Yellow section: **Canola, Dry Bean, Dry Pea, Flax, Onion, Potato, and Sunflower**

Wild oat control in Liberty Link canola. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate wild oat control in Liberty Link canola with Liberty and Select Max. All treatments were applied June 10 to cotyledon- to 3-leaf canola and 3-leaf wild oat. None of the treatments caused visible crop injury. All treatments provided excellent wild oat control. Liberty is more effective with warm, humid conditions and plenty of sunlight. Liberty can be effective on annual grasses, but should be applied when grasses are small. Tank mixing Liberty and Select has provided good grass control in previous studies.

Table. Wild oat control in Liberty Link canola. (1430)

		Canola		Weed Control		
		Injury		Wild oat		
Treatments[a]	Rate	Jun-17	Jun-23	Jun-23	Jul-08	Jul-30
		-----%-----		---------%---------		
Untreated		0	0	0	0	0
Liberty + AMS	22 oz + 4.41 gal	0	0	89	92	98
Liberty + AMS	29 oz + 4.41 gal	0	0	92	92	93
Liberty + Select Max + AMS	22 oz + 6 oz + 4.41 gal	0	0	98	94	100
Select Max + NIS	12 oz + 0.25%	0	0	86	92	100
LSD (0.05)		NS	NS	25.9	7.0	4.9
CV		0	0	20.2	5.0	3.3

[a] *All treatments applied at 3-leaf wild oat*

SU canola tolerance to thifensulfuron plus tribenuron. Howatt, Roach, and Harrington. '5117' and '5715' canola was seeded at 4302 40th Ave N, Fargo, North Dakota, on May 30, 2014. Soil was a Fargo silty clay with 5% organic matter and pH of 7.5. Soil moisture was adequate to damp for the first several weeks of growth by natural rain events. Field has drain tile to remove gravimetric water.

Treatments were applied to 2 to 3 leaf canola on June 18 with 67°F, 73% relative humidity, sky with 100% haze, 5 to 8 mph wind velocity at 90°, and moist soil at 64°F. Warrant insecticide at 2 fl oz/A plus clethodim at 4 fl oz/A was applied July 3 to pre-bolt crop and 2 to 5 leaf yellow foxtail with 67°F, 66% relative humidity and 1 mph wind at 270°. All treatments were applied with a backpack sprayer delivering 8.5 gpa at 38 psi through 11001 TT nozzles. Carrier water had pH of 8.9 with 1018 umho/cm electrical conductivity, 624 mg/L total dissolved solids, and 150 mg/L calcium carbonate equivalency. Specific cation analysis included calcium (42 ppm), magnesium (11 ppm), sodium (130 ppm), and potassium (12 ppm). Anion analysis included carbonate (12 ppm), bicarbonate (93 ppm), chloride (43 ppm), and sulfate (281 ppm). The experiment was a randomized complete block design with four replicates. Canola was harvested September 9.

			Injury			Tan pods	Leaning	Yield
Treatment	Rate	Seed	6/27	7/14	8/1	8/20	8/20	9/9
	oz ai/A		%	%	%	%	°	bu/A
Clethodim+Agral 90	1.3+0.2%	5117	0	0	0	7	13	31
VE2[a]+Clethodim+Agral 90	0.21+1.3+0.2%	5117	0	4	0	5	12	29
VE2+Clethodim+Agral 90	0.43+1.3+0.2%	5117	0	8	0	7	9	28
Clethodim+Agral 90	1.3+0.2%	5715	0	0	0	27	39	20
VE2+Clethodim+Agral 90	0.21+1.3+0.2%	5715	0	3	0	27	45	21
VE2+Clethodim+Agral 90	0.43+1.3+0.2%	5715	0	3	0	20	42	21
CV						39	37	6
LSD (P=0.05)			0	3	0	9	15	3

[a] Abbreviation: VE2 was Volta Extra II herbicide formulated by Rotam chemical company as a 2:1 ratio of thifensulfuron and tribenuron as a 75% dry flowable.

Visible injury to canola was not observed until July 7. Both hybrids contained a small number of plants that expressed stunting, chlorosis, and purplish discoloration of tissue consistent with physiologic response to the acetolactate synthase-inhibiting herbicides thifensulfuron and tribenuron. The majority of plants did not show symptoms. Injury to 5117 was more severe with the higher rate of these herbicides. Injury was not noticed in August, including delay of flowering or flower deformation, although 5715 initiated flowering earlier than 5117 regardless of herbicide treatment.

Estimation of tan pods on August 20 also supported an inherent maturity difference between the hybrids. But drying of pods was not affected by herbicide treatment within hybrid although estimate of tan pods was just within the LSD at the high herbicide rate for 5715. Plants within each plot leaned consistently. Values in the table indicate the number of degrees of lean from erect. Hybrid 5715 had a greater angle of lean than 5117, possibly because of more advanced maturity. Herbicide treatment did not affect the amount of lean and none of the plots were lodged. Yield of 5715 was not affected by herbicide treatment, but 9% less seed was harvested from 5117 that received the 2x rate of thifensulfuron and tribenuron.

Ethofumesate safety on DEB. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Thompson, ND to evaluate dry bean tolerance to ethofumesate. Navy dry bean was planted on June 4, 2014. PRE treatments were applied on June 6, 2014 at 11:00 am with 61.0 F air, 57.0 F soil at a four inch depth, 40% RH, 80% cloud cover, 8-10 mph NW wind, and moist soil moisture. Soil characteristics were: 13% sand, 53% silt, 34% clay, silty clay loam, 4.7% OM, and 7.6 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 TT11001 nozzles for the PRE applications. The experiment had a randomized complete block design with three replicates per treatment.

This study was conducted to evaluate dry bean safety from different rates of ethofumesate. A late, wet spring resulted in poor germination and poor vegetative growth of dry bean.

Table. Ethofumesate safety on DEB (Zollinger, Wirth, Adams).

Treatment[1]	Rate	14 DAA DEB	28 DAA DEB	42 DAA DEB
	(Product/A)	-%inj-	-%inj-	-%inj-
PPI				
(PPI) Ethofumesate	0.5pt	0	0	0
(PPI) Ethofumesate	1pt	0	0	0
(PPI) Ethofumesate	2pt	7	3	10
(PPI) Ethofumesate	3pt	15	10	10
(PPI) Ethofumesate	4pt	20	20	20
LSD (0.05)		5	5	5

Resistant common ragweed control using soil-applied f/b POST herbicides. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Mayville, ND to evaluate glyphosate resistant common ragweed control using ethofumesate followed by post applied herbicides. PPI treatments were applied on May 22, 2014 at 9:45 am with 68.0 F air, 55.0 F soil at a four inch depth, 28% RH, 0% cloud cover, 1-3 mph SSE wind, and adequate soil moisture. POST treatments were applied on June 25, 2014 at 1:30 pm with 70.0 F air, 68.0 F soil at a four inch depth, 55% RH, 100% cloud cover, 5-8 mph E wind, moist soil moisture. Weed species present at the time of the POST treatments were: 1-2" (2/yd^2) common lambsquarters, 1-3" (30/yd^2) common ragweed, and 1-2" (2/yd^2) redroot pigweed. Soil characteristics were: 70.6% sand, 20.6% silt, 8.8% clay, Sandy Loam, 2.8% OM, and 6.8 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 TT11002 nozzles for the PPI applications and delivering 8.5 gpa at 40 psi through TT11001 nozzles for the POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Eptam and ethofumesate influence cuticle development and enhance postemergence activity of Basagran, Permit, and Reflex.

Table. Resistant common ragweed control using soil-applied fb POST herbicides (Zollinger, Wirth, Adams).

		14 DA POST		28 & 42 DA POST	
Treatment[1]	Rate	Colq	Corw	Colq	Corw
	(Product/A)	-% control-		-% control-	
PPI					
(PPI) Etho+Sonalan	0.5pt+2pt	35	35	28	28
(PPI) Etho+Sonalan	1pt+2pt	35	35	30	30
(PPI) Eptam+Sonalan	3.5pt+2pt	52	52	43	43
(PPI) Eptam+Sonalan	4.5pt+2pt	37	37	40	40
PPI/EPOST					
(PPI) Sonalan	2pt	73	73	50	50
(EPOST) Basagran+MSO	2pt+1.5pt				
(PPI) Etho+Sonalan	0.5pt+2pt	80	80	63	63
(EPOST) Basagran+MSO	2pt+1.5pt				
(PPI) Etho+Sonalan	1pt+2pt	68	68	60	60
(EPOST) Basagran+MSO	2pt+1.5pt				
(PPI) Eptam+Sonalan	3.5pt+2pt	95	95	80	90
(EPOST) Basagran+MSO	2pt+1.5pt				
(PPI) Etho+Sonalan	4.5pt+2pt	73	73	40	62
(EPOST) Basagran+MSO	2pt+1.5pt				
(PPI) Sonalan	2pt	90	90	62	78
(EPOST) Permit+MSO	0.67oz+1.5pt				
(PPI) Etho+Sonalan	0.5pt+2pt	91	91	79	83
(EPOST) Permit+MSO	0.67oz+1.5pt				
(PPI) Etho+Sonalan	1pt+2pt	95	95	95	88
(EPOST) Permit+MSO	0.67oz+1.5pt				
(PPI) Eptam+Sonalan	3.5pt+2pt	93	93	97	95
(EPOST) Permit+MSO	0.67oz+1.5pt				
(PPI) Eptam+Sonalan	4.5pt+2pt	99	99	96	97
(EPOST) Permit+MSO	0.67oz+1.5pt				
(PPI) Sonalan	2pt	92	92	60	80
(EPOST) Reflex+MSO	0.75pt+1.5pt				
(PPI) Etho+Sonalan	0.5pt+2pt	96	96	50	85
(EPOST) Reflex+MSO	0.75pt+1.5pt				
(PPI) Etho+Sonalan	0.5pt+2pt	94	94	67	95
(EPOST) Reflex+MSO	0.75pt+1.5pt				
(PPI) Eptam+Sonalan	3.5pt+2pt	99	99	93	98
(EPOST) Reflex+MSO	0.75pt+1.5pt				
(PPI) Etho+Sonalan	1pt+2pt	99	99	72	92
(EPOST) Reflex+MSO	0.75pt+1.5pt				
LSD (0.05)		6	6	6	6

[1]Etho= Ethofumesate

PPI f/b POST herbicides in DEB. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control in dry bean using soil incorporated herbicides. Navy dry bean was planted on May 27, 2014. PPI and PRE treatments were applied on May 27, 2014 at 4:00 pm with 90.0 F air, 67.0 F soil at a four inch depth, 35% RH, 100% cloud cover, 2-5 mph N wind, and adequate soil moisture. POST treatments were applied on June 23, 2014 at 2:30 pm with 77.0 F air, 66.0 F soil at a four inch depth, 45% RH, 40% cloud cover, 4-6 mph NW wind, adequate soil moisture, good crop vigor, and no dew present at a 1-2 trifoliate dry bean crop stage. Weed species present at the time of the POST treatments were: 3-4" bolting (6/ft^2) common ragweed, 6-10" bolting (thick stand) cocklebur, 1-2" (6/ft^2) common lambsquarters, and 1-2" (3-4/ft^2) wild mustard. Soil characteristics were: 25% sand, 47% silt, 28% clay, clay loam, 4.2% OM, and 7.3 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 TT11002 nozzles for the PPI and PPI and PRE applications and delivering 8.5 gpa at 40 psi through TT11001 nozzles for the POST applications. The experiment had a randomized complete block design with three replicates per treatment.

At the time of PRE application there was already emerged common cocklebur which effected efficacy. and PPI herbicides were adequately activated by spring moisture. Only treatments that included effective PPI and effective post herbicides resulted in broad-spectrum weed control.

