 c
2	0.09	lbae	A	3.1 b	3.6 bc	6.6 c	4.2 c
3	0.05	lbae	A	2.2 b	0.0 c	4.7 c	2.0 c
4	0.02	lbae	A	0.8 b	1.3 bc	4.8 c	2.2 c
5	0.09	lbae	B	32.1 a	33.1 a	64.2 a	40.5 a
6	0.05	lbae	B	12.7 b	19.8 b	38.7 b	23.1 b
7	0.02	lbae	B	5.3 b	6.4 bc	18.3 c	7.5 c
8	0.18	lbae	C	0.0 b	1.9 bc	0.0 c	0.7 c
9	0.09	lbae	C	2.1 b	3.9 bc	4.3 c	3.5 c
10	0.05	lbae	C	1.1 b	3.1 bc	4.2 c	2.9 c
LSD (P=.05)				7.7	11.7	18.2	10.0

Bannock was the most sensitive cultivar tested. Glyphosate at 0.09 lb/A ETB caused reduced total yield compared to untreated. There were significantly more < 4 oz tubers, fewer 6-10 oz tubers, and fewer > 10 oz tubers. Glyphosate at 0.05 lb/A ETB or higher caused more imperfections in 4-6 oz tubers. Glyphosate at 0.09 lb/A ETB caused more imperfections in 6-10 and >10 oz tubers.

Ranger Russet was the least sensitive cultivar tested. Glyphosate did not reduce total or graded yields compared to untreated. However, glyphosate at 0.09 lb/A ETB did cause more imperfections in 4-6 and 6-10 oz tubers.

Russet Burbank was considered a cultivar with intermediate sensitivity to glyphosate. Glyphosate at 0.09 lb/A ETB caused approx. 22% market and total yield reduction but not significant compared to untreated. Glyphosate at 0.05 lb/A ETB or higher caused more imperfections in > 10 oz tubers. Glyphosate at 0.09 lb/A ETB caused more imperfections in 4-6 and 6-10 oz tubers.

Umatilla was also considered a cultivar with intermediate sensitivity to glyphosate. Glyphosate did not reduce total or graded yields compared to untreated. Glyphosate at 0.09 lb/A ETB caused more imperfections in 4-6, 6-10, and >10 oz tubers.

Weed control, efficacy, and selectivity of Solida (rimsulfuron) when applied PRE and early POST to Red Norland potatoes. Harlene Hatterman-Valenti and Collin Auwarter.

This study was conducted near Glyndon, MN to determine the efficacy and selectivity of SOLIDA formulation compared to Matrix for weed control in Red Norland potato. Plots were 4 rows by 20 feet arranged in a randomized complete block design with four replicates. Potatoes were planted May 14, 2012. PRE treatments were applied June 1(A), immediately after hilling. POST treatments were applied June 15 (B). Common lambsquarters, redroot pigweed and yellow foxtail were the primary weeds evaluated in this trial.

Application Information.

Date:		6/1/2012	6/15/2012
Time:		A	B
Sprayer:	GPA:	20	20
	PSI:	40	40
	Nozzle:	8002 FF	8002
Air Temperature (F):		65	67
Relative Humidity (%):		40	75
Wind (MPH):		9	5
Cloud Cover (%):		100	0

Weed Control with Solida.

