Weed Control in Alfalfa. Howatt, Roach, and Harrington. A study was established to compare weed control and alfalfa response of a metribuzin formulation from Cheminova with the current formulation and some other herbicide options. Treatments were applied to an established stand of glyphosate-resistant alfalfa with 1 inch of spring growth, cotyledon to one-leaf wild mustard and Venice mallow (2 to 5 plants/yd^2), and 2 to 6 inch wide rosette dandelion (1 to 3 plants/yd^2) at Fargo on May 5 with 45°F, 42% RH, 100% cloud cover, 4 mph wind at 90°, and dry soil at 49°F. A backpack sprayer delivering 17 gpa at 36 psi through 8002 nozzles was used to apply the treatments on an area 7 ft wide the length of 10 by 30 ft plots. The experiment had a randomized complete block design with four replicates.

		5/12	5/19	6/4	5/19
Treatment	Rate	alfa	alfa	alfa	weeds
	oz/A				
Metribuzin-CN[a]	16	11	0	0	99
Metribuzin-CN	32	21	0	0	99
Metribuzin-B	16	13	0	0	99
Hexazinone	16	0	0	0	99
Imazamox+MSO+UAN	0.5+0.187G+16	0	0	0	99
Glyphosate+AMS	12+8	0	0	0	99
Untreated	0	0	0	0	99
CV		27.3	0	0	0
LSD		2.6	0	0	0

[a] Metribuzin formulations –CN and –B were produced by Cheminova and Bayer, respectively.

Metribuzin was the only herbicide that caused injury to alfalfa. Symptoms were very pronounced 7 days after application, 5/12. Injury was evident as tissue with loss of pigmentation, but necrosis was not apparent. Doubling the rate of metribuzin essentially doubled the amount of tissue with visible injury. The formulation of metribuzin did not influence the injury observed. Alfalfa recovered from metribuzin injury without any lasting indication of the damage. Injured tissue regained full pigmentation and was as tall and full of foliage as the other treatments and control.

The 3-year-old stand of alfalfa had more than 25 plants/ft^2. Aggressive growth of this healthy stand of alfalfa eliminated weed pressure in the control plots by 5/19, the first evaluation for weed control. Plots were investigated throughout the season for new weed emergence to evaluate differences in soil residual activity, but new emergence did not occur even after harvest events.

Evaluation of new glufosinate formulation in Liberty Link canola. Jenks, Willoughby, and Mazurek. 'InVigor 8440' (Liberty Link) canola was seeded May 29 at 600,000 seeds/A in 7.5-inch rows into wheat stubble. Postemergence herbicide treatments were applied June 24 at the 3- to 5-leaf stage. Wild buckwheat (Wibw) was cotyledon to 4-leaf with 0-8 plants/ft^2; volunteer wheat (Vowh) was 3- to 4-leaf with 0-18 plants/ft^2; green foxtail (Grft) was 0.5-4" with 0-56 plants/ft^2; and wild oat was 3- to 4-leaf with 0-4 plants/ft^2.

Ignite is a new glufosinate formulation, which is the active ingredient in Liberty herbicide. All treatments provided excellent wild buckwheat and green foxtail control. Liberty and Ignite provided 15-17% less volunteer wheat and wild oat control compared to these herbicides tank mixed with a reduced rate of Select Max. No crop injury was observed with any treatment.

			Wibw[a]		Vowh[a]		Grft[a]		Wioa[a]	
Treatment	Rate	Timing	Jul 4	Jul 18	Jul 4	Jul 18	Jul 4	Jul 18	Jul 4	Jul 18
			----	----	----	---- % control	----	----	----	----
Untreated			0	0	0	0	0	0	0	0
Liberty 200 + AMS	32 oz + 3 lb	3-4 leaf	83	94	85	83	89	97	85	83
Ignite 200 + AMS	23 oz + 3 lb	3-4 leaf	85	98	85	85	89	97	85	85
Liberty 200 + Select Max + AMS	28 oz + 4 oz + 1.5 lb	3-4 leaf	88	96	95	100	95	100	95	100
Ignite 200 + Select Max + AMS	20 oz + 4 oz + 1.5 lb	3-4 leaf	84	93	95	100	95	100	95	100
Liberty 200 + Select Max + Capture + AMS	28 oz + 4 oz + 2 oz + 1.5 lb	3-4 leaf	83	94	95	100	95	100	95	100
Ignite 200 + Select Max + Capture + AMS	20 oz + 4 oz + 2 oz + 1.5 lb	3-4 leaf	84	98	95	100	95	100	95	100
LSD (0.05)			6.5	4.2	NS	6.4	1.1	2.5	NS	6.4
CV			5	3	0	4	0.7	1.7	0	4.5

[a] *Wibw=Wild buckwheat; Vowh=Volunteer wheat; Grft=Green foxtail; Wioa=Wild oat*

Post-harvest weed control with BAS 800 (Sharpen). Jenks, Willoughby, and Mazurek.
The objective of this study was to evaluate post-harvest weed control with BAS 800, a new herbicide from BASF that has the proposed trade name of Sharpen. Herbicides were applied September 11, 2008 into canola stubble. Weeds present were kochia (6-12", 0-18/ft^2), redroot pigweed (4-12", 0-8/ft^2), common lambsquarters (4-12", 0-8/ft^2), volunteer LL canola (1-2", 0-150/ft^2), and common mallow (2-4" tall, 2-8" diameter, 0-6/ft^2).

Herbicide treatments included BAS 800 applied alone, BAS 800 tank mixed with glyphosate, Fallow Master, and Weedar 64 + glyphosate. These treatments were applied post-harvest. Many of the weeds present had been cut off at harvest time and were hardened off by dry conditions. BAS 800 alone or glyphosate alone did not adequately control kochia 15 days after treatment (DAT); however, the combination of the two provided significantly better kochia control. Similar to kochia, the combination of BAS 800 + glyphosate provided better lambsquarters control compared to either herbicide alone. All treatments provided excellent pigweed and volunteer LL canola control. Glyphosate, Fallow Master, and Weedar + glyphosate provided poor mallow control. In contrast, BAS 800 treatments provided excellent mallow control.

		Kocz[b]		Rrpw[b]		Colq[b]		Voca[b]		Coma[b]	
Treatment[ab]	Rate	Sep 19	Sep 26	Sep 19	Sep 26	Sep 19	Sep 26	Sep 19	Sep 26	Sep 19	Sep 26
		----------% control----------									
Untreated		0	0	0	0	0	0	0	0	0	0
BAS 800 + Agridex + AMS	0.75 fl oz + 1% + 2%	68	62	92	100	72	75	96	100	88	98
Gly + Agridex + AMS	1 qt + 1% + 2%	28	68	70	100	55	75	82	96	32	37
BAS 800 + Gly + Agridex + AMS	0.75 floz + 1 qt + 1% + 2%	70	83	92	100	70	83	97	100	88	97
BAS 800 + Gly + Agridex + AMS	1 fl oz + 1 qt + 1% + 2%	76	88	92	100	73	91	98	100	90	97
BAS 800 + Gly + Agridex + AMS	2 fl oz + 1 qt + 1% + 2%	80	91	93	100	78	95	98	100	91	99
Fallow Master + NIS	44 oz + 0.25%	23	53	53	100	47	68	84	99	30	30
Weedar 64 + Gly + Agridex + AMS	1 pt + 1 qt + 1% + 2%	27	73	53	100	47	80	85	97	37	40
LSD (0.05)		9.3	7.1	17.9	NS	11.4	9	3.9	2.7	3.6	8.5
CV		11	6	15	0	12	7	3	2	4	8

[a] *BAS 800 = Sharpen; Gly = Roundup Original (3 lb ae/gal)*
[b] *Kocz=Kochia; Rrpw=Redroot pigweed; Colq=Common lambsquarters; Voca=Volunteer canola; Coma=Common mallow*

POST grass control in dry edible bean. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Casselton, ND, to evaluate volunteer grass control. Volunteer DeKalb 'DKC38-92' Roundup Ready corn was planted perpendicular to each plot length on May 9, 2008, followed by the planting of four rows per plot of Seedwest 'Ensign' navy bean. POST applications were applied on June 30 at 9:45 am with 75 F air, 76 F soil surface, 49% relative humidity, 5% clouds, 1 to 3 mph S wind, moist soil surface, moist subsoil, good crop vigor, and no dew present to V1 to V3 navy bean. Weed species present at the time of POST applications were: 1 to 3 inch (5 to 25/yd^2) yellow foxtail; and 16 to 24 inch (5 to 20/yd^2) corn. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plot 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.