Table. PPI f/b POST herbicide in Dry Edible Bean (Zollinger, Wirth, Adams).

		All Timings	14 DA POST							28, 42, and 56 DA POST						
Treatment[1]	Rate	Deb	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Yeft	Wimu	Rrpw	Colq	Hans	Corw	Cocb
	(Product/A)	-%inj-	----------% control----------							----------% control----------						
PRE																
(PRE) GWN 10293	2.12oz	10	0	63	43	40	40	30	28	0	63	43	40	40	30	28
(PRE) GWN 10293	3.17oz	15	20	83	45	45	45	45	38	20	83	45	45	45	45	38
PPI/POST																
(PPI) Eptam+Sonalan	4.5pt+2pt															
(POST) Permit+MSO	0.67oz+1%v/v	0	83	99	99	73	67	78	83	83	99	99	73	67	78	83
(PPI) Eptam+Sonalan	4.5pt+2pt															
(POST) Vida+MSO	0.5floz+1%v/v	0	99	75	88	85	73	65	48	99	75	88	85	73	65	47
(PPI) Eptam+Sonalan	4.5pt+2pt															
(POST) Permit+Vida+MSO	0.5oz+0.5floz+1%v/v	0	99	98	99	90	90	89	88	99	98	99	90	90	89	88
(PPI) Eptam+Sonalan	4.5pt+2pt															
(POST) Permit+Vida+MSO	0.67oz+0.5floz+1%v/v	0	99	99	99	92	72	93	91	99	99	99	92	72	93	91
(PPI) Eptam+Sonalan	4.5pt+4pt															
(POST) Basagran+Raptor+MSO	1pt+2floz+1%v/v	0	99	99	99	83	73	60	53	99	99	99	83	73	60	53
(PPI) Eptam+Sonalan	4.5pt+2pt															
(POST) Basagran+Raptor	0.5pt+1floz															
+Permit+MSO	+0.5oz+1%v/v	0	94	99	99	78	72	73	63	94	99	99	78	72	73	63
(PPI) Eptam+Sonalan	4.5pt+2pt															
(POST) Basagran+Raptor	1pt+2floz															
+Permit+MSO	+0.67oz+1%v/v	0	99	99	99	94	94	90	84	99	99	99	94	94	90	84
(PPI) Eptam+Sonalan	4.5pt+2pt															
(POST) Basagran+Raptor	1pt+2floz															
+Vida+MSO	+2oz+1%v/v	0	99	99	99	99	99	92	80	99	99	99	99	99	92	80
(PPI) Eptam+Sonalan	4.5pt+2pt															
(POST) Basagran+Raptor+Permit	1pt+2floz+0.67oz															
+Vida+MSO	+2oz+1%v/v	0	99	99	99	99	99	96	94	99	99	99	99	99	96	94
(PPI) Eptam+Sonalan	4.5pt+2pt															
(POST) GWN 10136+Basagran	4.5pt+1pt															
+Raptor+MSO	+2floz+1%v/v	10	99	99	99	99	99	93	83	99	99	99	99	99	93	83
(PPI) Eptam+Sonalan	4.5pt+2pt															
(POST) GWN 10172+Basagran	4.5pt+1pt															
+Raptor+MSO	+2floz+1%v/v	10	99	99	99	99	99	99	76	99	99	99	99	99	99	76
LSD (0.05)		0	8	9	5	7	6	8	9	8	9	5	7	6	8	9

[1]MSO=Upland MSO

Varisto in DEB. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Thompson, ND to evaluate weed control in dry bean using varisto. 2 rows of navy and pinto dry beans were planted on June 9, 2014. PRE treatments were applied on June 9, 2014 at 3:30 pm with 75.0 F air, 650 F soil at a four inch depth, 23% RH, 10% cloud cover, 5-7 mph W wind, and dry soil moisture. EPOST treatments were applied on July 23, 2014 at 12:00 pm with 78.2 F air, 80.0 F soil at a four inch depth, 40% RH, 0% cloud cover, 2-4 mph N wind, dry soil moisture, good crop vigor, and no dew present at a V6-V10 dry bean crop stage. Weed species present at the time of the EPOST treatments were: 1-1.5" (5-10/yd^2) redroot pigweed, 1-3" (1-3/yd^2) prostrate pigweed, 1-3" (5-10/yd^2) yellow foxtail, 1-3" (1-2/yd^2) knotweed, 2-4" (3-5/yd^2) common lambsquarters, and 1-2" (1/yd^2) kochia. POST treatments were applied on August 6, 2014 at 1:00 pm with 85.0 F air, 71.2 F soil at a four inch depth, 38% RH, 40% cloud cover, 6-10 mph S wind, adequate soil moisture, good crop vigor, and no dew present at a flowering dry bean crop stage. Weed species present at the time of the POST treatments were: 8-15" (5-10/yd^2) redroot pigweed, 6-12" (5-10/yd^2) yellow foxtail, and 6-10" (3-5/yd^2) common lambsquarters. Soil characteristics were: 13% sand, 53% silt, 34% clay, silty clay loam, 4.7% OM, and 7.6 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 TT11002 nozzles for the PRE, EPOST, and POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Varisto contains bentazon (Basagran) plus imazamox (Raptor). A late, wet spring resulted in poor germination and poor vegetative growth of dry bean. There was light pressure throughout the growing season. Varisto with additional Basagran and effective adjuvants (MSO + AMS) resulted in the greatest weed control.

Table. Varisto in DEB (Zollinger, Wirth, Adams).

		7 DA EPOST		14 DA EPOST							
Treatment[1]	Rate	DebP	DebN	DebP	DebN	Yeft	Rrpw	Colq	Biww	Prkw	Koch
	(Product/A)	-----%inj-----		-----%inj-----		----------%control----------					
PRE/EPOST											
(PRE) Outlook	16floz										
(EPOST) Varisto+MSO+CANG	16floz+1%v/v+2.5%v/v	0	0	0	0	99	99	77	99	20	99
(PRE) Outlook	16floz										
(EPOST) Varisto+Basagran 5L+MSO+CANG	16floz+16floz+1%v/v+2.5%v/v	0	0	0	0	99	99	96	99	20	99
PRE/EPOST/POST											
(PRE) Outlook	16floz										
(EPOST) Varisto+MSO+CANG	16floz+1%v/v+2.5%v/v										
(POST) Basagran 5L+MSO+CANG	16floz+1%v/v+2.5%v/v	0	0	0	0	99	99	96	95	20	96
EPOST											
(EPOST) Varisto+NIS+CANG	16floz+0.25%v/v+2.5%v/v	0	0	0	0	38	53	53	53	20	53
(EPOST) Varisto+MSO+CANG	16floz+1%v/v+2.5%v/v	0	0	0	0	77	90	75	90	20	47
(EPOST) Varisto+Select+MSO+CANG	16floz+6floz+1%v/v+2.5%v/v	0	0	0	0	76	93	93	93	20	48
(EPOST) Rezult B+Rezult G+Select+MSO+CANG	1.6pt+1.6pt+6floz+1%v/v+2.5%v/v	10	10	0	0	92	43	43	60	20	43
(EPOST) Varisto+Basagran 5L+Select+MSO+CANG	16floz+12.8floz+6floz+1%v/v+2.5%v/v	10	10	10	10	47	93	93	93	30	93
(EPOST) Varisto+Basagran 5L+MSO+CANG	16floz+12.8floz+1%v/v+2.5%v/v	0	0	0	0	65	92	95	95	20	90
(EPOST) Raptor+Basagran 5L+MSO+CANG	3floz+25.6floz+1%v/v+2.5%v/v	10	10	10	10	50	95	95	95	20	88
EPOST/POST											
(EPOST) Varisto+MSO+CANG	16floz+1%v/v+2.5%v/v										
(POST) Basagran 5L+MSO+CANG	12.8floz+1%v/v+2.5%v/v	0	0	0	0	23	23	23	23	20	23
LSD (0.05)		2	2	2	2	11	7	8	7	2	8

[1]CANG=Class Act NG; MSO=Upland; NIS=R-11

POST herbicide applications with adjuvants in DEB. Zollinger, Richard K., Devin A. Wirth, Jason W. Adams. An experiment was conducted near Prosper, ND to evaluate weed control in dry bean using POST applied herbicides. Navy dry bean was planted on May 27, 2014. POST treatments were applied on June 23, 2014 at 2:20 pm with 77.0 F air, 66.0 F soil at a four inch depth, 45% RH, 50% cloud cover, 3-8 mph NW wind, adequate soil moisture, good crop vigor, and no dew present at a 1-2 trifoliate dry bean crop stage. Weed species present at the time of the POST treatments were: 3-4" bolting (6/ft^2) common ragweed, 6-10" bolting (thick stand) cocklebur, 1-2" (6/ft^2) common lambsquarters, and 1-2" (3-4/ft^2) wild mustard. Soil characteristics were: 25% sand, 47% silt, 28% clay, clay loam, 4.2 OM, and 7.3 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through TT11001 nozzles for the POST applications. The experiment had a randomized complete block design with three replicates per treatment.

Weed pressure at this location was very heavy. MSO enhanced herbicide activity greater than other adjuvant types. Using herbicides with different modes of action and with effective adjuvants resulted in the greatest broad-spectrum weed control.

Table. POST herbicide applications with adjuvants in DEB (Zollinger, Wirth, Adams).

		7 DA POST							14, 28, & 42 DA POST						
Treatment[1]	Rate	Deb	Wimu	Rrpw	Colq	Hans	Corw	Cocb	Deb	Wimu	Rrpw	Colq	Hans	Corw	Cocb
	(Product/A)	-%inj-	----------% control----------						-%inj-	----------% control----------					
POST															
(POST) Permit+NIS	0.67oz+0.5%v/v	0	37	37	37	35	35	43	13	99	47	43	42	52	84
(POST) Permit+PO	0.67oz+1%v/v	0	45	45	45	45	45	57	18	99	42	42	42	42	88
(POST) Permit+MSO	0.67oz+1%v/v	0	50	50	50	50	48	60	23	73	70	57	53	60	90
(POST) Vida+NIS	0.5oz+0.5%v/v	0	17	27	27	27	27	27	0	50	30	30	30	30	30
(POST) Vida+PO	0.5oz+1%v/v	10	33	33	33	33	33	33	0	47	33	30	30	30	33
(POST) Vida+MSO	0.5oz+1%v/v	22	35	35	35	35	35	48	17	60	35	35	35	35	57
(POST) Permit+Vida+MSO	0.5oz+0.5oz+1%v/v	22	73	72	67	65	77	83	17	99	99	57	57	85	98
(POST) Permit+Vida+MSO	0.67oz+0.5oz+1%v/v	22	82	82	78	75	78	89	15	99	99	35	60	57	97
(POST) Basagran+Raptor+MSO	1pt+2floz+1%v/v	8	50	50	50	50	50	48	10	99	99	70	90	53	60
(POST) Basagran+Raptor +Permit+MSO	0.5pt+1floz +0.5oz+1%v/v	5	35	33	33	33	32	32	12	99	99	55	60	53	72
(POST) Basagran+Raptor +Permit+MSO	1pt+2floz +0.67oz+1%v/v	7	63	68	67	67	67	50	10	99	99	73	73	67	73
(POST) Basagran+Raptor +Vida+MSO	0.5pt+1floz +0.5floz+1%v/v	18	78	78	78	78	72	84	13	99	99	72	72	58	80
(POST) Basagran+Raptor +Vida+MSO	1pt+2floz +0.5floz+1%v/v	23	82	82	82	82	82	89	20	99	99	83	83	65	83
(POST) Basagran+Raptor+Permit +Vida+MSO	0.5pt+1floz+0.5oz +0.5oz+1%v/v	7	45	45	45	45	45	40	8	99	99	55	55	85	78
LSD (0.05)		3	9	8	8	9	9	8	5	8	5	7	9	7	8

[1]NIS=R-11; PO=WCS Crop Oil; MSO=Upland MSO

Dry pea tolerance to Spartan and Sharpen tank mixes. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate dry pea tolerance to Spartan and Sharpen applied alone or in a tank mix at different rates. All treatments were applied preemergence. Spartan at 3 oz and Sharpen at 1 oz were considered as the 1X rates. Spartan at 3 oz + Sharpen at 2 oz caused 10% injury or less. Rates up to Spartan 6 oz + Sharpen 4 oz caused 10-20% injury. Sharpen applied alone at 6 oz caused up to 26% injury and was the only treatment that caused a yield reduction.