					COLQ	AMARE	GRFT	INJ	COLQ	AMARE	GRFT	INJ	COLQ	AMARE	GRFT	INJ
Trt	Trt		Rate	App	----------6 DAA----------				----------21 DAA----------				----------32 DAA----------			
No	Name	Rate	Unit	Code	--------% Control--------			%	--------% Control--------			%	--------% Control--------			%
1	Unt				0.0d	0.0d	0.0c	0a	0.0d	0.0c	0.0b	0a	0.0a	0.0b	0.0b	0a
2	SOLIDA	0.0117	lbai/a	A	88.8c	87.5c	96.3b	0a	87.5c	90.0b	100a	0a	83.8bc	87.5a	87.5a	0a
3	SOLIDA	0.0234	lbai/a	A	93.8b	96.3ab	100a	0a	92.5b	97.5ab	100a	0a	87.5b	87.5a	87.5a	0a
4	SOLIDA	0.047	lbai/a	A	98.8a	97.5a	100a	0a	98.8a	98.8a	100a	0a	92.5a	90.0a	90.0a	0a
5	MATRIX	0.0234	lbai/a	A	91.3bc	92.5b	98.8a	0a	88.8bc	90.0b	95.0a	0a	86.3b	87.5a	87.5a	0a
6	SOLIDA	0.0117	lbai/a	B	0.0d	0.0d	0.0c	0a	90.0bc	93.8ab	97.5a	0a	80.0c	82.5a	83.8a	0a
	NIS	0.25	% v/v													
7	SOLIDA	0.0234	lbai/a	B	0.0d	0.0d	0.0c	0a	90.0bc	95.0ab	97.5a	0a	83.8bc	82.5a	87.5a	0a
	NIS	0.25	% v/v													
8	SOLIDA	0.047	lbai/a	B	0.0d	0.0d	0.0c	0a	98.8a	97.5ab	100a	0a	87.5b	87.5a	88.8a	0a
	NIS	0.25	% v/v													
9	SOLIDA	0.0234	lbai/a	B	0.0d	0.0d	0.0c	0a	91.3bc	93.8ab	100a	0a	85.0b	83.8a	86.3a	0a
	NIS	0.25	% v/v													
LSD (P=.05)					3.14	3.94	2.70	0	3.22	5.29	4.03	0	3.60	5.11	5.00	0

The highest rate of SOLIDA (0.047 lbai/a) applied PRE provided the best weed control throughout the study. At 6 DAA, 99% of COLQ was controlled at the 0.047 lbai/a rate compared to 89% control with the 0.0117 lbai/a (lowest rate). Matrix at 0.0234 lbai/a provided 91% control of the COLQ. At 21 DAAA (7 DAAB) results were similar with the higher rates providing better weed control. Both the PRE and POST treatments at 0.047 lbai/a had significantly better control of COLQ. At 32 DAAA (18 DAAB) the PRE treatments appeared to provide better COLQ control compared to the POST treatments at the same rates. Solida at 0.047 lbai/a PRE had 93% COLQ control while the POST treatment at the same rate only had 88% control. The Matrix treatments at this evaluation showed 80% control with the PRE treatment and 85% control with the POST treatment.

Total yield was very minimal due to the dry summer. However, differences were seen among treatments. The highest yield with 13.3 lbs/20 feet of row was from the Solida at 0.047 lbai/a PRE treatment. This was followed by 10.80 lbs/20 feet of row from the Solida at 0.047 lbai/a POST treatment. The untreated treatment yielded the least.

Broadaxe in Sunflower. Zollinger, Richard K., Angela J. Kazmierczak, and Devin A. Wirth. An experiment was conducted near Valley City, ND to evaluate weed efficacy and crop response to Broadaxe in sunflowers. Croplan '555' ClearField sunflower was planted on May 16, 2012. PRE treatments were applied on May 18, 2012 at 10:00 am with 77.7 F air, 63.5 F soil at a four inch depth, 25% cloud cover, 6 to 8 mph SSE wind, dry soil surface, and dry subsoil. Soil characteristics were: 9.9% sand, 78.2% silt, 12% clay, silt loam texture, 2.8% OM and 6.4 pH. POST treatments were applied on June 12, 2012 at 10:15 am with 73 F air, 59 F soil at a four inch depth, both soil surface and subsoil were dry, and crop vigor was good at 4-6 leaf. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles. The experiment had a randomized complete block design with three replicates per treatment.

BroadAxe is a premix containing metolachlor (Dual) plus sulfentrazone (Spartan). These data and other data show the combination of these two herbicides compliments each other and provides good to excellent control of weeds the each herbicide may not give adequate control alone. Dry conditions before and after PRE application may not have fully activated PRE herbicides. The soil type was light to medium and the 35 fl oz/A BroadAxe rate was excessive. No sunflower injury was observed with any treatment or with any rate. (Dept of Plant Sciences, North Dakota State University, Fargo).