Targa and Fusilade DX gave near complete volunteer corn control and less yellow foxtail. Select and Select Max gave near complete yellow foxtail control and less volunteer corn control. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. Post grass control in dry edible bean (Zollinger and Ries).

		7 DAT		14 DAT		28 DAT	
Treatment	Rate	Yeft	Corn	Yeft	Corn	Yeft	Corn
	(product/A)	- - % control - -		- - % control - -		- - % control - -	
Targa+Herbimax	3fl oz+1% v/v	40	58	50	92	63	99
Targa+Herbimax	4fl oz+1% v/v	47	68	62	96	73	99
Targa+Herbimax	5fl oz+1% v/v	50	73	73	99	83	99
Select+Herbimax	4fl oz+1% v/v	63	55	72	68	78	77
Select+Herbimax	6fl oz+1% v/v	70	53	78	78	92	85
Select Max+Herbimax	6fl oz+1% v/v	57	58	85	78	96	82
Select Max+Herbimax	9fl oz+1% v/v	62	67	90	82	98	92
Fusilade DX+Herbimax	3fl oz+1% v/v	50	65	58	89	68	95
Fusilade DX+Herbimax	4fl oz+1% v/v	50	65	72	91	78	97
Fusilade DX+Herbimax	5fl oz+1% v/v	50	65	78	93	82	98
LSD (0.05)		6	6	4	3	5	3

<u>Dry edible bean desiccation, 2008.</u> Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Hatton, ND to evaluate dry edible bean desiccation treatments. 'Norstar' navy bean was planted on June 2, 2008. The study was maintained weed free throughout the growing season from two applications of Rezult Copack at 1.6pt/A and hand weeding. Desiccation treatments were applied on September 5 at 9:55 am, with 57 F air, 56 F soil surface, 100% relative humidity, 100% clouds, 1 to 3 mph N wind, wet soil surface, wet subsoil, and no dew present to naturally senescent dry bean. Dry bean senescence at application was quantified in the following manner: 30 to 50% green pods, 40 to 70% yellow pods, 5 to 15% leather pods, 50 to 80% leaf drop, and 0 to 15% natural vine desiccation. Treatments were applied to the center 6.7 feet vo the 10 by 30 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Before desiccation treatments were applied, the previous 10 to 12 days were in the upper 80's to lower 90's, very high humidity, very sunny, and 25 to 35 mph winds. These conditions took off a lot of the leaves and sped up the natural desiccation of the dry bean plants. The weather then turned very cool and cloudy, lows in the 40's and highs in the upper 50's, four to five days before applications. After applications weather was very variable. 3 DAT was very cool and cloudy. 6 DAT 0.35 inches of rain fell. On 7 DAT, more sunny weather and 48 low and 75 high. 8 DAT 0.30 inches of rain fell. 8 to 14 DAT lows were between 45 and 55 F and highs of 70 to 80 F, and no rain. Treatments were applied before dry bean senescence to create treatment separation. Valor and Gramoxone Inteon generally increased the rate of desiccation when compared to Aim treatments. Some Aim treatments were comparable to Valor and Gramoxone, but tended to take longer to reach similar activity. Previous research has shown that Valor plus a methylated seed oil increased desiccation when compared to other treatments. Gramoxone Inteon has also shown to be an effective dry bean desiccant the last several years, probably due to favorable conditions of sunlight and moderate temperatures after application. BAS, Valor, Gramoxone, and Aim were tank-mixed with glyohosate to see if there was any type of dry bean response. BAS treatments worked very well this year and show a new potential for dry bean desiccation. No untreated treatment was used due to adding treatments. Although, all treatments increased desiccation in the untreated portion of each plot compared to the treated portion. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Dry edible bean desiccation, 2008 (Zollinger and Ries).

Treatment[1]	Rate	3 DAT leaf[2]	3 DAT vine[3]	3 DAT green[4]	3 DAT yellow[5]	3 DAT leather[6]	7 DAT leaf	7 DAT vine	7 DAT green	7 DAT yellow	7 DAT leather
	(product/A)	% control					% control				
Valor+Scoil	1.5 oz+1qt	67	17	13	53	33	89	53	7	20	73
Valor+Scoil	2oz+1qt	80	17	12	47	42	92	73	4	7	89
Gramoxone Inteon+R-11	1.5pt+0.5% v/v	82	20	20	42	38	91	68	8	17	75
Gramoxone Inteon+R-11	2pt+0.5% v/v	87	27	15	42	43	93	78	3	8	90
Aim+Herbimax	2oz+1qt	75	15	18	50	32	87	61	12	25	63
Valor+N-Tense	1.5oz+0.5% v/v	79	17	17	47	37	83	60	10	23	67
Valor+Linkage	1.5oz+1% v/v	78	15	20	35	45	82	55	12	20	68
BAS 800 04 H+Scoil+AMS	0.75fl oz+1% v/v+17lb/100gal	81	27	12	43	45	89	67	4	13	83
BAS 800 04 H+Scoil+AMS	1fl oz+1% v/v+17lb/100gal	89	30	6	31	63	96	83	2	5	93
BAS 800 04 H+Scoil+AMS	2fl oz+1% v/v+17lb/100gal	85	20	12	37	52	94	78	4	4	92
BAS 800 01 H+Scoil+AMS	1oz+1% v/v+17lb/100gal	83	18	12	43	45	93	86	0	5	95
BAS 800 04 H+Roundup PowerMax+Scoil+AMS	1fl oz+22fl oz+1% v/v+17lb/100gal	83	18	12	38	50	93	68	5	8	87
Cadet+Scoil	2fl oz+1qt	70	13	18	45	37	78	40	10	25	65
Roundup PowerMax+Valor+R-11	22fl oz+1.5oz+0.5% v/v	81	15	10	39	51	91	69	6	13	81
Roundup PowerMax+Valor+Scoil	22fl oz+1.5oz+1qt	80	18	13	40	47	89	73	5	5	90
Roundup PowerMax+Valor+Destiny HC	22fl oz+1.5oz+1pt	78	18	13	43	43	90	63	7	7	87
Roundup PowerMax+Aim+Destiny HC	22fl oz+2oz+1pt	77	12	15	48	37	82	48	12	22	67
Roundup PowerMax+Gramoxone Inteon+Destiny HC	22fl oz+1.5pt+1pt	83	12	27	48	25	91	50	17	22	62
Valor+Aim+Destiny HC	1.5oz+2oz+1pt	77	15	18	46	36	85	46	13	25	62
Valor+Gramoxone Inteon+Scoil	1.5oz+1.5pt+1qt	89	20	14	44	42	93	75	2	9	88
LSD (0.05)		7	6	7	9	13	5	12	6	8	12

[1]BAS = proprietary products from BASF.
[2]Leaf = % dry leaf and leaf drop.
[3]Vine = % vine desiccation.
[4]Green = % green pods.
[5]Yellow = % yellow pods.
[6]Leather = % brown/dry pods.

Table cont. Dry edible bean desiccation, 2008 (Zollinger and Ries).