Table. Dry pea tolerance to Spartan and Sharpen tank mixes. (1439)

		Dry pea									
		Injury					Density	Height		Yield	Test wt.
Treatment[ab]	Rate	30-May	10-Jun	27-Jun	10-Jul	8-Aug	12-Jun	Jun-2-	18-Jul	19-Aug	19-Aug
		----------%----------					pl m row	cm		lb/A	lb/bu
Untreated		0	0	0	0	0	10.3	34.4	81.7	3411	66.5
Spartan	3 oz	0	3	2	2	1	9.6	32.0	81.0	3736	66.5
Spartan	6 oz	0	9	7	5	5	11.7	32.4	82.5	3999	66.9
Spartan + Sharpen + MSO	3 oz + 1 oz + 1%	0	6	7	8	9	9.9	31.7	83.7	3970	66.3
Spartan + Sharpen + MSO	3 oz + 2 oz + 1%	0	6	8	10	9	10.7	32.7	81.1	3573	66.8
Spartan + Sharpen + MSO	6 oz + 2 oz + 1%	0	13	10	10	11	11	32.9	82.4	3928	66.6
Spartan + Sharpen + MSO	6 oz + 4 oz + 1%	0	17	19	20	19	9.3	28.9	83.3	3834	66.6
Sharpen + MSO	3 oz + 1%	0	6	8	8	8	10	31.2	83.7	3689	66.5
Sharpen + MSO	6 oz + 1%	0	15	17	26	23	8.9	32.6	77.2	2983	66.5
Untreated		0	0	0	0	0	10	33.1	82.9	3366	66.2
LSD (0.05)		NS	2.8	3.8	12.1	13.1	NS	NS	NS	NS	NS
CV		0.0	22.2	28.5	77.7	88.7	12.4	5.5	6.8	11.2	0.6

[a] *All treatments applied PRE*

[b] *All treatments applied with Glyphosate + AMS (32 oz + 2.94 gal/100 gal); Glyphosate = 3 lb ae formulation*

Broadleaf weed control in Flax. Howatt, Roach, and Harrington. 'Rahab 94' flax was seeded June 4. Treatments were applied to 3 to 5 leaf yellow foxtail, 4 to 6 leaf Venice mallow, flowering wild mustard, and 4 to 6 leaf pigweed on July 7 with 82°F, 38% relative humidity, 80% clear sky, 5 to 10 mph wind at 330° and dry soil at 76°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Flax 7/21/14	Vema 7/21/14	Wimu 7/21/14
	oz ai/A	%	%	%
Cleth SM+Brox&MCPA+PO	1.5+7.2+20	4	32	95
Cleth SM+Brox&MCPA5+PO	1.5+7.2+20	4	49	97
Cleth SM+Brox+MCPA+PO	1.5+5+3+20	15	74	95
Cleth SM+Brox+MCPA+PO	1.5+2.5+5+20	6	30	90
Cleth SM+Carf+MCPA+PO	1.5+0.13+4+20	76	94	95
Cleth SM+Pyraflufen+MCPA+PO	1.5+0.013+4+20	19	78	95
Cleth SM+Pyraflufen+MCPA+PO	1.5+0.026+4+20	15	88	98
Cleth SM+Fluthiacet+MCPA+PO	1.5+0.06+4+20	15	94	97
Cleth SM+Fluthiacet+MCPA+PO	1.5+0.1+4+20	6	93	97
Cleth SM+Brox&Pyst+PO	1.5+2.9+20	35	88	97
Cleth SM+GWN10293+PO	1.5+0.86+20	7	30	80
Cleth SM+Pyroxsulam+PO	1.5+0.2+20	64	92	96
Cleth SM+Thcz+PO	1.5+0.07+20	50	90	96
Cleth SM+Thif-sg+MCPA+PO	1.5+0.05+4+20	17	69	91
CV		35	18	2
LSD (P=0.05)		12	18	3

Clethodim completely controlled yellow foxtail. None of the broadleaf treatments antagonized the efficacy of clethodim. Carfentrazone supplemented broadleaf weed control with MCPA quite effectively, especially for Venice mallow at 94% control. But this treatment also caused 76% necrosis to flax. Pyraflufen caused less than 20% injury to flax but the field rate gave only 78% control of Venice mallow. Venice mallow control increased with increasing rate of bromoxynil from 30 to 74%. Fluthiacet caused 15% flax injury or less and also provided 93% control of mallow and 97% control of wild mustard. Pyroxsulam gave good weed control but also resulted in substantial chlorosis and stunting.

Preemergent treatments in Flax. Howatt, Roach, and Harrington. 'Rahab 94' flax was seeded near Fargo, North Dakota on June 4. Treatments were applied preemergence on June 3 with 74°F, moist soil, 57% relative humidity, 5% cloud cover, 2 to 3 mph wind at 90° and moist soil at 60°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Flax 6/27/2014	Flax 7/18/2014
	oz ai/A	%	%
Pendimethalin-h	16	0	6
Pendimethalin-h	24	15	52
Mesotrione	1.5	0	22
Mesotrione	3	12	55
GWN10293	1	0	11
GWN10293	2	0	24
Sulfentrazone	3	10	35
Flumioxazin	1	0	32
Flumioxazin&Pyroxasulfone	2.3	26	54
Pyroxasulfone	1.3	22	47
Pyroxasulfone	3	17	69
Saflufenacil	0.72	4	64
Saflufenacil	1.08	52	80
Acetochlor	24	60	79
Metolachlor	24	0	5
Alachlor	24	14	24
Untreated Check	0	6	2
CV		106	43
LSD (P=0.05)		21	24

Standard field rate of several herbicides did not cause appreciable injury on June 27. These herbicides primarily were mitosis inhibitors, HPPD inhibitors, and PPO inhibitors. Response to seedling inhibitors varied by specific herbicide. Acetochlor was the most injurious seedling inhibitor, followed by pyroxasulfone and alachlor, but metolachlor was very safe to flax.

Rain and persistently damp to wet soil conditions possibly enhanced the expression of herbicide injury; however, untreated flax exhibited very minor chlorosis attributable to the wet conditions alone. Metolachlor, pendimethalin, and GWN10293 present viable herbicide options related to flax tolerance. Flax treated with any of these herbicides resulted in similar or less injury than flax treated with mesotrione or sulfentrazone, which are currently registered for use in flax. Elevated rate of pendimethalin caused substantial increase in flax injury. Increased injury with increased GWN10293 was consistent with magnitude of rate increase, but elevated rate of metolachlor was not included for comparison.

Early-season Weed Control in Onion Using Micro-rates (Oakes, ND) - H. Hatterman-Valenti and C. Auwarter.
This study was conducted at the Oakes Irrigation Research Facility near Oakes, North Dakota to compare early-season weed control of bromoxynil (Buctril and Broclean) and oxyfluorfen (GoalTender) applied at micro rates to standard pre-emergence treatment of DCPA (Dacthal) and ethofumesate (Nortron) in onion. 'Crocket', 'Patterson', 'Sedona', and 'Talon were planted April 25 with 18" centers and a planting population of 175,000 seeds/ac. PRE treatments included 1 and 2 lb/ac ethofumesate and 13.33 lb/ac DCPA and were applied 11 days after planting (DAP). Micro rate applications began between the flag-leaf and one-leaf stage, 27 DAP. Bromoxynil and oxyfluorfen were applied at the 0.25 and 0.13 times the lowest labeled rate along with 0.031 lb/ac clethodim (Select Max) and applied in four of five sequential applications when weeds and onions were in seedling growth stages. Petroleum oil-surfactant (Herbimax) (1 pt/ac) was tank mixed with the micro rate application. All treatments received bromoxynil at 0.25 lb/acl and oxyfluorfen at 0.50 lb/ac when onions were around the 5 and 9-leaf stage.

Trt No.	Trt Name	Rate	Rate Unit	App Code
1	Buctril	4	floz/a	B
	Buctril	4	floz/a	C
	Goal Tender	2	floz/a	D
	Goal Tender	2	floz/a	E
2	Buctril	2	floz/a	B
	Buctril	2	floz/a	C
	Buctril	4	floz/a	D
	Buctril	2	floz/a	E
	Goal Tender	2	floz/a	E
	Buctril	2	floz/a	F
	Goal Tender	2	floz/a	F
3	Buctril	2	floz/a	B
	Goal Tender	1	floz/a	B
	Buctril	2	floz/a	C
	Goal Tender	1	floz/a	C
	Buctril	2	floz/a	D
	Goal Tender	1	floz/a	D
	Buctril	2	floz/a	E
	Goal Tender	1	floz/a	E
	Buctril	2	floz/a	F
	Goal Tender	1	floz/a	F
4	Buctril	4	floz/a	B
	Buctril	4	floz/a	C
	Buctril	4	floz/a	D
	Buctril	4	floz/a	E
	Buctril	4	floz/a	F
5	Goal Tender	2	floz/a	B
	Goal Tender	2	floz/a	C
	Goal Tender	2	floz/a	D
	Goal Tender	2	floz/a	E
	Goal Tender	2	floz/a	F
6	Dacthal	10	lb/a	A
7	Nortron	32	floz/a	A
8	Nortron	64	floz/a	A
9	Buctril	2	floz/a	B
	Buctril	2	floz/a	C
	Buctril	2	floz/a	D
	Goal Tender	2	floz/a	D
	Buctril	2	floz/a	E
	Goal Tender	2	floz/a	E

Trt No.	Trt Name	Rate	Rate Unit	App Code
10	Buctril	4	floz/a	B
	Buctril	4	floz/a	C
	Buctril	4	floz/a	D
	Goal Tender	2	floz/a	D
	Buctril	4	floz/a	E
	Goal Tender	2	floz/a	E
11	Buctril	4	floz/a	B
	Buctril	4	floz/a	C
	Buctril	4	floz/a	D
	Buctril	4	floz/a	E
	Goal Tender	2	floz/a	E
	Buctril	4	floz/a	F
	Goal Tender	2	floz/a	F
12	Check			
13	Broclean	2	floz/a	B
	Broclean	2	floz/a	C
	Broclean	2	floz/a	D
	Broclean	2	floz/a	E
	Goal Tender	2	floz/a	E
	Broclean	2	floz/a	F
	Goal Tender	2	floz/a	F
14	Broclean	4	floz/a	B
	Broclean	4	floz/a	C
	Broclean	4	floz/a	D
	Broclean	4	floz/a	E
	Broclean	4	floz/a	F
15	Nortron	32	floz/a	A
16	Broclean	4	floz/a	B
	Broclean	4	floz/a	C
	Broclean	4	floz/a	D
	Goal Tender	2	floz/a	D
	Broclean	4	floz/a	E
	Goal Tender	2	floz/a	E

Application Information.