Trial. BroadAxe in Sunflower. (Zollinger, Wirth, Kazmierczak)

		28 DA PRE					15 DA POST						30 DA POST						45 DA POST					
Treatments	Rate	Yeft	Rrpw	Colq	Biww	Mrsh	Yeft	Rrpw	Colq	Biww	Ebns	Mrsh	Yeft	Rrpw	Colq	Biww	Ebns	Mrsh	Yeft	Rrpw	Colq	Biww	Ebns	Mrsh
	(Product/A)	% Control					% Control						% Control						% Control					
PRE																								
Dual Magnum	20fl oz	92	57	57	47	23	80	63	62	43	35	23	77	63	62	40	35	30	56	65	62	42	37	30
Spartan Charge	5.75oz	23	90	90	82	75	27	87	87	80	80	78	27	88	88	82	82	78	28	90	90	83	83	80
BroadAxe	25fl oz	99	99	99	95	94	92	96	96	95	91	94	93	98	98	96	92	96	95	98	98	96	95	96
BroadAxe	35fl oz	99	99	99	96	98	98	99	99	97	99	98	98	99	99	97	99	98	98	99	99	97	99	98
Prowl H20	2.5pt	73	72	78	33	23	73	63	72	35	35	23	72	63	70	35	35	23	70	62	68	33	33	23
PRE/POST																								
BroadAxe	25fl oz																							
Select+PO	6fl oz+1qt	85	95	95	90	80	99	98	98	96	99	95	99	98	98	96	99	96	99	98	98	96	99	96
LSD (0.05)		16	5	7	12	16	12	8	7	14	7	17	9	6	5	10	7	9	7	5	4	7	4	8

Zidua in sunflower. Zollinger, Richard K., Angela J. Kazmierczak, and Devin A. Wirth. An experiment was conducted near Valley City, ND to evaluate crop response to EPOST Zidua treatments in sunflower programs. Croplan 555 NS,CL,DR sunflower was planted on May 16, 2012. POST 2-leaf treatments were applied on June 8, 2012 at 9:15 am with 66 F air, 68 F soil at a four inch depth, 68% relative humidity, 0% cloud cover, 8 to 10 mph W wind, dry soil surface, dry subsoil, good crop vigor, and no dew present to 2-leaf sunflower. POST 6-leaf treatments were applied on June 12, 2012 at 10:20 am with 73 F air, 59 F soil at a four inch depth, 23% relative humidity, 0% cloud cover, 1 to 3 mph W wind, dry soil surface, dry subsoil, good crop vigor, and no dew present to 6-leaf sunflower. POST 10-leaf treatments were applied on June 18, 2012 at 5:00 pm with 83 F air, 81.5 F soil at a four inch depth, 32% relative humidity, 5% cloud cover, 5 to 7 mph W wind, dry soil surface, dry subsoil, good crop vigor, and no dew present to 10-leaf sunflower. Soil characteristics were: 9.9% sand, 78.2% silt, 12% clay, silt loam texture, 2.8% OM and 6.4 pH. POST Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles. The experiment had a randomized complete block design with three replicates per treatment.

The objective of this study was to evaluate sunflower tolerance from EPOST applications of Zidua applied alone and with Beyond herbicide. Zidua is a soil-applied herbicide that controls emerging grass and broadleaf weeds. Zidua is an acetanilide type herbicide in which herbicides of this mechanism of action do not normally control emerged weeds. Zidua appears to be somewhat different as some POST activity was observed. Sunflower injury was stunting and slight chlorosis at early evaluations and only stunting at later evaluations. The 2-, 6-, and 10 leaf application timings represents early, target stage, and late sunflower stages as not all weeds may be emerged at the 2-leaf and weeds would be too large at 10-leaf. Most treatments had less than 10% sunflower injury. MSO adjuvant was used as the most aggressive adjuvant. Sunflower that showed significant injury early from herbicide treatments did not recover. (Dept of Plant Sciences, North Dakota State University, Fargo)