Treatment[1]	Rate	10 DAT					14 DAT				
		leaf[2]	vine[3]	green[4]	yellow[5]	leather[6]	leaf	vine	green	yellow	leather
	(product/A)	% control					% control				
Valor+Scoil	1.5 oz+1qt	97	80	3	8	88	99	98	0	2	98
Valor+Scoil	2oz+1qt	99	88	1	4	95	99	99	0	0	99
Gramoxone Inteon+R-11	1.5pt+0.5% v/v	98	85	4	8	88	99	98	0	0	99
Gramoxone Inteon+R-11	2pt+0.5% v/v	99	96	0	5	95	99	99	0	0	99
Aim+Herbimax	2oz+1qt	93	73	8	10	82	99	91	0	7	93
Valor+N-Tense	1.5oz+0.5% v/v	92	72	4	14	80	99	95	0	3	97
Valor+Linkage	1.5oz+1% v/v	92	67	4	9	88	98	90	0	3	97
BAS 800 04 H+Scoil+AMS	0.75fl oz+1% v/v+17lb/100gal	95	77	3	7	89	99	96	0	2	98
BAS 800 04 H+Scoil+AMS	1fl oz+1% v/v+17lb/100gal	99	92	0	4	96	99	98	0	0	99
BAS 800 04 H+Scoil+AMS	2fl oz+1% v/v+17lb/100gal	99	97	0	1	98	99	98	0	0	99
BAS 800 01 H+Scoil+AMS	1oz+1% v/v+17lb/100gal	99	96	0	2	98	99	98	0	0	99
BAS 800 04 H+Roundup PowerMax+Scoil+AMS	1fl oz+22fl oz+1% v/v+17lb/100gal	99	95	0	3	97	99	98	0	0	99
Cadet+Scoil	2fl oz+1qt	90	62	5	13	82	99	87	1	5	94
Roundup PowerMax+Valor+R-11	22fl oz+1.5oz+0.5% v/v	95	85	3	4	96	99	99	0	0	99
Roundup PowerMax+Valor+Scoil	22fl oz+1.5oz+1qt	98	95	1	2	97	99	99	0	0	99
Roundup PowerMax+Valor+Destiny HC	22fl oz+1.5oz+1pt	98	84	1	4	95	99	99	0	0	99
Roundup PowerMax+Aim+Destiny HC	22fl oz+2oz+1pt	90	65	7	12	82	99	92	0	3	97
Roundup PowerMax+Gramoxone Inteon+Destiny HC	22fl oz+1.5pt+1pt	95	75	3	8	88	99	90	0	4	96
Valor+Aim+Destiny HC	1.5oz+2oz+1pt	95	75	5	12	83	99	92	0	3	97
Valor+Gramoxone Inteon+Scoil	1.5oz+1.5pt+1qt	99	91	1	4	95	99	99	0	0	99
LSD (0.05)		3	7	3	4	5	1	6	1	3	3

[1]BAS = proprietary products from BASF.
[2]Leaf = % dry leaf and leaf drop.
[3]Vine = % vine desiccation.
[4]Green = % green pods.
[5]Yellow = % yellow pods.
[6]Leather = % brown/dry pods.

Weed control in fallow with saflufenacil. Howatt, Roach, and Harrington. An experiment was conducted near Casselton, North Dakota, to evaluate saflufenacil efficacy to several broadleaf species. 'Sterling' field pea, 'Pennil' lentil, 'Marksman Roundup Ready' canola, and 'Omega' flax were seeded in 5 ft-wide strips perpendicular to the direction of plot length. Treatments were applied to 4 to 6 inch tall crops, blooming wild mustard, 6 to 8 inch tall common lambsquarters, 8 to 10 inch long wild buckwheat, and 4 leaf redroot pgweed and Venice mallow on July 2 with 67°F, 62% RH, 70% cloud cover, 2 mph wind at 170°, and moist soil at 63°F. A backpack sprayer delivering 8.5 gpa at 38 psi through 11001 TT nozzles was used to apply treatments to an area 7 ft wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		7/11	7/17	7/31	7/11	7/17	7/31	7/11	7/17	7/31	7/11	7/17	7/31	7/11	7/17	7/31
Treatment	Rate	Field pea	Field pea	Field pea	Lentil	Lentil	Lentil	Canola	Canola	Canola	Flax	Flax	Flax	Wild bucwheat	Wild bucwheat	Wild bucwheat
	oz/A								%							
Saflufenacil+PO+AMS	0.36+1%+24	38	60	60	35	76	71	30	48	35	38	40	33	28	28	10
Glyt[a]+NIS+AMS	12+0.25%+24	76	96	99	89	97	97	0	0	0	98	99	99	84	92	93
Glyt+Saflufenacil+PO+AMS	12+0.36+1%+24	84	99	99	80	96	93	40	63	43	98	99	99	96	95	96
Glyt+Saflufenacil+PO+AMS	12+0.55+1%+24	91	99	99	92	98	98	84	88	86	99	99	99	99	98	99
Glyt+2,4-Damine+NIS+AMS	12+7.6+0.25%+27	92	98	99	95	98	98	74	95	98	99	99	99	99	97	98
Glyt+Dica-dry+NIS+AMS	12+2.8+0.25%+27	73	98	98	96	99	99	38	73	71	99	99	99	84	98	98
Glyt+2,4-D&Dica+NIS+AMS	12+7.75+0.25%+27	76	97	98	94	98	98	63	91	96	99	99	99	89	94	97
Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CV		4	1	1	3	2	2	7	6	6	2	3	4	3	2	2
LSD		4	1	1	4	3	2	4	5	5	3	4	5	3	3	2

[a] Glyphosate was Buccaneer from West Central.

[b] 2,4-D amine was Weedar 64.

Table continued

Treatment	Rate	Common lambsquarters 7/11	Common lambsquarters 7/17	Common lambsquarters 7/31	Wild mustard 7/11	Wild mustard 7/17	Wild mustard 7/31	Redroot pigweed 7/11	Redroot pigweed 7/17	Redroot pigweed 7/31	Pigweed population 8/19	Venice mallow 7/11	Venice mallow 7/17	Venice mallow 7/31	Mallow population 8/19
	oz/A	%									/yd^2	%			/yd^2
Saflufenacil+PO+AMS	0.36+1%+24	30	18	18	83	88	58	99	28	18	6	83	35	15	12
Glyt[a] +NIS+AMS	12+0.25%+24	92	99	98	40	98	99	99	99	96	2	93	96	95	4
Glyt+Saflufenacil+PO+AMS	12+0.36+1%+24	95	99	97	96	99	98	99	99	85	3	91	88	84	10
Glyt+Saflufenacil+PO+AMS	12+0.55+1%+24	99	99	99	99	99	99	99	99	91	2	98	95	91	5
Glyt+2,4-Damine[b]+NIS+AMS	12+7.6+0.25%+27	99	99	99	99	99	99	99	99	86	4	99	93	83	6
Glyt+Dica-dry+NIS+AMS	12+2.8+0.25%+27	95	99	99	92	98	99	99	99	96	3	83	95	92	4
Glyt+2,4-D&Dica+NIS+AMS	12+7.75+0.25%+27	95	98	99	92	98	98	99	99	91	2	86	89	87	3
Untreated	0	0	0	0	0	0	0	0	0	0	4	0	0	0	15
CV		1	2	3	2	2	6	0	2	6	56	3	4	5	45
LSD		2	3	3	2	2	7	0	3	6	3	3	4	5	5

[a] Glyphosate was Buccaneer from West Central.
[b] 2,4-D amine was Weedar 64.

Saflufenacil alone generally was ineffective in controlling these species, likely due in part to the large plant size at application. Saflufenacil at 0.36 oz/A plus glyphosate gave less control than glyphosate alone for redroot pigweed and Venice mallow, but the combination gave similar or better control of other species, especially at 7/11. Glyphosate at 12 oz/A alone provided excellent control, 93% or greater, of all species except canola, which was resistant to glyphosate, on 7/31.