Date:		5/6/14	5/22/14	5/29/14	6/4/14	6/13/14	6/20/14	6/30/14	7/23/14
Time:		A	B	C	D	E	F	G	H
Sprayer:	GPA:	20	20	20	20	20	20	20	20
	PSI:	40	40	40	40	40	40	40	40
	Nozzle:	8002	8002	8002	8002	8002	8002	8002	8002
Air Temperature (F):		48	72	87	81	59	69	75	79
Relative Humidity (%):		76	37	24	37	63	83	45	43
Wind (MPH):		4.6	7.0	10.0	9.0	7.0	7.5	11.1	7.0
Cloud Cover (%):		100	0	0	10	5	5	50	60
Onion Leaf Stage:		PRE	Flag	1-2	2	3	4	5	9

Stand Counts 29 DAA-A, 13 DAA-B, 6 DAA-C in 3 row feet.

Weed Control and Injury 38 DAA-A.

Trt	----------Variety----------					-----% Control-----		
No.	Crockett	Sedona	Patterson	Talon		Colq	Pigw	Injury
1	12.8a	12.8a	9.3a	7.8a		93.3a	100a	7.5ab
2	12.3a	10.5a	12a	11a		70a	81.3ab	1.3c
3	11.5a	12.5a	9.8a	9a		86.7a	100a	8.8a
4	10.3a	10.3a	10.8a	8a		85a	98.8a	3.8abc
5	12a	9.5a	8.8a	9.8a		81.7a	100a	6.3ab
6	12.8a	8.3a	10.8a	8.3a		80a	62.5b	0c
7	10.5a	13.3a	10.8a	9.5a		11.7b	100a	0c
8	12a	12.3a	12a	11a		38.3b	98.8a	0c
9	11.5a	10.8a	11a	9.3a		80a	100a	7.5ab
10	10.5a	7.8a	9.5a	9a		95a	100a	6.3ab
11	8a	8.5a	10.8a	9.3a		90a	98.8a	2.5bc
12	7.8a	10.3a	10.8a	7.5a		0c	0c	0c
13	13.8a	10.8a	11.8a	9.5a		86.7a	100a	6.3ab
14	9.8a	10.3a	9.8a	7.3a		86.7a	100a	5abc
15	12.3a	13.8a	11.8a	9.3a		15c	100a	0c
16	9.3a	11.5a	10.5a	9.5a		95a	100a	6.3ab
LSD (P=.05)	3.98	4	3.32	3.65		17	20.92	3.14

Crocket Yield.

Trt	----------Onion Bulb Counts in 6 row feet----------						----------CWT/A----------					
No.	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total
1	0.7b	4.7c	12.5abc	10.0ab	0a	28.5ab	3.63a	34bcd	211abc	312a	0a	565abc
2	0.3b	15.3ab	16.5ab	1d	0a	33.5a	2.42a	95abc	264ab	29bc	0a	388bcd
3	0.1b	9.5abc	15.3abc	7.5abc	0a	32.8a	1.21a	62a-d	270ab	219a	0a	568abc
4	0.1b	6.8bc	14.3abc	6.8abc	0a	28.3ab	1.21a	46a-d	247abc	200a	0a	501abc
5	0.1b	20a	7.5cd	0.5d	0a	28.8ab	1.21a	125a	120cd	5c	0a	260de
6	0.0b	5.9bc	19.8a	8.3ab	0a	34a	0.0a	44a-d	340a	244a	0a	634a
7	0.1b	12abc	13abc	2cd	0a	27.8ab	1.21a	78a-d	207abc	42bc	0a	346cde
8	0.6b	3.5c	14.3abc	8.8ab	0a	27.5ab	3.63a	22cd	258ab	276a	0a	566abc
9	0.3b	19.2b	4.5de	0.0d	0a	24.3ab	2.42a	118ab	65de	0c	0a	184ef
10	0.1b	7.3bc	11bcd	6.8abc	0a	25.8ab	1.21a	56a-d	186bc	201a	0a	451abc
11	0.2b	6.7bc	10.3bcd	10.5ab	0a	28.5ab	1.21a	41a-d	184bc	322a	0a	558abc
12	3.6a	12.5abc	1.3e	0.3d	0a	18.8b	6.05a	52a-d	22e	3c	0a	88f
13	0.7b	10.5abc	13.5abc	5a-d	0a	30.8a	3.63a	69a-d	247abc	114ab	0a	471abc
14	0.4b	8.5abc	11bcd	7.5abc	0a	28.3ab	2.42a	59a-d	192bc	223a	0a	486abc
15	0.1b	11.7abc	12bc	4.3bcd	0a	28.5ab	1.21a	107ab	213abc	123ab	0a	473abc
16	0.1b	3.5c	12.8abc	10.8a	0a	27.5ab	1.21a	19d	225abc	346a	0a	594ab
LSD (P=.05)	0.47	0.95	4.66	3.8	0	6.18	3.32	2.94	81.19	5.14	0	138

Patterson Yield.

Trt	----------Onion Bulb Counts in 6 row feet----------						----------CWT/A----------					
No.	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total
1	0.4a	14ab	9.5ab	0.0a	0a	24.3a	2.42a	97ab	133abc	0a	0a	232abc
2	0.3a	18.3ab	2c	0.0a	0a	20.8ab	2.42a	94ab	27d	0a	0a	123de
3	0.1a	17.5ab	9ab	0.3a	0a	27a	1.21a	115a	145ab	7a	0a	269ab
4	2.8a	19.8ab	2c	0.3a	0a	25a	4.84a	98ab	28d	8a	0a	139cde
5	0.1a	19.8ab	5.8abc	0.0a	0a	25.8a	1.21a	122a	85a-d	0a	0a	208a-d
6	0.0a	17.8ab	10.5ab	0.8a	0a	29a	0.0a	117a	156ab	19a	0a	293a
7	0.4a	16.8ab	5.3abc	0.5a	0a	23.3a	2.42a	81ab	76a-d	15a	0a	174bcd
8	0.3a	19.8ab	7.8abc	0.3a	0a	28.3a	2.42a	122a	121abc	8a	0a	254ab
9	0.0a	21.3a	4.8bc	0.0a	0a	26a	0.0a	120a	65bcd	0a	0a	185a-d
10	0.4a	12.5ab	8.5ab	1.3a	0a	23a	2.42a	85ab	136abc	35a	0a	258ab
11	0.1a	16.3ab	11a	0.3a	0a	27.8a	1.21a	107a	173a	8a	0a	289a
12	0.6a	9.3b	2.8c	0.0a	0a	13.3b	2.42a	35b	46cd	0a	0a	83e
13	0.3a	14.5ab	10.5ab	0.8a	0a	26.3a	2.42a	90ab	165ab	18a	0a	275ab
14	0.1a	16.5ab	4.5bc	0.5a	0a	21.8ab	1.21a	91ab	76a-d	13a	0a	182a-d
15	0.1a	14.3ab	6.5abc	0.8a	0a	21.8ab	1.21a	79ab	100a-d	21a	0a	201a-d
16	0.1a	12ab	9.3ab	0.8a	0a	22.3ab	1.21a	74ab	146ab	22a	0a	243ab
LSD (P=.05)	0.48	6.38	3.64	0.86	0	6.5	3.38	40.98	58.47	24.26	0	65.91

Sedona Yield.

Trt	----------Onion Bulb Counts in 6 row feet----------						----------CWT/A----------					
No.	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total
1	0.2a	6.8cd	12a	7.4ab	0a	27a	1.21a	44bc	215a	258ab	0a	524a-d
2	0.3a	15.8ab	13.5a	1c	0a	31a	2.42a	107a	208a	21c	0a	353cde
3	0.1a	7cd	12.3a	10.1a	0.1a	30a	1.21a	41bc	229a	317a	15a	609ab
4	0.7a	14.3abc	9.8a	2.4bc	0a	27.8a	3.63a	82abc	172a	69bc	0a	341cde
5	0.1a	7.8cd	13.5a	2.6bc	0a	25a	1.21a	57abc	217a	69bc	0a	378b-e
6	0.0a	4d	13a	9.7a	0a	26.8a	0.0a	33c	246a	332a	0a	611ab
7	0.1a	10.8a-d	17.3a	2.8bc	0a	31.5a	1.21a	84abc	306a	74bc	0a	488a-d
8	0.0a	4.5d	13.8a	9.7a	0.1a	28.5a	0.0a	35bc	243a	323a	13a	623a
9	0.4a	17.5a	11.5a	0.4c	0a	30.3a	2.42a	113a	180a	5c	0a	310de
10	0.1a	3.3d	12a	7.6ab	0a	23.3a	1.21a	39bc	223a	235ab	0a	515a-d
11	0.1a	6.3d	11.8a	8.1ab	0.1a	27a	1.21a	50bc	225a	272ab	17a	570abc
12	0.7a	16.3ab	5.8a	0.4c	0a	23.5a	3.63a	97ab	86a	9c	0a	201e
13	0.3a	9.8bcd	12.3a	6.1ab	0.1a	29a	2.42a	71abc	218a	193ab	13a	508a-d
14	0.4a	8.8cd	9.8a	5.4ab	0.1a	25.3a	2.42a	58abc	177a	169ab	15a	434a-d
15	0.1a	6.3d	14.5a	5.8ab	0a	27a	1.21a	46bc	267a	181ab	0a	502a-d
16	0.1a	4d	10.3a	12.2a	0.1a	27a	1.21a	36bc	199a	416a	15a	667a
LSD (P=.05)	0.48	4.93	5	7.9	.24	6.2	3.45	35.94	91.83	89.68	24.64	143.27

Talon Yield.

Trt	----------Onion Bulb Counts in 6 row feet----------						----------CWT/A----------					
No.	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total
1	0.0a	5a	9a	5.8a-d	0.1a	20ab	0a	36a	153a	186a-d	17a	392abc
2	0.0a	10.5a	5.7a	2.5bcd	0a	18.8ab	0a	62a	88a	81bcd	0a	231cd
3	0.0a	5.8a	10.1a	5.8a-d	0.1a	22.3ab	0a	34a	173a	172a-d	18a	397abc
4	0.0a	10.5a	6.7a	2.8a-d	0a	20.8ab	0a	61a	113a	82bcd	0a	255bcd
5	0.0a	7a	8.2a	4.8a-d	0a	20ab	0a	50a	130a	137a-d	0a	316a-d
6	0.0a	7.8a	7.7a	6.5abc	0.1a	22.3ab	0a	47a	125a	221abc	15a	408abc
7	0.0a	12a	6.8a	3.8a-d	0a	23.3ab	0a	64a	130a	115a-d	0a	309a-d
8	0.0a	6.8a	10.5a	5.3a-d	0.1a	23.3ab	0a	42a	176a	185a-d	16a	419abc
9	0.0a	9.5a	13.4a	3a-d	0a	26a	0a	59a	215a	88bcd	0a	363abc
10	0.3a	7a	9.1a	7.3ab	0.1a	24a	1.21a	51a	146a	237ab	15a	450ab
11	0.0a	8.8a	9.4a	7.8a	0a	26a	0a	54a	166a	263a	0a	483a
12	0.3a	6.8a	4.1a	1.3d	0a	12.5b	1.21a	36a	68a	42d	0a	148d
13	0.0a	7.8a	8.7a	6.3a-d	0a	23ab	0a	52a	151a	209a-d	0a	413abc
14	0.0a	7.8a	7.9a	5.5a-d	0.1a	21.5ab	0a	48a	131a	197a-d	15a	391abc
15	0.5a	8.5a	6.3a	2cd	0a	17.5ab	2.42a	53a	108a	59cd	0a	223cd
16	0.3a	5a	7a	7.3ab	0.1a	20ab	1.21a	35a	121a	236ab	12a	405abc
LSD (P=.05)	0.37	4.44	7.8	2.95	.28	6.45	1.77	28.17	77.42	98.47	29.69	125.75

The pre-applications of DCPA and ethofumesate didn't injure onion (37 DAA), while the post-applications all had some injury after the third application. Micro-rate treatments without oxyfluorfen at this time had less injury and bromoxynil at 0.031 lb/A had less injury then 0.062 lb/A. The Buctril treatments had less injury than the Broclean treatments. When ccomparing treatment 2 (Buctril) versus treatment 13 (Broclean), treatment 4 (Buctril) vs treatment 14 (Broclean), treatment 7 (Buctril) vs treatment 15 (Broclean) and treatment 10 (Buctril) vs treatment 16 (Broclean); the biggest difference in injury was shown between treatments 2 and 13. Both received 0.031 lb/A bromoxynil for 2 applications, fb 0.0625 lb/A with 6.3% onion injury for Broclean and only 1.3% onion injury for Buctril. DCPA controlled COLQ better than ethofumesate, while ethofumesate had better control of RRPW than DCPA 37 DAA. Stand counts were taken 40 DAP, just prior to the third application. No differences were observed.