Table. Zidua in sunflower. (Zollinger, Wirth, Kazmierczak)

		2-lf Trts	Prior 10-lf	7 DA 10-lf	14 DA 10-lf	28,42,55 DA 10-lf	14 DA 10-lf			28,42,56 DA 10-lf		
Treatments	Rate	Sunflower	Sunflower	Sunflower	Sunflower	Sunflower	Yeft	Rrpw	Colq	Yeft	Rrpw	Colq
	(Product/A)	% Injury	% Injury	% Injury	% Injury	% Injury	% Control			% Control		
2-leaf												
Zidua	2.52oz	5	0	0	0	0	57	57	57	50	50	57
Zidua	5.04oz	9	3	7	3	3	53	57	57	53	53	57
Zidua+Beyond+NIS+28% UAN	2.52oz+4fl oz+0.25%v/v+2.5%v/v	9	3	12	12	8	99	99	99	99	99	99
Zidua+Beyond+NIS+28% UAN	5.04oz+4fl oz+0.25%v/v+2.5%v/v	11	5	10	8	5	99	99	99	99	99	99
Zidua+Beyond+MSO+28% UAN	2.52oz+4fl oz+1%v/v+2.5%v/v	10	15	25	23	20	99	99	99	99	99	99
Zidua+Beyond+MSO+28% UAN	5.04oz+4fl oz+1%v/v+2.5%v/v	18	40	28	22	18	99	99	99	99	99	99
Beyond+MSO+28% UAN	4fl oz+1%v/v+2.5%v/v	5	0	0	0	0	99	99	99	99	99	99
Untreated		0	0	8	0	2	0	0	0	0	0	0
6-leaf												
Zidua	2.52oz	0	0	0	0	0	33	33	33	33	33	33
Zidua	5.04oz	---	0	3	2	0	57	57	57	57	57	57
Zidua+Beyond+NIS+28% UAN	2.52oz+4fl oz+0.25%v/v+2.5%v/v	---	20	12	7	7	99	99	99	99	99	99
Zidua+Beyond+NIS+28% UAN	5.04oz+4fl oz+0.25%v/v+2.5%v/v	---	20	10	7	7	99	99	99	99	99	99
Zidua+Beyond+MSO+28% UAN	2.52oz+4fl oz+1%v/v+2.5%v/v	---	20	20	20	18	99	99	99	99	99	99
Zidua+Beyond+MSO+28% UAN	5.04oz+4fl oz+1%v/v+2.5%v/v	---	22	22	18	17	99	99	99	99	99	99
Beyond+MSO+28% UAN	4fl oz+1%v/v+2.5%v/v	---	0	12	7	7	99	99	99	99	99	99
Untreated		---	---	0	0	0	0	0	0	0	0	0
10-leaf												
Zidua	2.52oz	---	---	7	3	7	43	43	43	43	43	43
Zidua	5.04oz	---	---	12	7	7	47	47	47	47	47	47
Zidua+Beyond+NIS+28% UAN	2.52oz+4fl oz+0.25%v/v+2.5%v/v	---	---	18	10	10	99	99	99	99	99	99
Zidua+Beyond+NIS+28% UAN	5.04oz+4fl oz+0.25%v/v+2.5%v/v	---	---	20	12	12	99	99	99	99	99	99
Zidua+Beyond+MSO+28% UAN	2.52oz+4fl oz+1%v/v+2.5%v/v	---	---	30	12	10	99	99	99	99	99	99
Zidua+Beyond+MSO+28% UAN	5.04oz+4fl oz+1%v/v+2.5%v/v	---	---	33	27	20	99	99	99	99	99	99
Beyond+MSO+28% UAN	4fl oz+1%v/v+2.5%v/v	---	---	17	15	13	99	99	99	99	99	99
Untreated		---	---	0	0	0	0	0	0	0	0	0
LCD (0.05)		2	2	6	9	6	5	5	5	4	4	5