Kixor Herbicide on Tough Broadleaf Weeds in Summer Fallow at Hettinger, ND

Eric Eriksmoen

Treatments were applied on June 25 to flowering field bindweed (fibw), flowering wild buckwheat (wibw) and to flowering dandelion (dali) with 74° F, 40% RH, clear sky and west wind at 5 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The trial was a randomized complete block design with four replications. Plots were evaluated for weed control on July 2 and on July 30.

		Product	------- July 2 -------			-- July 30 --	
	Treatment	Rate	wibw	fibw	dali	wibw	fibw
		oz/A	-------------- % control --------------				
1	Untreated	0	0	0	0	0	0
2	Glyphosate + NIS + AMS	32 + 0.25% + 17 lbs	0	18	1	2	5
3	2,4-D + glyphosate + NIS + AMS	16 + 32 + 0.25% + 20 lbs	18	6	19	21	8
4	Kixor + glyphosate + COC + AMS	1.0 + 32 + 1% + 17 lbs	85	97	80	85	78
5	Kixor + glyphosate + COC + AMS	1.5 + 32 + 1% + 17 lbs	92	99	94	97	91
6	Kixor + glyphosate + COC + AMS	2.0 + 32 + 1% + 17 lbs	91	99	93	94	97
	C.V.%		9	14	21	19	9
	LSD .05		7	14	16	15	8

Summary

Treatments were applied to large and 'older' weeds. Glyphosate alone (trt 2) and 2,4-D + glyphosate (trt 3) had very poor activity on these weeds. The 1 oz/A rate of Kixor (trt4) provided relatively good initial weed control but this control tended to diminished over time. The 1.5 and 2.0 oz/A rates of Kixor (trts 5 & 6) provided excellent season long control of these tough broadleaf weeds.

2008 Kixor Herbicide Applied to Summer Fallow at Hettinger, ND (Eriksmoen)

Treatments were applied on June 1 to 1" kochia (kocz), 2" Russian thistle (ruth), 4 leaf wild buckwheat (wibw), 6" field bindweed (fibw) and to two leaf volunteer canola (cano) with 52 deg. F, 85% RH, heavy dew, clear sky and NW wind at 3 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpm at 30 psi through PK-01E80 nozzles to 5' by 28' plots. The trial was a randomized complete block design with three replications. Kochia, Russian thistle, wild buckwheat, field bindweed and canola populations were 50+, 15, 9, 0.25 and 3 plants per sq. ft, respectively. Plots were evaluated for weed control on June 10, June 26 and on July 27.

		June 10					June 26					July 27				
Treatment	Product Rate	kocz	ruth	wibw	fibw	cano	kocz	ruth	wibw	fibw	cano	kocz	ruth	wibw	fibw	cano
	oz/A	% control														
1 Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Glyphosate + NIS + AMS	32 + 0.25% + 17 lbs	93	96	43	13	0	80	95	50	47	0	80	90	0	0	0
3 Kixor + Glyphosate + COC + AMS	1.0 + 32 + 1% + 17 lbs	92	93	83	95	50	80	93	87	50	50	73	92	70	0	43
4 2,4-D + Glyphosate + NIS + AMS	16 + 32 + 0.25% + 20 lbs	95	95	85	87	85	83	98	88	88	98	77	92	70	0	98
CV %		2	4	6	11	15	5	4	4	12	26	6	3	29	0	16
LSD 5%		4	6	6	11	10	6	6	5	10	19	7	4	20	NS	11

Summary: There were no significant differences between herbicide treatments for season long control of kochia or Russian thistle. The addition of Kixor or 2,4-D to glyphosate (trts 3 and 4) enhanced wild buckwheat control over glyphosate alone (trt 2). Kixor and 2,4-D treatments (trts 3 and 4) also provided significantly higher suppression (leaf burn) of field bindweed initially but this suppression declined as the season progressed. The 2,4-D treatment (trt 4) provided excellent season long control of volunteer canola.

Performance of preharvest desiccants in flax, Carrington, 2008. (Greg Endres). The field experiment was conducted at the NDSU Carrington Research Extension Center to test selected herbicides for effectiveness of preharvest desiccation in flax. The experimental design was a randomized complete block with three replicates. 'York' flax was seeded on May 14. Best management practices were used for flax production. The trial was over-sprayed with Bronate Advanced at 16 fl oz plus Assure II at 8 fl oz plus MSO at 16 fl oz/A on June 30. Herbicide treatments were applied with a CO_2-hand-boom plot sprayer delivering 18 gal/A at 35 psi through 8001 flat fan nozzles on August 27 with 58 F, 66% RH, 70% clear sky, and 7 mph wind to flax with 80-90% brown bolls. Visual evaluation of flax stems and all plants (flax and weeds) in plots was done on September 1 and 9 using the scale of 0-9 (0=100% green and 9=100% brown). The trial was harvested on September 15 with a plot combine.

Gramoxone Inteon and Valor plus glyphosate provided the highest amount of tissue desiccation when evaluated 5 days after application (DAT) (Table). Gramoxone Inteon, glyphosate, and Valor plus glyphosate provided the highest amount of plant tissue desiccation in plots when evaluated 14 DAT. Seed yield and quality not shown due to excessive boll loss primarily from grasshopper feeding.

Table.

Herbicide		0-9[1]			
		1-Sep		9-Sep	
Treatment[2]	fl oz product/A	Flax stems	Plot	Flax stems	Plot
untreated check	x	2	2	3	3
Valor+Superb HC+AMS	2 oz+32+0.5%	3	4	4	5
Gramoxone Inteon+NIS	32+0.25%	4	7	5	7
Valor+glyt+Superb HC+AMS	2 oz+22+32+0.5%	4	5	7	8
glyt+Superb HC+AMS	22+32+0.5%	2	3	7	7
C.V. (%)		21.5	12.9	22.9	14.1
LSD (0.05)		1	1	2	2

[1]0=green and 9=brown; plot=flax plus weeds.

[2]Superb HC=high surfactant oil concentrate (Winfield); AMS=Blue Diamond Activator; NIS=Preference (Winfield); glyt=RU WeatherMax (4.5 lb ae).

Weed control and dry pea tolerance to experimental herbicides. Jenks, Willoughby, and Mazurek. The objective of this study was to evaluate weed control and dry pea tolerance to several spring-applied experimental herbicides. All treatments were applied preplant on May 8. 'Majoret' dry pea was seeded May 8 at 150 lb/A into 7.5-inch rows into wheat stubble. Individual plots were 10 x 30 ft and replicated three times. Most of the herbicides evaluated in this study are experimental and not labeled for use as of 2008. Only Prowl and Spartan are labeled for preplant use. Select was applied twice to control grasses. Broadleaf weed density was low in the plot area in May and June, but July and August rains resulted in considerable late-season weed pressure.

None of the treatments significantly affected dry pea density or height. KIH-485 and Valor caused slight to moderate visual crop injury in June; however, these injury symptoms subsided to 12% or less by late July. There were no significant differences in dry pea yield or test weight between treatments. KIH-485 alone or with Prowl provided good control of kochia (Kocz) and prostrate pigweed (Prpw), but only fair control of common lambsquarters (Colq). Valor alone or with Prowl provided excellent control of all three weeds. Spartan effectively controlled kochia and lambsquarters, but provided only fair pigweed control. Prowl alone provided only poor-fair weed control. Linuron (Lorox) and BAS 800 (Sharpen) were quite safe to the peas, but provided very little weed control.