Sedona onions had the highest yield among the four cultivars fb Crocket, Talon, and Patterson. Even though there was more onion injury in the Broclean treatments, these treatments had a higher yield overall than the Buctril treatments. The highest yielding treatment over all four cultivars was treatment 16 with Sedona onions at 666 cwt/A. This treatment consisted of bromoxynil (Broclean) at 0.0625 lb/A applied twice fb bromoxynil (Broclean) at 0.0625 lb/A and oxyfluorfen at 0.0625 lb/A applied twice. This treatment resulted in a top seven yield among the four cultivars of onion. In comparison, the Buctril treatment 10 ranked in the middle among all treatments for total onion yield averaged over all cultivars. The most consistent treatment was treatment 6; pre-application of DCPA and two additional applications of the grower standard use rate of bromoxynil and oxyfluorfen at the 5- and 9-leaf stages. The untreated consistently yielded at the bottom even though it received the two standard bromoxynil and oxyfluorfen applications at the 5- and 9-leaf stages, because the weeds were too big to fully control.

Having oxyfluorfen mixed with bromoxynil in the first three applications compared to only bromoxynil increased yields with all four cultivars (treatments 3 vs 2). Comparing treatments 10 and 11, where an application of bromoxynil at 0.0625 lb/A was added for treatment 11, showed a yield increase with all four cultivars. Treatment 10 had 2 applications of bromoxynil at 0.0625 lb/A and 2 applications of bromoxynil at 0.0625 lb/A plus oxyfluorfen at 0.0625 lb/A. Treatment 11 added a third application of bromoxynil at 0.0625 lb/A in the middle fb 2 applications of bromoxynil at 0.0625 lb/A plus oxyfluorfen at 0.0625 lb/A.

Weed Control and Crop Response on Russet Burbank potato. Harlene Hatterman-Valenti and Collin Auwarter.

Field research was conducted in 2014 at the Oakes irrigation research site south of the town of Oakes, ND to evaluate different rates of F9312-3 alone and tank mixed with Sencor and Matrix. We also looked at F9314-3 at two rates and F9350-1 compared to standard grower recommended herbicide applications. Russet Burbank potato seed pieces (2 oz) were planted on May 16 with 36" rows and 12" spacing using a Harriston Double Row planter. On June 2, we hilled and sprayed treatments with a CO2 backpack sprayer at 40 psi using 8002 flat fan nozzles and 20 gpa. Potatoes were harvested on September 19 and graded December 10.

Trt		Rate	Tuber Counts in 20'											
Name	Rate	Unit	---<4 oz---		---4-6 oz---		---6-12 oz---		--->12 oz---		---Total---		--->4 oz---	
F9312-3	0.122	lb ai/a	82.0	a	47.5	a	51.8	a	8.8	a	190.0	a	108.0	a
F9312-3	0.144	lb ai/a	69.5	a	49.0	a	55.5	a	9.3	a	183.3	a	113.8	a
F9312-3	0.191	lb ai/a	72.0	a	44.5	a	60.5	a	12.0	a	189.0	a	117.0	a
F9312-3	0.29	lb ai/a	83.0	a	52.8	a	48.8	a	7.5	a	192.0	a	109.0	a
F9312-3	0.122	lb ai/a	72.3	a	43.8	a	63.8	a	11.5	a	191.3	a	119.0	a
Sencor 75DF	0.375	lb ai/a												
F9312-3	0.144	lb ai/a	77.5	a	44.5	a	55.5	a	10.3	a	187.8	a	110.3	a
Sencor 75DF	0.375	lb ai/a												
F9312-3	0.122	lb ai/a	98.8	a	56.3	a	58.3	a	6.0	a	219.3	a	120.5	a
Matrix	0.016	lb ai/a												
F9314-3	0.2	lb ai/a	75.5	a	41.0	a	58.8	a	11.5	a	186.8	a	111.3	a
F9314-3	0.258	lb ai/a	89.0	a	42.3	a	54.5	a	10.5	a	196.3	a	107.3	a
F9350-1	2.7	oz/a	86.0	a	42.8	a	55.5	a	10.0	a	194.3	a	108.3	a
Sencor 75DF	0.375	lb ai/a	83.3	a	49.8	a	64.8	a	7.5	a	205.3	a	122.0	a
Boundary	2.68	lb ai/a	101.3	a	55.8	a	51.3	a	6.5	a	214.8	a	113.5	a
Matrix	0.016	lb ai/a	82.5	a	50.0	a	63.0	a	5.5	a	201.0	a	118.5	a
Fierce	0.166	lb ai/a	79.3	a	37.8	a	44.5	a	12.5	a	174.0	a	94.8	a
		LSD (P=.05)	32.41		14.25		13.18		5.64		32.68		17.04	

Trt		Rate	Row A		Row B CWT/a											
Name	Rate	Unit	CWT/a		---<4 oz---		---4-6 oz---		---6-12 oz---		--->12 oz---		---Total---		--->4 oz---	
F9312-3	0.122	lb ai/a	534.0	a	84.9	a	107.8	a	189.5	a	59.3	a	441.4	a	356.6	a
F9312-3	0.144	lb ai/a	560.5	a	71.9	a	112.4	a	204.6	a	61.2	a	450.1	a	378.1	a
F9312-3	0.191	lb ai/a	519.5	a	67.0	a	101.2	a	229.3	a	83.2	a	480.8	a	413.7	a
F9312-3	0.29	lb ai/a	547.9	a	90.1	a	118.3	a	183.6	a	51.7	a	443.8	a	353.7	a
F9312-3 +	0.122	lb ai/a	561.8	a	72.5	a	101.4	a	241.9	a	82.2	a	498.0	a	425.5	a
Sencor 75DF	0.375	lb ai/a														
F9312-3 +	0.144	lb ai/a	538.8	a	74.4	a	101.4	a	205.8	a	65.9	a	447.4	a	373.0	a
Sencor 75DF	0.375	lb ai/a														
F9312-3 +	0.122	lb ai/a	574.8	a	101.0	a	127.2	a	214.8	a	38.5	a	481.6	a	380.5	a
Matrix	0.016	lb ai/a														
F9314-3	0.2	lb ai/a	596.4	a	76.5	a	91.6	a	222.4	a	72.0	a	462.5	a	386.0	a
F9314-3	0.258	lb ai/a	589.9	a	89.2	a	96.6	a	202.0	a	73.4	a	461.2	a	372.0	a
F9350-1	2.7	oz/a	530.6	a	88.7	a	97.9	a	211.1	a	66.8	a	464.5	a	375.8	a
Sencor 75DF	0.375	lb ai/a	554.3	a	83.4	a	112.1	a	238.5	a	54.2	a	488.2	a	404.8	a
Boundary	2.68	lb ai/a	551.8	a	106.2	a	123.4	a	190.2	a	43.4	a	463.2	a	357.0	a
Matrix	0.016	lb ai/a	560.9	a	82.9	a	115.1	a	232.2	a	37.8	a	467.9	a	385.0	a
Fierce	0.166	lb ai/a	482.8	a	84.4	a	84.4	a	163.8	a	80.2	a	412.8	a	328.4	a
		LSD (P=.05)	82.49		32.63		32.64		51.89		38.12		55.62		67.40	

All treatments had sufficient weed control. Increasing the rate of F9312-3 or tank mixed with metribuzin or rimsulfuron did not show any benefits for controlling redroot pigweed, common lambsquarter, nightshade (hairy and eastern black) and foxtail (green and yellow) 17 and 36 DAA. Weed average counts in border rows that were not sprayed in one square foot were 8 redroot pigweed, 10 common lambsquarter, 2 foxtail, and 1 nightshade. No potato injury was observed.

Potato yields were not affected by any of the treatments. Yields varied from 413 to 575 cwt/A with the lowest in both the A and B rows when Fierce was applied at 0.17 lb/A with 483 and 413 cwt/A, respectively. F9312-3 tank mixed with Matrix had the highest yield in row A with 575 cwt/a. Stand counts 9 DAE showed row A had a slightly higher stand than row B. Row B's highest yielding treatment was F-9312-3 (0.122 lb ai/A) tank mixed with Sencor with a yield of 498 cwt/A.

Effect of Simulated Glyphosate Drift on Seed Pieces from Four Potato Processing Cultivars. Harlene Hatterman-Valenti and Collin Auwarter.

A field study was conducted to determine the carryover effect on potatoes grown for seed and planted the season following simulated glyphosate drift on four processing cultivars (Bannock Russet, Ranger Russet, Russet Burbank, and Umatilla Russet). In 2013, the four cultivars were planted on June 12 at the Northern Plains Potato Growers Association irrigation research site near Inkster, ND. Sub-lethal rates of glyphosate were applied to mother plants at one-half, one-quarter, and one-eighth the lowest labeled rate of 0.38 lb ae/A glyphosate at the tuber initiation (TI), early tuber bulking (EB), and late tuber bulking (LB) stages. Potatoes were harvested October 23, graded for yield and quality, and stored for planting in 2014. On May 28, 2014, individual seed pieces from 20 randomly selected tubers within each treatment were planted. Potato stand counts were recorded mid-July and mid-August. Plots were harvested mid-October and graded shortly after harvest.

Stand Count 42 (7/9/14) and 83 (8/19/14) DAP in 20' of row.

Trt	Trt		Rate	App	----Ranger----		---Bannock---		---Burbank---		---Umatilla---	
No.	Name	Rate	Unit	Code	7/9	8/19	7/9	8/19	7/9	8/19	7/9	8/19
1	Untreated				19.3a	19.3a	18.5a	18.5a	18.7a	18.8a	13.7ab	17.5ab
2	RU Weather Max	0.19	lb/a	TI	4.8d	6.3b	4.5bc	8.8ab	0.4f	3.5d	3.8abc	9.5bc
	Ammonium Sulfate	4	lb/100 gal	TI								
3	RU Weather Max	0.10	lb/a	TI	1.8d	9b	6.9abc	15.5ab	1.2ef	6cd	9.6ab	14ab
	Ammonium Sulfate	4	lb/100 gal	TI								
4	RU Weather Max	0.05	lb/a	TI	11c	14.8a	15.5ab	16.8ab	3.7c-f	12.5ab	10.3ab	15ab
	Ammonium Sulfate	4	lb/100 gal	TI								
5	RU Weather Max	0.19	lb/a	EB	15.8b	17.5a	0.4c	13.5ab	5.6b-f	15.5a	3.3bc	12.5b
	Ammonium Sulfate	4	lb/100 gal	EB								
6	RU Weather Max	0.10	lb/a	EB	19.5a	19.5a	6abc	16.8ab	11.9a-d	17a	18.2a	18.3a
	Ammonium Sulfate	4	lb/100 gal	EB								
7	RU Weather Max	0.05	lb/a	EB	19.5a	19.5a	16.4ab	17.8a	13.1abc	16.8a	18.2a	18.3a
	Ammonium Sulfate	4	lb/100 gal	EB								
8	RU Weather Max	0.19	lb/a	LB	2.3d	7.5b	4.1bc	6.3b	2.6def	9.3bc	0.3c	5.5c
	Ammonium Sulfate	4	lb/100 gal	LB								
9	RU Weather Max	0.10	lb/a	LB	15.3b	16.3a	4.3bc	12ab	8.2a-e	17.3a	6.5abc	12.3b
	Ammonium Sulfate	4	lb/100 gal	LB								
10	RU Weather Max	0.05	lb/a	LB	19.3a	19.3a	6.1abc	16.5ab	16.5ab	16.5a	18.7a	18.8a
	Ammonium Sulfate	4	lb/100 gal	LB								

Ranger Tuber counts in 20' of row.