Weed control and sunflower response in herb-resistant sunflower systems. Howatt, Roach, Ciernia, and Harrington. 'Express 460 ENS' and 'CL Paraiso 1000' sunflower was seeded near Fargo followed by a preemergence treatment of sulfentrazone at 2 oz ai/A on May 16 with 79°F, 20% relative humidity, 0% cloud cover, 10 mph wind at 180°, and dry soil at 78°F. This treatment was applied with a sprayer mounted on a 4 wheeler delivering 20 gpa at 28 psi through 8003 TT nozzles. Post treatments were applied to 2 to 4 leaf sunflower, 2 to 4 leaf wild mustard, 1 leaf Venice mallow, 2 leaf yellow foxtail, and 1 to 3 leaf wild buckwheat and annual smartweed on June 19 with 59°F, 88% relative humidity, 100% cloud cover, 6 mph wind at 45°, damp soil at 63°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 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.

			July 3							July 16	
Treatment	Rate	Seed	Sufl	Yeft	Wimu	Vema	Wibw	Answ	Rrpw	Yeft	Wimu
	oz ai/A		%	%	%	%	%	%	%	%	%
Imazamox+MSO+AMS	0.38+1%+22	IMI	0	86	95	81	80	80	99	95	99
Imazamox+MSO+AMS	0.5+1%+22	IMI	0	89	97	85	85	95	99	96	99
Imazamox+NIS+AMS	0.5+0.25%+22	IMI	0	86	98	83	86	90	99	97	99
Imazamox+MSO+AMS	0.75+1%+22	IMI	0	92	97	90	89	97	99	95	99
Trib+quiz+MSO+AMS	0.188+0.9+1%+22	SU	0	89	96	90	82	95	96	81	99
CV			0	3	3	6	5	.	3	3	0
LSD (P=0.05)			0	5	4	8	9	.	5	5	0

Table continues

			July 16				Aug 7	July 31			
Treatment	Rate	Seed	Vema	Wibw	Answ	Rrpw	Sufl	Yeft	Vema	TW	Yield
	oz ai/A		%	%	%	%	%	%	%	lb/bu	bu/A
Imazamox+MSO+AMS	0.38+1%+22	IMI	88	91	99	99	2	96	94	31	45
Imazamox+MSO+AMS	0.5+1%+22	IMI	91	92	99	99	3	95	94	32	49
Imazamox+NIS+AMS	0.5+0.25%+22	IMI	91	96	99	99	2	96	95	31	51
Imazamox+MSO+AMS	0.75+1%+22	IMI	95	93	99	99	2	97	97	32	40
Trib+quiz+MSO+AMS	0.188+0.9+1%+22	SU	90	88	99	80	2	81	86	31	22
CV			3	4	.	3	98	4	3	4	24
LSD (P=0.05)			5	6	.	5	3	5	5	2	15

The SU sunflower did not establish well, possibly due to issue with the seeding nechanism. This resulted in large sections of row where seed did not emerge. This likely is the primary reason for unusually low yield relative to the IMI hybrid.

Sunflower damage was not observed until August 7. Whether this injury was due to the treatments could not be determined. The injury was an occasional deformed head, which has been attributed to herbicide application in previous experiments; however, the injury has not taken so long to express in previous studies. Both sunflower systems demonstrated the injury.

Weed control generally was similar across treatments. The high rate of imazamox tended to give better control than lesser rates of imazamox or tribenuron plus quizalofop. The greatest difference was for control of yellow foxtail. Imazamox seemed to provide some residual control such that by July 16 there was about a 15 point improvement of control with imazamox compared with quizalofop. This difference was primarily due to presence of yellow foxtail that emerged after herbicide application.