		Dry Pea						Kocz[b]			Prpw[b]		Colq[b]		Dry Pea	
Treatment[a]	Rate	Density Jun 18	Jun 24	Jul 17	Jun 21	Jul 3	Jul 22	Jun 21	Jul 3	Jul 22	Jun 21	Jul 3	Jun 21	Jul 3	Yield	TW
		pl/m row	height (in.)		----- % injury -----			% control							lb/A	lb/bu
Untreated		12.6	11.0	24.1	0	0	0	0	0	0	0	0	0	0	1825	63.9
Prowl	2 pt	10.7	11.7	22.3	1	1	0	58	55	53	72	73	70	73	2019	64.2
Linuron + Prowl	1 lb + 2 pt	10.0	11.3	25.8	1	0	0	50	53	53	72	67	87	73	2220	64.6
Linuron	1 lb	11.3	11.9	23.6	0	0	0	10	7	7	17	17	17	17	1854	63.9
KIH-485 + Prowl	0.15lb + 2pt	11.2	10.3	20.2	14	9	3	89	90	90	95	92	70	73	1815	64.6
KIH-485	0.15 lb ai	11.9	10.5	24.3	14	12	4	85	82	87	92	85	82	82	2184	64.5
Prowl + BAS 800 + Agridex + AMS	2 pt + 1 fl oz + 1% + 1 fl oz	12.6	11.0	22.3	5	4	0	53	57	57	75	70	63	70	1961	63.9
BAS 800 + Agridex + AMS	1 fl oz + 1% + 17 lb/100gal	10.6	11.7	23.4	7	3	0	0	0	0	17	20	13	20	1740	64.3
Valor + Prowl	2 oz + 2 pt	10.8	9.6	22.0	23	19	12	93	91	97	92	94	95	98	1757	64.1
Valor	2 oz	12.5	10.2	21.5	19	17	8	90	89	92	93	95	92	96	1758	64.0
Handweed + Prowl	2 pt	11.4	10.5	19.8	1	1	0	53	100	98	57	100	77	100	1711	63.6
Spartan	4.5 fl oz	10.1	10.2	20.8	3	3	0	100	100	100	63	67	97	100	1712	64.0
LSD (0.05)		NS	NS	NS	7.5	8.9	7.3	17.4	12.4	13	20.7	15.2	24.2	17.1	NS	NS
CV		13	13	13	60	92	186	18	12	13	20	14	23	15	17	1

[a] *All treatments were applied preplant; BAS 800 = BAS 800 04H; Prowl=Prowl H2O*

[b] *Kocz=Kochia; Prpw=Prostrate pigweed; Colq=Common lambsquarters.*

Prickly lettuce control and dry pea tolerance to experimental herbicides. Jenks, Willoughby, and Mazurek. The objective of this study was to evaluate prickly lettuce control and dry pea tolerance to experimental herbicides. Linuron, KIH-485, BAS 800, and Valor are experimental herbicides and not labeled for preemergence (PRE) use in dry pea as of 2008. 'Golden' dry pea was seeded April 30 at 220 lb/A into 7.5-inch rows at Velva, ND. Preemergence herbicides were applied May 5. Postemergence (POST) treatments were applied June 16 to 7- to 10-inch peas. Select was applied to control grasses. Individual plots were 10 x 30 ft and replicated three times.

Valor, Basagran, and Raptor caused slight injury at the June 25 evaluation. However, on July 16, significant injury was visible only with the Raptor treatment, which was 1-3 inches shorter than other treatments. It should be noted that Raptor is labeled for use only as a tank mix with Basagran or Rezult and is recommended to be applied to smaller peas. Dry pea yields were similar across treatments with the exception of the untreated and the Raptor treatment, which were significantly lower than the rest. There was no significant difference in test weight between treatments.

On July 16, prickly lettuce plants were counted in each plot. Prickly lettuce counts within each treatment were fairly consistent across the three replications with a couple exceptions. Prickly lettuce counts in the untreated reps were all near 60 per plot. Treatments that reduced prickly lettuce densities the most were BAS 800 (Sharpen), Valor, and Pursuit – all tank mixed with Prowl H2O, as well as Basagran following Spartan. Based on these results, these herbicides show potential to reduce prickly lettuce competition in dry pea. However, more research is needed to verify the consistency of these results.

			Prle[b]	Dry Pea							
			Density	Density	Jun	Jul	Jun	Jun	Jul		
Treatment[a]	Rate	Timing	Jul 16	Jun 18	18	14	6	25	16	Yield	TW
			pl/plot	pl/m row	height (in.)		---- % injury ----			lb/A	lb/bu
Untreated			61.3	9.0	8.1	17.8	0	0	0	1056	62.5
Prowl	2 pt	PRE	20.0	9.1	9.1	18.5	0	0	0	1374	63.1
Linuron + Prowl	1 lb + 2 pt	PRE	7.7	10.6	9.2	19.8	0	0	0	1312	63.1
Linuron	1 lb	PRE	19.0	9.9	7.7	18.8	0	0	0	1266	63.6
KIH-485 + Prowl	0.15lb+2pt	PRE	4.0	8.8	7.0	19.1	0	3	1	1399	63.3
KIH-485	0.15 lb	PRE	17.7	9.4	9.5	18.6	0	0	0	1295	63.1
Prowl + BAS 800 + Agridex	2 pt + 1 fl oz + 1%	PRE	0	9.4	8.2	19.3	0	0	0	1402	63.7
BAS 800 + Agridex	1 fl oz + 1%	PRE	1.3	10.1	8.6	20.1	0	0	0	1319	62.8
Valor + Prowl	2 oz + 2 pt	PRE	0.7	8.1	7.6	18.9	0	9	1	1389	63.5
Valor	2 oz	PRE	2.3	10.0	7.7	19.6	0	9	1	1276	63.6
Handweeded Check[c] + Prowl	2 pt	PRE	14.7	11.1	8.8	18.9	0	0	0	1301	63.2
Spartan	4.5 oz	PRE	18.7	10.1	7.5	18.2	0	1	0	1259	63.4
Spartan / Basagran + COC	4.5 oz / 1 pt + 2 pt	PRE / POST	1.3	10.6	8.2	18.2	0	5	3	1417	62.9
Spartan / Raptor + NIS	4.5oz/2oz + 0.25%	PRE / POST	5.3	9.7	7.8	16.9	0	5	10	1029	62.8
Prowl + Pursuit	2pt + 2oz	PRE	0.3	8.5	8.6	19.4	0	0	0	1448	63.3
LSD (0.05)			13.3	NS	NS	1.0	NS	3.0	1.7	195	NS
CV			69	12	14	3	0	82	92	9	0.7

[a] *BAS 800 = BAS 800 04H; Prowl=Prowl H2O*

[b] *Prle=Prickly lettuce*

[c] *This handweeded check was handweeded only once.*

Weed control in field pea, Williston 2008. Neil Riveland

'Mozart' yellow field pea was planted on May 15 into 2007 safflower stubble using a JD 750 notill planter with 7 inch row spacing at 150 lbs/a. All PE treatments were applied on May 15 to a dry soil surface with 55 F, 44% RH, 85% clear sky and wind at 3-5 mph from 228 degrees with topsoil at 53 F. The Raptor post emergence treatment was applied on June 2 to 2.5-3 inch peas and 1 to 2 inch Russian thistle with 61 degree F, 63% RH, 98% cloudy, Wind at 3-6 mph from 123 degrees, damp plant and soil surfaces, with soil temperature at 66 F. We used a small plot sprayer with wind cones, mounted on a G-Allis Chalmers tractor to apply all treatments, delivering 10 gals/a at 40 psi through 8001 flat fan nozzles to a 6.67 ft wide area the length of 10 by 30 ft plots. Glyphosate was applied to the whole plot area on May 14 to control emerged weeds. First rain received after PE applications was 0.62 inch on May 24 and May 25. First rain event after Raptor treatment was 0.05 inches on June 3. The experiment was a randomized complete block design with four replications. Plots were evaluated for crop injury on June 12 and July 27. Weed control was evaluated on July 27 also. Russian thistle density was 4-5 plants/sq ft. Peas were machine harvested on July 31.