Trt	Trt		Rate	App	----------Tuber Counts in 20' of row----------					
No.	Name	Rate	Unit	Code	<4oz	4-6oz	6-12oz	>12oz	Total	>4oz
1	Untreated				80a	45a	55ab	12ab	191a	111a
2	RU Weather Max	0.19	lb/a	TI	37b	18bc	18cd	8abc	73bc	40cd
	Ammonium Sulfate	4	lb/100 gal	TI						
3	RU Weather Max	0.10	lb/a	TI	27b	7c	10d	2c	45c	18d
	Ammonium Sulfate	4	lb/100 gal	TI						
4	RU Weather Max	0.05	lb/a	TI	35b	14bc	24bcd	9abc	81bc	47bcd
	Ammonium Sulfate	4	lb/100 gal	TI						
5	RU Weather Max	0.19	lb/a	EB	48ab	21abc	31a-d	15a	114ab	65abc
	Ammonium Sulfate	4	lb/100 gal	EB						
6	RU Weather Max	0.10	lb/a	EB	59ab	37ab	45abc	10abc	145ab	88abc
	Ammonium Sulfate	4	lb/100 gal	EB						
7	RU Weather Max	0.05	lb/a	EB	77a	36ab	56ab	8abc	175a	99ab
	Ammonium Sulfate	4	lb/100 gal	EB						
8	RU Weather Max	0.19	lb/a	LB	25b	6c	5d	3bc	41c	15d
	Ammonium Sulfate	4	lb/100 gal	LB						
9	RU Weather Max	0.10	lb/a	LB	48ab	24abc	47abc	15a	133ab	85abc
	Ammonium Sulfate	4	lb/100 gal	LB						
10	RU Weather Max	0.05	lb/a	LB	65ab	37ab	63a	13ab	177a	112a
	Ammonium Sulfate	4	lb/100 gal	LB						
			LSD (P=.05)		26.93	17.12	14.34	6.47	2.57	2.32

Ranger CWT/A.

Trt	Trt		Rate	App	----------CWT/A----------					
No.	Name	Rate	Unit	Code	<4oz	4-6oz	6-12oz	>12oz	Total	>4oz
1	Untreated				84a	102a	208ab	83abc	474a	393a
2	RU Weather Max	0.19	lb/a	TI	34bc	40bc	79bc	66abc	202bc	184bc
	Ammonium Sulfate	4	lb/100 gal	TI						
3	RU Weather Max	0.10	lb/a	TI	25bc	15c	38c	16c	94d	69c
	Ammonium Sulfate	4	lb/100 gal	TI						
4	RU Weather Max	0.05	lb/a	TI	35bc	32bc	94bc	64abc	223bc	190bc
	Ammonium Sulfate	4	lb/100 gal	TI						
5	RU Weather Max	0.19	lb/a	EB	51abc	47abc	123abc	110a	323abc	279ab
	Ammonium Sulfate	4	lb/100 gal	EB						
6	RU Weather Max	0.10	lb/a	EB	62abc	84ab	175ab	74abc	383abc	334ab
	Ammonium Sulfate	4	lb/100 gal	EB						
7	RU Weather Max	0.05	lb/a	EB	77a	81ab	209ab	49abc	413ab	338ab
	Ammonium Sulfate	4	lb/100 gal	EB						
8	RU Weather Max	0.19	lb/a	LB	21c	14c	34bc	22bc	82d	70c
	Ammonium Sulfate	4	lb/100 gal	LB						
9	RU Weather Max	0.10	lb/a	LB	52abc	55abc	186ab	101a	390abc	342ab
	Ammonium Sulfate	4	lb/100 gal	LB						
10	RU Weather Max	0.05	lb/a	LB	64ab	84ab	237a	90ab	472a	410a
	Ammonium Sulfate	4	lb/100 gal	LB						
			LSD (P=.05)		26.44	39.04	84.69	44.73	3.93	128.25

Bannock Tuber counts in 20' of row.

Trt	Trt		Rate	App	----------Tuber Counts in 20' of row----------					
No.	Name	Rate	Unit	Code	<4oz	4-6oz	6-12oz	>12oz	Total	>4oz
1	Untreated				40a	22a	54a	35a	151a	111a
2	RU Weather Max	0.19	lb/a	TI	17ab	7bc	16b	13ab	53bc	36bc
	Ammonium Sulfate	4	lb/100 gal	TI						
3	RU Weather Max	0.10	lb/a	TI	27ab	10abc	18b	8b	63bc	36bc
	Ammonium Sulfate	4	lb/100 gal	TI						
4	RU Weather Max	0.05	lb/a	TI	38a	19ab	29b	18ab	105ab	67b
	Ammonium Sulfate	4	lb/100 gal	TI						
5	RU Weather Max	0.19	lb/a	EB	18ab	3c	6b	3b	31bc	12bc
	Ammonium Sulfate	4	lb/100 gal	EB						
6	RU Weather Max	0.10	lb/a	EB	32ab	12abc	19b	7b	74bc	41bc
	Ammonium Sulfate	4	lb/100 gal	EB						
7	RU Weather Max	0.05	lb/a	EB	27ab	15abc	31b	13ab	87bc	60bc
	Ammonium Sulfate	4	lb/100 gal	EB						
8	RU Weather Max	0.19	lb/a	LB	5b	2c	3b	2b	13c	8c
	Ammonium Sulfate	4	lb/100 gal	LB						
9	RU Weather Max	0.10	lb/a	LB	29ab	8abc	20b	10b	69bc	40bc
	Ammonium Sulfate	4	lb/100 gal	LB						
10	RU Weather Max	0.05	lb/a	LB	31ab	10abc	25b	10b	77bc	46bc
	Ammonium Sulfate	4	lb/100 gal	LB						
			LSD (P=.05)		18.42	8.80	17.45	11.66	49.16	35.75

Bannock CWT/A.

Trt	Trt		Rate	App	----------CWT/A----------					
No.	Name	Rate	Unit	Code	<4oz	4-6oz	6-12oz	>12oz	Total	>4oz
1	Untreated				40a	49a	214a	273a	582a	541a
2	RU Weather Max	0.19	lb/a	TI	13bc	15bc	65b	109ab	206cd	195cd
	Ammonium Sulfate	4	lb/100 gal	TI						
3	RU Weather Max	0.10	lb/a	TI	25abc	23abc	67b	58b	176cd	150cd
	Ammonium Sulfate	4	lb/100 gal	TI						
4	RU Weather Max	0.05	lb/a	TI	34ab	43ab	110b	132ab	279bc	247bc
	Ammonium Sulfate	4	lb/100 gal	TI						
5	RU Weather Max	0.19	lb/a	EB	11bc	7c	22b	21b	55d	46d
	Ammonium Sulfate	4	lb/100 gal	EB						
6	RU Weather Max	0.10	lb/a	EB	25abc	27abc	77b	62b	119cd	94cd
	Ammonium Sulfate	4	lb/100 gal	EB						
7	RU Weather Max	0.05	lb/a	EB	26abc	33abc	120b	93ab	376b	343b
	Ammonium Sulfate	4	lb/100 gal	EB						
8	RU Weather Max	0.19	lb/a	LB	3c	4c	13b	15b	61d	57d
	Ammonium Sulfate	4	lb/100 gal	LB						
9	RU Weather Max	0.10	lb/a	LB	24abc	18abc	79b	74ab	144cd	127cd
	Ammonium Sulfate	4	lb/100 gal	LB						
10	RU Weather Max	0.05	lb/a	LB	27abc	22abc	100b	73ab	198cd	172cd
	Ammonium Sulfate	4	lb/100 gal	LB						
			LSD (P=.05)		16.80	20.11	69.60	5.46	130.49	118.88

Russet Burbank Tuber counts in 20' of row.

Trt	Trt		Rate	App	----------Tuber Counts in 20' of row----------					
No.	Name	Rate	Unit	Code	<4oz	4-6oz	6-12oz	>12oz	Total	>4oz
1	Untreated				63b	39ab	71a	20a	194a	131a
2	RU Weather Max	0.19	lb/a	TI	11d	3e	2b	0.3c	16d	5d
	Ammonium Sulfate	4	lb/100 gal	TI						
3	RU Weather Max	0.10	lb/a	TI	27cd	2e	3b	1bc	33cd	6d
	Ammonium Sulfate	4	lb/100 gal	TI						
4	RU Weather Max	0.05	lb/a	TI	47bc	11cde	11b	6abc	78bc	30cd
	Ammonium Sulfate	4	lb/100 gal	TI						
5	RU Weather Max	0.19	lb/a	EB	78b	15b-e	11b	3abc	109ab	30cd
	Ammonium Sulfate	4	lb/100 gal	EB						
6	RU Weather Max	0.10	lb/a	EB	121a	30abc	25b	4abc	181a	61abc
	Ammonium Sulfate	4	lb/100 gal	EB						
7	RU Weather Max	0.05	lb/a	EB	60b	29abc	54a	16ab	162a	100ab
	Ammonium Sulfate	4	lb/100 gal	EB						
8	RU Weather Max	0.19	lb/a	LB	46bc	6de	12b	5abc	68bc	23cd
	Ammonium Sulfate	4	lb/100 gal	LB						
9	RU Weather Max	0.10	lb/a	LB	77b	19a-d	20b	5abc	124ab	46bc
	Ammonium Sulfate	4	lb/100 gal	LB						
10	RU Weather Max	0.05	lb/a	LB	74b	43a	66a	15ab	199a	125a
	Ammonium Sulfate	4	lb/100 gal	LB						
			LSD (P=.05)		23.34	1.69	2.21	11.47	2.53	2.74

Russet Burbank CWT/A.

Trt	Trt		Rate	App	----------CWT/A----------					
No.	Name	Rate	Unit	Code	<4oz	4-6oz	6-12oz	>12oz	Total	>4oz
1	Untreated				65b	90a	276a	142a	579a	514a
2	RU Weather Max	0.19	lb/a	TI	7c	6d	7b	2c	22e	16d
	Ammonium Sulfate	4	lb/100 gal	TI						
3	RU Weather Max	0.10	lb/a	TI	19c	5d	9b	10bc	44de	24cd
	Ammonium Sulfate	4	lb/100 gal	TI						
4	RU Weather Max	0.05	lb/a	TI	36bc	25bcd	49b	44abc	155cd	119bcd
	Ammonium Sulfate	4	lb/100 gal	TI						
5	RU Weather Max	0.19	lb/a	EB	70b	33bcd	49b	23abc	175bcd	104bcd
	Ammonium Sulfate	4	lb/100 gal	EB						
6	RU Weather Max	0.10	lb/a	EB	119a	68ab	89b	34abc	319abc	200b
	Ammonium Sulfate	4	lb/100 gal	EB						
7	RU Weather Max	0.05	lb/a	EB	56b	66ab	210a	120ab	456ab	401a
	Ammonium Sulfate	4	lb/100 gal	EB						
8	RU Weather Max	0.19	lb/a	LB	35bc	13cd	45b	38abc	131cd	97bcd
	Ammonium Sulfate	4	lb/100 gal	LB						
9	RU Weather Max	0.10	lb/a	LB	68b	42abc	74b	35abc	237bc	163bc
	Ammonium Sulfate	4	lb/100 gal	LB						
10	RU Weather Max	0.05	lb/a	LB	72b	99a	253a	109ab	541a	469a
	Ammonium Sulfate	4	lb/100 gal	LB						
			LSD (P=.05)		26.03	2.57	4.52	5.04	5.52	5.83

Umatilla Tuber counts in 20' of row.