Timing of imazamox application and split-application in sunflower. Howatt, Roach, Ciernia, and Harrington. 'Express 460 ENS' and 'CL Paraiso 1000' sunflower was seeded near Fargo followed by a preemergence treatment of sulfentrazone at 2 oz ai/A on May 16 with 79°F, 20% relative humidity, 0% cloud cover, 10 mph wind at 180°, and dry soil at 78°F. This treatment was applied with a sprayer mounted on a 4 wheeler delivering 20 gpa at 28 psi through 8003 TT nozzles on May 16 with 79°F, 20% relative humidity, 0% cloud cover, 10 mph wind at 180° and dry soil at 78°F. Post applications were as follows:

Date of application	June 12	June 15	June 22	June 25
Temperature (°F)	60	72	64	72
RH (%)	66	62	79	59
Cloud cover (%)	10	0	0	0
Wind mph	2	7	2	7
direction (°)	300	315	330	180
Soil temp. (°F)	55	63	50	66
Sunflower stage	2 leaf	4 leaf	6 leaf	8 leaf
Wimu stage	2 leaf	2 to 4 Leaf	2 to 4 leaf	4 leaf
Vema stage	Cotyledon	2 to 4 leaf	2 to 4 leaf	1 to 2 leaf
Fota (green and Yellow) stage	2 leaf	3 leaf	3 leaf	2 to 3 leaf

All treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 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.

		Growth	July 3					
Treatment	Rate	Stage	Sufl	Yeft	Wibw	Vema	Wimu	Rrpw
	oz ai/A		%	%	%	%	%	%
Immx+MSO+AMS/immx+MSO+AMS	0.38+1%+22/0.38+1%+22	2L/6L	0	89	90	88	99	99
Immx+MSO+AMS/immx+MSO+AMS	0.5+1%+22/0.5+1%+22	2L/6L	0	94	94	93	99	99
Immx+MSO+AMS	0.38+1%+22	4L	0	90	89	90	99	99
Immx+MSO+AMS/immx+MSO+AMS	0.38+1%+22/0.38+1%+22	4L/ 8L	0	94	91	93	99	99
Immx+MSO+AMS	0.5+1%+22	4L	0	96	94	94	99	99
Immx+MSO+AMS/immx+MSO+AMS	0.5+1%+22/0.5+1%+22	4L/8L	0	96	96	95	99	99
Immx+MSO+AMS	0.75+1%+22	4L	0	95	95	93	99	99
Immx+MSO+AMS/immx+MSO+AMS	0.75+1%+22/0.75+1%+22	4L/8L	0	97	95	95	99	99
CV			0	3	3	4	0	0
LSD (P=0.05)			0	5	5	6	0	0

Table continued

		Growth	July 16					
Treatment	Rate	Stage	Yeft	Wibw	Vema	Wimu	Rrpw	Yield
	oz ai/A		%	%	%	%	%	bu/A
Immx+MSO+AMS/immx+MSO+AMS	0.38+1%+22/0.38+1%+22	2L/6L	89	99	92	99	99	56
Immx+MSO+AMS/immx+MSO+AMS	0.5+1%+22/0.5+1%+22	2L/6L	92	97	93	99	99	45
Immx+MSO+AMS	0.38+1%+22	4L	96	97	96	99	99	59
Immx+MSO+AMS/immx+MSO+AMS	0.38+1%+22/0.38+1%+22	4L/ 8L	97	97	98	99	99	50
Immx+MSO+AMS	0.5+1%+22	4L	95	99	95	99	99	57
Immx+MSO+AMS/immx+MSO+AMS	0.5+1%+22/0.5+1%+22	4L/8L	97	99	98	99	99	57
Immx+MSO+AMS	0.75+1%+22	4L	96	97	98	99	99	53
Immx+MSO+AMS/immx+MSO+AMS	0.75+1%+22/0.75+1%+22	4L/8L	98	99	96	99	99	46
CV			4	2	3	0	0	12
LSD (P=0.05)			6	3	4	0	0	10

Sunflower was tolerant to imazamox at all rates and timings. Weed control was excellent with each herbicide program, although imazamox applied twice at 0.38 oz ai/A was not enough to maximize control of each weed. Dry weather promoted eventual death of weeds in later application timing, although given response of weeds immediately after application some of these larger weeds may have survived with better soil moisture. Early control of small weeds would facilitate optimum activity.