Treatment *	Product Rate	Unit/a	Crop Inj. %	% Control Ruth 6/12	% Control Ruth 7/27	Test Weight lbs/bu	Grain Yield bus/a
Untreated	0		0	0	0	65.5	10.3
Prowl H2O	32	fl oz	2	3	0	64.0	4.7
Linuron+Prowl H2O	16+32	oz+fl oz	8	0	0	65.1	4.6
Linuron	16	oz	13	15	0	64.0	4.1
V-10206+Prowl H2O	2.4+32	oz+fl oz	18	43	40	64.3	5.4
V-10206	2.4	oz	20	22	0	64.8	4.2
Pursuit Plus	20	fl oz	7	33	50	64.0	6.7
Spartan	3	fl oz	22	70	68	64.8	7.0
Valor+Prowl H2O	2+32	oz+fl oz	18	68	60	64.2	8.9
Valor	2	oz	12	72	58	65.4	6.9
Prowl H2O+Hand Weed	32	fl oz	0	0	85	64.8	5.6
Spartan	4.5	fl oz	8	90	85	64.7	7.1
Raptor+NIS	4+0.25%	fl oz	5	58	43	64.4	8.0
	EXP MEAN		10	36	38	64.6	6.4
	C.V. %		59	32	26	.8	26.0
	LSD 5%		10	20	16	NS	2.8

Summary: Variable weed populations and very dry growing season conditions resulted in variable pea yields. Linuron, Prowl H2O and V-10206 did not control the weeds present.

Sharpen for preplant weed control in field pea, Carrington, 2008. (Greg Endres). The field trial was established under conventional till on a Heimdahl-Emrick loam soil with 2.8% organic matter and 6.8 pH. The experimental design was a randomized complete block with three replicates. Herbicide treatments were applied with a CO_2-hand-boom plot sprayer delivering 10 gal/A at 35 psi through 8001 flat-fan nozzles to the center 6.7 ft of 10 by 25 ft plots on June 4 with 52 F, 99% RH, 100% cloudy sky, and 4 mph wind to 1-inch tall common lambsquarters and 0.5- to 1-inch tall wild buckwheat. Rainfall totaled 0.32 inches during 2 days before and 1.34 inches 2 days after herbicide application. 'Admiral' field pea was seeded on June 17.

Common lambsquarters control generally was excellent with all treatments three weeks after treatment (Table). Sharpen plus glyphosate provided good (82%) control of common lambsquarters six weeks after application and generally improved control compared to glyphosate. Sharpen and Sharpen plus glyphosate provided greatly improved control of wild buckwheat compared to glyphosate. No crop response was observed.

Table.

Herbicide		Weed control[1]							
		6/9		6/27		7/18		7/29	
Treatment[2]	Rate	colq	wibw	colq	wibw	colq	wibw	colq	wibw
	fl oz product/A								
Untreated check	0	0	0	0	0	0	0	0	0
Sharpen + COC + AMS	1 + 1% + 0.5% v/v	99	99	98	78	75	68	77	71
Glyphosate + NIS + AMS	24 + 0.25% + 0.5% v/v	99	70	86	56	58	27	47	23
Sharpen + glyt + COC + AMS	1 + 24 + 1% + 0.5% v/v	99	99	91	77	82	63	66	67
Sharpen + glyt + COC + AMS	2 + 24 + 1% + 0.5% v/v	99	99	96	81	82	73	78	71
Aim + glyt + COC + AMS	0.54 + 24 + 1% + 0.5% v/v	99	99	91	69	60	50	48	43
C.V. (%)		0.0	0.5	7.8	11.1	15.0	22.4	19.7	17.9
LSD (0.05)		0	1	11	13	17	21	21	16

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

[2]Glyt=Roundup Original (Monsanto); NIS=Preference (WinField); AMS=Blue Diamond Activator; COC=Destiny (Winfield); 2,4-D=Cornbelt 4 lb Amine.

Dry pea tolerance to postemergence herbicides. Jenks, Willoughby, and Mazurek. The objective of this study was to evaluate dry pea tolerance to Basagran and Raptor tank mixes. 'Majoret' dry pea was seeded May 8 at 150 lb/A into 7.5-inch rows into wheat stubble. Spartan was applied preemergence at 4.5 fl oz to all plots except the untreated to reduce weed competition. All postemergence treatments were applied June 16 to 6- to 8-inch peas. Select was applied twice to control grasses. Individual plots were 10 x 30 ft and replicated three times. Broadleaf weed density was low in the plot area in May and June, but July and August rains resulted in considerable late-season weed pressure.

Three treatments appeared to cause more visible crop injury. These were Basagran + Poast + COC + 28%N, Basagran + Raptor + COC + 28%N, and Raptor (3oz) + NIS + 28%N. There was more chlorosis, stunting, and necrosis in these three treatments than other treatments. The combination of Basagran + Poast at 2 pt + 1 pt is essentially equivalent to the active ingredient in the full rate of Rezult. Despite the injury observed, dry pea yields were not significantly reduced. However, plot variability was high (CV=22); therefore, yield results should be interpreted with caution. Note: Raptor is not currently labeled for use alone, it must be tank mixed with Basagran or Rezult.

		Dry Pea									
Treatment[a]	Rate	Jun 24	Jul 2	Jun 18	Jun 21	Jul 3	Jun 28	Jul 3	Jul 19	Yield	TW
		height (in.)		---% chlorosis---			---- % injury[b]----			lb/A	lb/bu
Untreated		10.8	18.5	0	0	0	0	0	0	1237	64.5
Assure II + COC	8 fl oz + 1%	8.4	17.9	1	0	0	3	3	2	1639	64.2
Basagran + Poast + COC + 28% N	2 pt + 1 pt + 1 qt + 1 pt	8.7	16.2	16	11	0	16	15	14	1888	64.7
Basagran + Raptor + NIS	1 pt + 4 fl oz + 0.25 %	9.9	17.3	4	1	0	3	5	5	1921	64.5
Basagran + Raptor + COC + 28% N	1 pt + 4 fl oz + 1 pt + 2.5%	9.3	15.8	11	6	0	12	12	13	1824	64.0
Basagran + Raptor + COC	1 pt + 2 fl oz + 1 pt	9.7	18.1	8	1	0	4	4	3	1827	64.7
Raptor + NIS + 28% N	2 fl oz + 0.25 % + 2.5%	10.6	18.2	3	0	0	2	0	0	2395	64.9
Raptor + NIS + 28% N	3 fl oz + 0.25 % + 2.5%	9.9	16.0	9	14	0	18	17	17	2108	64.5
LSD (0.05)		1.1	NS	1.3	2.5	NS	5.2	4.9	5.1	NS	NS
CV		7	9	12	34	0	42	41	43	22	1

[a] *Spartan was applied preemergence at 4.5 fl oz to all plots except the untreated.*

[b] *Is an estimate of injury in the form of stunting and necrosis.*

Post emergence weed control in field pea, Williston 2008. Neil Riveland

'Mozart'yellow field pea was planted on May 7 notill into durum stubble from 2007, using a JD 750 notill planter with 7 inch row spacing at 150 lbs/a. All pre-emergence (pre) treatments were applied on May 13 to a dry soil surface with 56 F, 44% RH, 75% clear sky and 2-4 mph wind from 267 degrees with a topsoil temperature of 64 F.Post emergence treatments were applied May 30 to 3-3.5 inch peas, Russian thistle (Ruth) and red root pigweed (Rrpw) less than 1 inch tall and green foxtail (Grft) at 2-leaf stage. Air temperature was 76 degrees F, 41% RH, 65% clear sky and wind from 280 degrees at 3-5 mph with dry plant and soil surfaces.Soil temperature was 73 F. We used a small plot sprayer with wind cones, mounted on a G-Allis Chalmers tractor to apply all treatments, delivering 10 gals/a (post treatments) and 20 gal/z (pre treatments) at 40 psi through 8001 flat fan nozzles to a 6.67 ft wide area the length of 10 by 30 ft plots. Glyphosate was applied to the whole plot area on May 14 to control emerged weeds. First rain received after PE applications was 0.62 inch on May 24 and May 25. First rain event after post treatments was 0.05 inches on June 3. The experiment was a randomized complete block design with four replications. Plots were evaluated for crop injury on June 20 and July 5 Weed control was evaluated on July 5 also. Weed densities were 4-6 plts/sq for Ruth, Rrpw and green foxtail. Peas were machine harvested on July 27.