Trt	Trt		Rate	App	----------Tuber Counts in 20' of row----------					
No.	Name	Rate	Unit	Code	<4oz	4-6oz	6-12oz	>12oz	Total	>4oz
1	Untreated				84a	33ab	58a	23a	198a	113a
2	RU Weather Max	0.19	lb/a	TI	33bc	14cd	29abc	14ab	91cd	58bc
	Ammonium Sulfate	4	lb/100 gal	TI						
3	RU Weather Max	0.10	lb/a	TI	56ab	19bcd	31abc	8ab	114bc	59bc
	Ammonium Sulfate	4	lb/100 gal	TI						
4	RU Weather Max	0.05	lb/a	TI	56ab	33ab	39ab	19ab	147abc	90ab
	Ammonium Sulfate	4	lb/100 gal	TI						
5	RU Weather Max	0.19	lb/a	EB	44abc	9d	16bc	6ab	75cd	31c
	Ammonium Sulfate	4	lb/100 gal	EB						
6	RU Weather Max	0.10	lb/a	EB	61ab	29abc	44ab	14ab	147abc	86ab
	Ammonium Sulfate	4	lb/100 gal	EB						
7	RU Weather Max	0.05	lb/a	EB	81a	43a	60a	19ab	202a	122a
	Ammonium Sulfate	4	lb/100 gal	EB						
8	RU Weather Max	0.19	lb/a	LB	11c	3d	3c	6b	21d	10c
	Ammonium Sulfate	4	lb/100 gal	LB						
9	RU Weather Max	0.10	lb/a	LB	33bc	13cd	18bc	10ab	74cd	41bc
	Ammonium Sulfate	4	lb/100 gal	LB						
10	RU Weather Max	0.05	lb/a	LB	65ab	41a	57a	23a	186ab	121a
	Ammonium Sulfate	4	lb/100 gal	LB						
			LSD (P=.05)		27.69	12.94	20.32	10.39	57.18	35.57

Umatilla CWT/A.

Trt	Trt		Rate	App	----------CWT/A----------					
No.	Name	Rate	Unit	Code	<4oz	4-6oz	6-12oz	>12oz	Total	>4oz
1	Untreated				86a	75ab	225a	166a	552a	467a
2	RU Weather Max	0.19	lb/a	TI	29bc	32cd	114abc	106a	281abc	252abc
	Ammonium Sulfate	4	lb/100 gal	TI						
3	RU Weather Max	0.10	lb/a	TI	54ab	43bcd	119abc	64a	281abc	226abc
	Ammonium Sulfate	4	lb/100 gal	TI						
4	RU Weather Max	0.05	lb/a	TI	58ab	74ab	143ab	144a	419ab	361ab
	Ammonium Sulfate	4	lb/100 gal	TI						
5	RU Weather Max	0.19	lb/a	EB	38ab	20d	63bc	44a	167bc	127bc
	Ammonium Sulfate	4	lb/100 gal	EB						
6	RU Weather Max	0.10	lb/a	EB	66ab	65abc	171ab	94a	398ab	330ab
	Ammonium Sulfate	4	lb/100 gal	EB						
7	RU Weather Max	0.05	lb/a	EB	85a	97a	229a	137a	550a	463a
	Ammonium Sulfate	4	lb/100 gal	EB						
8	RU Weather Max	0.19	lb/a	LB	8c	6d	10c	35a	59bc	51c
	Ammonium Sulfate	4	lb/100 gal	LB						
9	RU Weather Max	0.10	lb/a	LB	27bc	30cd	74bc	72a	206bc	176bc
	Ammonium Sulfate	4	lb/100 gal	LB						
10	RU Weather Max	0.05	lb/a	LB	67ab	93a	214a	163a	539a	470a
	Ammonium Sulfate	4	lb/100 gal	LB						
			LSD (P=.05)		2.34	29.27	78.97	81.04	184.79	164.40

All cultivars had slower plant emergence when glyphosate was applied to mother plants, regardless of the application timing. In general, potato yield was inversely related to the glyphosate rate. The lowest 'Russet Burbank' yield occurred when glyphosate was applied at the TI stage, while the lowest yield with the other three cultivars was when glyphosate was applied later at either the EB or LB stages. 'Bannock' was the most sensitive cultivar with seed from plants receiving any sub-lethal glyphosate rate yielding ≤ 65% of the untreated. The remaining three cultivars were less sensitive to glyphosate drift and had at least one glyphosate drift treatment with similar or greater tuber yield compared to the untreated yield. Plants treated with 0.05 lb/A glyphosate at the LB stage produced seed that had the highest yields. Seed from plants receiving 0.19 lb/A glyphosate, regardless of the application timing and cultivar had lower tuber counts compared to the untreated. Results suggested that 'Ranger Russet' was the least sensitive cultivar to the carryover effect on potatoes grown for seed and planted the season following simulated glyphosate drift.

Marketability and Seed Production Effects from Glyphosate Drift Injury to Red Norland Potato - Amanda Crook, Harlene Hatterman-Valenti and Collin P Auwarter.

Field research was conducted at the NPPGA Research site near Grand Forks, ND in 2014 to evaluate the effects when sub-lethal rates of glyphosate were applied to 'Red Norland' potatoes. Glyphosate was applied at one-quarter, one-eighth, one-sixteenth and one-thirty-second the standard use rate (840g ae ha-1) during three crucial growth stages: tuber initiation (A), early tuber bulking (B) and late tuber bulking (C). Previous crop was Soybeans. Plots were 4 rows by 6 meters arranged in a randomized complete block design with three replicates. Seed pieces (65-75g) were planted June 9 in 0.9m rows and 0.3 m spacing. Treatments were applied on July 21 (tuber initiation), August 11 (early tuber bulking), and August 19 (late tuber bulking) to the middle 2 rows with a C02 backpack sprayer. Potatoes were manually harvested from two plants/plot on September 9.

Table 1. Glyphosate Treatments

Trt No	Trt Name	Rate	Unit	A.I.	Rate	Unit	Code
*1	Untreated	0			0	g ae/ha	A
*2	Roundup WeatherMax	0.048	L/ha	glyphosate	26	g ae/ha	A
*3	Roundup WeatherMax	0.096	L/ha	glyphosate	53	g ae/ha	A
*4	Roundup WeatherMax	0.195	L/ha	glyphosate	105	g ae/ha	A
5	Roundup WeatherMax	0.385	L/ha	glyphosate	210	g ae/ha	A
*6	Untreated	0			0	g ae/ha	B
*7	Roundup WeatherMax	0.048	L/ha	glyphosate	26	g ae/ha	B
*8	Roundup WeatherMax	0.096	L/ha	glyphosate	53	g ae/ha	B
*9	Roundup WeatherMax	0.195	L/ha	glyphosate	105	g ae/ha	B
10	Roundup WeatherMax	0.385	L/ha	glyphosate	210	g ae/ha	B
*11	Untreated	0			0	g ae/ha	C
*12	Roundup WeatherMax	0.048	L/ha	glyphosate	26	g ae/ha	C
*13	Roundup WeatherMax	0.096	L/ha	glyphosate	53	g ae/ha	C
*14	Roundup WeatherMax	0.195	L/ha	glyphosate	105	g ae/ha	C
15	Roundup WeatherMax	0.385	L/ha	glyphosate	210	g ae/ha	C
	*AMS added	4.8	g/L				

Table 2. Herbicide Drift application information

Date:		21-Jul	11-Aug	19-Aug
Time:		A	B	C
Sprayer:	**L/Ha:**	187	187	187
	KPA:	275	275	275
	Nozzle:	FF 8002	FF 8002	FF 8002
Air Temperature (C):		29.5	21.5	26.5
Relative Humidity (%):		67	66	67
Wind (Km/H):		20	10	8.5
Could Cover (%):		0	0	30

Table 3. Collected Data

Trt No.	Glyphosate Rate	Rate Unit	App Code	Yield	Total Tuber	Damaged Tuber	Tubers <56.7g
				g/Plant	----------Number/Plant----------		
1	0	g ae/ha	A	1595.7	9.3 c	0.0 c	0.8 c
2	26	g ae/ha	A	781.5	7.2 c	4.2 b	2.3 b
3	53	g ae/ha	A	1004.9	13.8 b	11.0 a	4.3 b
4	105	g ae/ha	A	940.6	17.3 a	10.5 a	7.8 a
5	210	g ae/ha	A	781.3	18.7 a	11.2 a	6.5 ab
6	0	g ae/ha	B	1009.3	7.3 c	0.0 c	0.3 c
7	26	g ae/ha	B	1317.5	7.8 c	0.0 c	0.2 c
8	53	g ae/ha	B	1138.2	7.2 c	0.3 c	0.7 c
9	105	g ae/ha	B	1075.1	9.2 c	0.3 c	1.5 c
10	210	g ae/ha	B	1037.3	8.3 c	1.0 c	0.8 c
11	0	g ae/ha	C	1272.4	9.0 c	0.2 c	0.3 c
12	26	g ae/ha	C	1235.4	8.7 c	0.0 c	0.7 c
13	53	g ae/ha	C	1044.1	7.7 c	0.7 c	1.0 c
14	105	g ae/ha	C	1015.0	8.7 c	0.2 c	0.7 c
15	210	g ae/ha	C	1269.3	8.5 c	0.2 c	0.8 c
			LSD (P=0.05)	NS	1.1	0.6	0.9

Data was collected on yield, total tuber numbers, number of damaged-cracked tubers and tubers less than 56.7g (undesirable size for seed). Visible foliar damage symptoms (chlorosis at the growing points) were most noticeable at the TI stage due to the determinant growth nature of this cultivar. Although no significant yield differences occurred, other symptoms developed creating unmarketable tubers for fresh market or creating severely undersized tubers for seed production. Glyphosate applied to plants at the EB and LB growth stages did not affect total tuber number, total cracked tuber number or less than 56.7 g seed pieces. In contrast, glyphosate applied at 53, 105, and 210 g/ha to plants at the TI stage resulted in greater total tuber numbers. Additionally, glyphosate applied at all sub-lethal rates to plants at the TI stage resulted in more damaged-cracked tubers. More daughter tubers were less than 56.7 g when plants at the TI stage were treated with 105 and 210 g/ha glyphosate. Further research is focusing on sprout inhibition on daughter tubers used for seed pieces as well as quantifying glyphosate residue within the seed pieces.

Sunflower seed size effect on Pyroxasulfone. Howatt, Roach, and Harrington. wild, 'RHA 468' (parent), '8N270CLDM' (oil), and '8C410CL' (confection) sunflowers were seeded near Fargo on May 30 and June 30. Preemergence treatments were applied May 30 with 93°F, 36% relative humidity, 40% cloud cover, 7 to 10 mph wind velocity at 165°, and moist to damp soil at 73°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Table 1. First run seeded May 30.