Treatment	Timing	Product Rate	--% Crop-- Injury June	July	-- Control -- Ruth	Wimu	Rrpw	Test Weight lbs/b	Grain Yield bus/a
					-----	%	------		
Untreated		0	0	0	0	0	0	65.4	10.6
Spartan/AssureII+COC	pre/post	4.5+8+1%v/v	7	2	77	99	83	65.1	12.2
Spartan/Basagran+AssureII+COC	pre/post	4.5+16+8+1% v/v	7	9	96	99	96	65.2	14.1
Spartan/Basagran+Raptor+NIS	pre/post	4.5+16+2+0.25% v/v	8	6	93	83	96	65.9	11.9
Spartan/Basagran+Raptor+COC+28%N	pre/post	4.5+16+4+1%+0.25%v/v	0	4	97	94	97	64.9	14.8
Spartan/Basagran+AssureII+COC	pre/post	4.5+16+8+1% v/v+16	5	3	93	91	88	65.4	13.2
Spartan/Raptor+NIS	pre/post	4.5+2+0.25% v/v	2	0	81	85	93	65.2	14.2
Spartan/Metribuzin+AssureII+COC	pre/post	4.5+5.3+8+1% v/v	7	7	72	98	57	64.5	11.9
Prowl H2O	pre	32	0	0	0	90	25	64.8	10.2
Pursuit	post	2 oz	8	3	87	87	93	65.9	12.0
		EXP MEAN	4	3	70	83	73	65.2	12.5
		C.V. %	91	84	11	7	21	1.4	17.3
		LSD 5%	NS	5	14	11	26	NS	NS

Summary: Cominations of post emergence herbicides with Spartan applied PE resulted in very good weed control without crop injury.

Lentil tolerance to experimental herbicides. Jenks, Willoughby, and Mazurek. The objective of this study was to evaluate lentil tolerance to several spring-applied experimental herbicides. All treatments were applied preplant on May 8, except for Metribuzin that was applied to either 2- to 4-inch lentil or 4- to 8-inch lentil on June 16 and June 24, respectively. 'Pennell' lentil was seeded May 14 at 80 lb/A into 7.5-inch rows into wheat stubble. Individual plots were 10 x 30 ft and replicated three times. Most of the herbicides evaluated in this study are experimental and not labeled for use as of 2008. Only Prowl is labeled for preplant use. Select was applied twice to control grasses. Broadleaf weed density was low in the plot area in May and June, but July and August rains resulted in considerable late-season weed pressure.

Valor alone, Valor + Prowl and Metribuzin + Prowl were the only treatments that significantly reduced lentil density and height compared to the untreated check. Several treatments caused moderate to severe lentil injury. Almost all treatments resulted in numerically lower lentil yields compared to the two untreated checks, but were not significant at LSD (0.05). However, only Valor + Prowl and Metribuzin + Prowl resulted in significantly lower yields at LSD (0.10).

		Lentil									
Treatment[a]	Rate	Density Jun 18	Jun 24	Jul 17	Jun 23	Jul 3	Jul 14	Jul 24	Yield	TW
		pl/m row	height (in.)		% injury				lb/A	lb/bu
Untreated		15.4	5.3	11.3	0	0	0	0	2134	58.9
Prowl	2 pt	13.5	5.1	11.5	16	16	15	13	2140	59.5
Linuron + Prowl	1 lb + 2 pt	14.9	4.7	10	16	18	18	17	1698	59.3
Linuron	1 lb	17.3	5.6	11.1	2	1	2	2	1861	58.9
KIH-485 + Prowl	0.15 lb ai + 2 pt	16.5	4.5	9.5	24	36	27	20	1644	59.7
KIH-485	0.15 lb ai	17.8	4.5	11.2	13	21	13	13	1745	59.4
Prowl + BAS 800 + Agridex + AMS	2 pt + 1 floz + 1% + 17 lb/100 gal	14.6	4.5	10.8	23	22	16	15	1737	59.4
BAS 800 + Agridex + AMS	1 floz + 1% + 17 lb/100 gal	16.3	4.5	10.8	7	8	8	5	1730	59.0
Valor + Prowl	2 oz + 2 pt	8.7	4	7.6	64	68	71	62	1352	59.6
Valor	2 oz	13.9	3.8	8.3	51	48	50	38	1738	60.0
Handweed + Prowl	2 pt	14.1	4.8	10.5	17	24	19	17	1886	59.3
Metribuzin + Prowl	0.33 lb + 2 pt	12.0	3.5	7.8	48	53	52	48	1248	59.5
Spartan + Prowl	2.25 oz + 2 pt	15.5	4.6	9.4	23	32	40	36	1699	60.0
Spartan + BAS800 + Agridex + AMS	2.25oz + 1 fl oz + 1% +17lb/100 gal	16.6	4.8	10.1	14	27	35	33	1801	59.8
Prowl / Metribuzin[c]	2 pt / 0.25 lb	16.5	4.8	10.3	24	25	23	20	1711	59.7
Prowl / Metribuzin[d]	2 pt / 0.25 lb	13.6	4.6	10.3	17	22	23	20	1902	59.8
Untreated		15.6	4.8	11	0	0	0	0	1942	59.3
LSD (0.05)		3.4	NS	2.0	20	22	21	19	NS	NS
CV		14	15	12	55	53	53	54	17	1

[a] *All treatments applied preemergence except for Metribuzin*
[b] *BAS 800 = BAS 800 04H; Prowl=Prowl H2O*
[c] *Metribuzin applied at 2- to 4-inch lentil*
[d] *Metribuzin applied at 4- to 8-inch lentil*

Weed control in lentil, Williston 2008. Neil Riveland

'Pennel' lentil was planted on May 15 into 2007 safflower stubble using a JD 750 notill planter with 7 inch row spacing at 75 lbs/a. All pre treatments were applied on May 15 to a dry soil surface with 62 F, 31% RH, 75% clear sky and wind at 5-7 mph from 310 degrees with topsoil at 55 F. The Metribuzin post emergence treatment (2-lf) was applied on June 2 to 2 lf lentils and 1 to 2 inch Russian thistle with 61 degree F, 63% RH, 98% cloudy, Wind at 3-6 mph from 123 degrees, damp plant and soil surfaces, with soil temperature at 66 F. The 4-lf metribuzin treatment was applied on June 17 to 4-lf lentils and 1-3 inch Russian thistle with 82 degree F air temperature, 39% RH, soil temp of 81 deg F, windat 5-7 mph from 171 degrees. We used a small plot sprayer with wind cones, mounted on a G-Allis Chalmers tractor to apply all treatments, delivering 10 gals/a at 40 psi through 8001 flat fan nozzles to a 6.67 ft wide area the length of 10 by 30 ft plots. Glyphosate was applied to the whole plot area on May 14 to control emerged weeds. First rain received after the pre applications was 0.62 inch on May 24 and May 25. First rain event after the 2-lf metribuzin treatment was 0.05 inches on June 3 and 0.01 on June 17 after the 4-lf metribuzin treatment was applied. The experiment was a randomized complete block design with four replications. Plots were evaluated for crop injury on June 12 and July 27. Weed control was evaluated on July 27 also. Russian thistle density was 4-5 plants/sq ft. Lentils were not harvested because of very dry growing season conditions.