			Chlor	Ht Red	Injury		Plants	R-Stage	
Treatment	Rate	Seed	6/18	6/18	6/26	7/3	7/18	8/1	8/8
	oz ai/A		%	%	%	%	#/20'		
Untreated Check	0	wild/parent	2	2	0	0	13	3	4
BAS82000	8.6	wild/parent	9	14	16	21	13	3	4
BAS820AB	8.6	wild/parent	8	17	52	57	12	3	4
Untreated Check	0	Oil	1	0	0	0	22	4	5.7
BAS82000	8.6	Oil	7	0	0	0	23	4	5.7
BAS820AB	8.6	Oil	10	5	0	6	18	4	5.6
Untreated Check	0	Confection	0	0	0	0	15	4	5.1
BAS82000	8.6	Confection	5	2	1	12	15	4	5.1
BAS820AB	8.6	Confection	7	10	1	21	16	4	5.1
CV			43	79	49	51	30	0	8
LSD (P=0.05)			3	6	6	10	7	0	0.6

Table 2. Second run seeded June 30.

			Injury			Plants	R-Stage		
Treatment	Rate	Seed	7/14	7/18	8/1	8/6	8/12	8/20	8/29
	oz ai/A		%	%	%	#/20'			
Untreated Check	0	wild/parent	0	0	0	19	1	3	4
BAS82000	8.6	wild/parent	0	0	0	18	1	3	4
BAS820AB	8.6	wild/parent	0	0	0	13	0	3	4
Untreated Check	0	Oil	0	0	0	4	1	4	5.3
BAS82000	8.6	Oil	0	0	0	8	2	4	5.4
BAS820AB	8.6	Oil	0	0	0	10	1	4	5.5
Untreated Check	0	Confection	0	0	0	3	1	3	4
BAS82000	8.6	Confection	0	0	0	4	1	3	4
BAS820AB	8.6	Confection	0	0	0	4	0	3	4
CV			0	0	0	60	40	11	11
LSD (P=0.05)			0	0	0	8	1	1	0.7

Both herbicides in the first run caused chlorosis of up to 10% to all sunflower types on June 18, but height reduction varied by sunflower type. The oil sunflower height was not reduced, confection sunflower appeared stunted in plots where BAS820AB was applied, and wild/parent sunflower appeared shorter with either herbicide. The wild and especially parent line exhibited more injury than the other sunflower types, especially when treated with BAS820AB. Sunflower response to herbicides was not evident on July 18. Also, plant population and reproductive development stage was not affected by either herbicide within sunflower type.

Sunflower in the second run did not exhibit stunting or chlorosis. Emergence was low because of soil condition, but stand was not reduced by the herbicides. Onset of reproductive stage was slightly hindered in wild/parent and confection lines, but treatments within sunflower type were not separated in later stages.

Dandelion control in June. Howatt, Roach, and Harrington. Dandelion control treatments were applied June 10 with 69°F, 65% relative humidity, mostly clear sky, 8 mph wind velocity at 165°, and moist soil at 62°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7 foot wide area the length of 10 by 30 feet. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	DALI 6/27	DALI 7/14
	oz ae/A	%	%
Dicamba	1.5	32	40
Salvo	8	35	40
Saber	8	22	35
MCPA	8	25	25
MCPP	8	22	27
Clopyralid	1.5	47	47
Triclopyr	3	40	0
MCPA&Triclopyr&2,4-DP	21	45	57
Aminopyralid	1	70	89
Clopyralid&Triclopyr	6	45	0
Carf+NIS	0.26+0.25%	0	0
Carf+Dicamba+NIS	0.26+1.5+0.25%	30	0
Carf+Salvo+NIS	0.26+8+0.25%	61	0
Carf+MCPA+NIS	0.26+8+0.25%	32	0
Carf+Triclopyr+NIS	0.26+3+0.25%	27	0
Untreated Check	0	0	0
CV		28	33
LSD (P=0.05)		13	10

Most treatments that only included growth regulator herbicides gave sustained but low level of dandelion control, generally 20 to 50%. Dandelion population and condition in plots treated with triclopyr or carfentrazone were undiscernible from the untreated by mid-July. Aminopyralid provided better control initially than most treatments and maintained near 90% control on July 14.

Tank mixtures with Linex in Russet Burbank potato production. Robinson, A.P. and Brandvik, E. An experiment was conducted near Ottertail, MN to evaluate various tank mixtures with Linex for weed control and effect on graded yield of potato. PRE treatment were applied on 28 May 2014 at 7:00 pm with 86 °F air temperature and 89 °F soil temperature at four inch depth, 36% relative humidity, 10% cloud cover, 7 mph SE wind, and soil moisture was dry. Soil characteristics were 90% sand, 8% silt, and 2% clay with 1.4% OM, pH of 6.8, and CEC of 6.3. Treatments were applied to the center 9 feet of the 12 x 30 foot plots with a backpack plot sprayer delivering 15 gpa at 27 psi through XR11002 nozzles spayed 18 inches apart. The experiment was a randomized complete block design with four replicates per treatment.

Control of proso millet was good with all treatments except Linex alone. When weeds were controlled total marketable yield was not different. In general, tank combination provided good weed control and had good yield. Using multiple modes of action is a good method to control various weeds and to delay weed resistance to the limited number of potato herbicides.

Table. PRE treatments of linuron tank mixtures for weed control and yield in Russet Burbank potato conducted in Ottertail, MN 2014.

Treatment	Rate	14 DAT Proso millet	28 DAT Proso millet	< 4 oz	4-6 oz	6-10 oz	10-14 oz	> 14 oz	Total	US #1 > 4 oz	US #2 > 4 oz	Total marketable	> 6 oz	> 10 oz
		% control				cwt/a							%	
1 Non-treated		0	0	81	121	98	18	2	322	220	21	220	38	8
2 Linex 4L	16 fl oz/a	24	6	66	88	130	47	11	343	248	29	248	55	17
3 Metribuzin	0.67 lb/a	98	96	69	135	191	52	19	466	344	54	344	56	15
4 Chateau	0.75 oz/a	100	100	69	122	197	43	11	445	319	57	319	57	13
Metribuzin	0.67 lb/a													
5 Linex 4L	8 fl oz/a	100	99	68	114	159	50	14	410	307	35	307	56	17
Metribuzin	0.67 lb/a													
6 Linex 4L	12 fl oz/a	75	92	82	132	156	40	13	427	308	38	308	49	13
Metribuzin	0.5 lb/a													
7 Linex 4L	12 fl oz/a	86	86	63	94	176	68	20	424	309	53	309	63	22
Prowl H20	1.5 pt/a													
8 Linex 4L	12 fl oz/a	100	100	70	123	182	69	16	463	346	47	346	58	19
Dual Magnum	1 pt/a													
Metribuzin	5 oz/a													
9 Linex 4L	24 fl oz/a	99	93	71	114	175	60	24	446	325	51	325	60	20
Dual Magnum	1 pt/a													
Metribuzin	5 oz/a													
10 Linex 4L	8 fl oz/a	98	99	82	130	166	56	10	448	311	55	311	53	16
Metribuzin	0.25 lb/a													
Prowl H20	1.5 pt/a													
11 Linex 4L	12 fl oz/a	99	91	62	127	158	76	17	441	344	34	344	57	22
Metribuzin	0.25 lb/a													
Prowl H20	1.5 pt/a													
12 Linex 4L	8 fl oz/a	84	82	72	130	189	50	9	452	353	28	353	56	14
Prowl H20	1.5 pt/a													
Chateau	0.75 oz/a													
LSD P=.10		23	15	20	28	38	28	2	54	51	25	51	10	8
CV		24	19	23	19	19	44	55	10	13	50	13	15	39

Timing of Linex + Metribuzin on Russet Burbank Potato. Robinson, A.P. and Brandvik, E. An experiment was conducted near Ottertail, MN to evaluate timing of Linex + Metribuzin on weed control, crop injury and graded yield of potato. Treatments were applied on 29 May at 9:20 am with 32% RH, 4 mph wind, 74 °F air temperature and 84 °F soil temperature, 5 June at 4:30 pm with 60% RH, 2 mph wind, 78°F air temperature and 71 °F soil temperature, and 21 June 2014 at 10:40 am with 68% RH, 4 mph wind 81°F air temperature and 75 °F soil temperature. Soil characteristics were 90% sand, 8% silt, and 2% clay with 1.4% OM, pH of 6.8, and CEC of 6.3. Treatments were applied to the center 9 feet of the 12 x 30 foot plots with a backpack plot sprayer delivering 15 gpa at 27 psi through XR11002 nozzles spayed 18 inches apart. The experiment was a randomized complete block design with four replicates per treatment.

Crop injury at 14 and 28 days after treatment was only observed at the 8-10" treatment. Although not shown, it was observed that the 50% emergence treatment did cause potatoes to have a yellow flash, but this quickly dissipated by 7 days after treatment. Marketable yield was best when 24 oz/a of Linex + 0.7 lb/a metribuzin was applied at 50% emergence.

Table. Treatments of linuron + metribuzin applied at preemergence, 50% emergence, and on 8-10 tall potato in Ottertail, MN 2014.

	Treatment	Rate	Timing	Crop injury 14 DAT	Crop injury 28 DAT	Biomass 14 DAT	Biomass 28 DAT
				%			
1	Non-treated			0 c	0 b	100 a	100 a
2	Linex 4L + Metribuzin	12 oz/a + 0.7 lb/a	PRE	0 c	0 b	96 a	100 a
3	Linex 4L + Metribuzin	12 oz/a + 0.7 lb/a	50% emergence	0 c	0 b	100 a	100 a
4	Linex 4L + Metribuzin	12 oz/a + 0.7 lb/a	8-10 in tall	50 b	23 a	84 b	71 b
5	Linex 4L + Metribuzin	24 oz/a + 0.7 lb/a	PRE	0 c	0 b	96 a	100 a
6	Linex 4L + Metribuzin	24 oz/a + 0.7 lb/a	50% emergence	0 c	0 b	100 a	100 a
7	Linex 4L + Metribuzin	24 oz/a + 0.7 lb/a	8-10 in tall	65 a	19 a	74 c	71 b

Means within column and the same letter are not different according to Tukey pairwise comparison at P=0.05

Table. Graded yield of Russet Burbank with linuron + metribuzin treatments in Ottertail, MN 2014.

Treatment	Rate	Timing	< 4 oz	4-6 oz	6-10 oz		10-14 oz	> 14 oz	Total		US #1 > 4 oz		US #2 > 4 oz	Total marketable		> 6 oz	> 10 oz
			cwt/a													%	
1. Non-treated			37	150	138	ab	45	8	379	bcd	327	b	15	341	bc	50	14
2. Linex 4L + Metribuzin	12 oz/a + 0.7 lb/a	PRE	38	137	132	b	56	16	380	bcd	322	b	20	341	bc	53	18
3. Linex 4L + Metribuzin	12 oz/a + 0.7 lb/a	50% emergence	40	143	150	ab	52	35	420	ab	349	ab	32	380	ab	56	21
4. Linex 4L + Metribuzin	12 oz/a + 0.7 lb/a	8-10 in tall	30	129	115	b	38	8	320	d	276	b	14	290	c	50	14
5. Linex 4L + Metribuzin	24 oz/a + 0.7 lb/a	PRE	42	149	134	ab	55	22	402	bc	341	ab	20	360	bc	52	19
6. Linex 4L + Metribuzin	24 oz/a + 0.7 lb/a	50% emergence	34	128	181	a	100	33	475	a	410	a	31	442	a	66	27
7. Linex 4L + Metribuzin	24 oz/a + 0.7 lb/a	8-10 in tall	33	117	141	ab	47	13	351	cd	307	b	11	318	bc	57	17

Means within column and the same letter are not different according to Tukey pairwise comparison at P=0.05