Treatment *	Product Rate	Unit/a	Timing	Crop Inj. %	% Control Ruth 6/12	% Control Ruth 7/27
Untreated	0			0	0	0
Prowl H2O	32	fl oz	pre	3	3	0
Linuron+Prowl H2O	16+32	oz+fl oz	pre	23	22	0
Linuron	16	oz	pre	27	13	0
V-10206+Prowl H2O	2.4+32	oz+fl oz	pre	15	42	0
V-10206	2.4	oz	pre	5	10	0
Pursuit Plus	20	fl oz	pre	23	45	35
Spartan	3	fl oz	pre	13	82	68
Valor+Prowl H2O	2+32	oz+fl oz	pre	30	62	60
Valor	2	oz	pre	30	80	62
Prowl H2O+Hand Weed	32	fl oz	pre	3	13	95
Metribuzin+Prowl H2O	5.3	oz	pre	7	37	32
Spartan+Prowl H2O	2.25+32	fl oz	pre	18	68	62
Spartan	2.25	fl oz	pre	25	75	58
Metribuzin+Prowl H2O	4+32	oz+fl oz	2-lf+pre	10	55	35
Metribuzin+Prowl H2O	4+32	oz+fl oz	4-lf+pre	13	28	10
Untreated				0	0	0
EXP MEAN				15	37	30
C.V. %				76	40	46
LSD 5%				18	25	23

Summary:

2008 Kixor Herbicide Applied Pre-Plant to Lentil at Hettinger, ND (Eriksmoen)

Treatments were applied on May 6 to 1/2" kochia (kocz), 1/2" Russian thistle (ruth), 1 leaf wild buckwheat (wibw), 1 leaf field bindweed (fibw) and volunteer canola (cano) had not emerged with 57 deg. F, 57% RH, heavy dew, cloudy sky and south wind at 7 mph. 'CDC Richlea' lentil was seeded on May 14. Treatments were applied with a tractor mounted CO2 propelled plot sprayer delivering 10 gpm at 30 psi through PK-01E80 nozzles to 5' by 28' plots. The trial was a randomized complete block design with three replications. Kochia, Russian thistle, wild buckwheat, canola and field bindweed populations were 25, 27, 8, 3 and 0.25 plants per sq. ft, respectively. Plots were evaluated for crop injury and weed control on May 13, May 27, June 10, June 29 and on July 27. The trial was harvested on August 7.

		May 13					May 27					June 10			
Treatment	Product Rate	kocz	ruth	wibw	cano	fibw	inj	kocz	ruth	wibw	cano	inj	kocz	ruth	wibw
	oz/A	% control													
1 Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Kixor + COC + AMS	0.72 + 1% + 17 lbs	30	40	68	0	10	0	40	88	96	0	0	37	73	92
3 Glyphosate + NIS + AMS	32 + 0.25% + 17 lbs	43	62	70	0	43	2	60	99	96	0	0	30	82	40
4 Kixor + Glyphosate + COC + AMS	0.72 + 32 + 1% + 17 lbs	63	72	80	0	47	0	78	98	99	0	0	73	77	93
5 Aim + Glyphosate + COC + AMS	0.54 + 32 + 1% + 20 lbs	63	63	67	0	50	0	78	99	99	0	0	67	83	30
CV %		30	20	27	0	50	387	18	5	4	0	0	32	18	24
LSD 5%		23	18	29	NS	28	NS	17	7	7	NS	NS	25	21	23

continued:

		June 10		June 26					July 29						Seed
Treatment	Product Rate	fibw	cano	inj	kocz	ruth	wibw	cano	inj	kocz	ruth	wibw	fibw	cano	yield
	oz/A	% control													lbs/A
1 Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	138
2 Kixor + COC + AMS	0.72 + 1% + 17 lbs	2	0	0	43	60	73	0	0	47	50	77	0	0	221
3 Glyphosate + NIS + AMS	32 + 0.25% + 17 lbs	2	0	0	40	73	40	0	0	40	33	7	0	0	447
4 Kixor + Glyphosate + COC + AMS	0.72 + 32 + 1% + 17 lbs	2	0	2	72	90	83	0	0	57	50	77	0	0	316
5 Aim + Glyphosate + COC + AMS	0.54 + 32 + 1% + 20 lbs	3	0	0	50	83	40	0	0	57	50	27	0	0	388
CV %		155	0	387	19	20	29	0	0	38	19	31	0	0	14
LSD 5%		NS	NS	NS	15	23	26	NS	NS	29	13	22	NS	NS	81

Summary: Crop injury was very minor when observed. The addition of Kixor or Aim to glyphosate (trts 4 & 5) tended to enhance kochia and Russian thistle control. These two weeds accounted for intense competition to the crop even with good levels of control. The most evidant Strength of Kixor appears to be on wild buckwheat. Treatments were applied prior to canola emergence. None of the treatments provided any residual canola control. All of the herbicide treatments provided temporary field bindweed control (leaf burn). All seed yields were very poor but were significantly higher than the untreated check.

Field pea, lentil, and chickling vetch response to pyroxasulfone. Howatt, Roach, and Harrington. Crop response and weed control with pyroxasulfone were evaluated in a study in Fargo. 'Sterling' field pea, 'Pennil' lentil, and 'AC Greenfix' chickling vetch were seeded May 14. Treatments were applied preemergence on May 14 with 63°F, 17% RH, 0% cloud cover, 8 to 10 mph wind at 180°, and a dry soil surface at 52°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 38 psi through 11002 TT nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment had a randomized complete block design with four replicates (the July 22 evaluations with three replicates).

		7/02	7/02	7/02	7/22	7/22	7/22	7/22	7/21	7/21	7/21
Treatment	Rate	Lentil	Wild mustard	Wild buckwheat	Wild mustard	Wild buckwheat	Redroot pigweed	Green foxtail	Field pea	Lentil	Chickling Vetch
	oz/A				%					plants/yd	
Sulfentrazone	3.5	50	81	69	81	47	58	70	4	4	4
Pyroxasulfone	0.7	0	76	35	33	7	17	20	2	4	3
Pyroxasulfone	1.0	0	83	59	53	7	47	53	4	5	3
Pyroxasulfone	1.2	0	90	68	77	23	47	47	3	4	4
Pyroxasulfone	1.8	0	89	63	82	23	62	88	4	4	4
Pyroxasulfone	2.4	23	91	66	87	40	63	92	2	4	4
Pyroxasulfone	4.7	55	96	69	96	48	66	96	5	3	4
Untreated	0	0	0	0	0	0	0	0	2	4	3
CV		90	11	32	12	75	48	25	47	23	42
LSD		21	12	25	13	32	38	26	2	1	2

Insufficient moisture for germination and establishment resulted in poor plant populations of the crops. Herbicide injury was not observed on crops before 7/2. Field pea and chickling vetch did not produce visible injury. Pyroxasulfone rates below 2.4 oz/A did not cause visible injury to lentil either; however, 2.4 oz/A pyroxasulfone caused 23% injury and 4.7 oz/A caused 55% injury to lentil. Sulfentrazone at a rate for this soil type also caused 50% injury to lentil.

Wild mustard and wild buckwheat were present for control evaluation on 7/2, and redroot pigweed and green foxtail emergence occurred before evaluation on 7/22. Pyroxasulfone at 1.2 oz/A provided 90% control of wild mustard on 7/2. Control with this rate of pyroxasulfone was only 77% on 7/22 and only 4.7 oz/A pyroxasulfone provided greater than 90% control of wild mustard. Wild buckwheat was less susceptible than wild mustard. Pyroxasulfone at the highest rate only gave 48% control of wild buckwheat on 7/22. Establishment of redroot pigweed and green foxtail was inhibited 2 months after application. Pyroxasulfone at 1.8 oz/A gave 62 to 66% control of redroot pigweed but provided at least 88% green foxtail control.

Annual legume response to V10206. Howatt, Roach, and Harrington. 'Sterling' field pea, 'Pennil' lentil, and 'AC Greenfix' chickling vetch were seeded May 14. Treatments were applied preemergence on May 14 with 63°F, 17% RH, 0% cloud cover, 8 to 10 mph wind at 180°, and dry soil at 62°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 38 psi through 11002 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.

		7/2	7/2	7/2	7/22	7/22	7/22	7/22	7/21	7/21	7/21
Treatment	Rate	Lentil	Wild mustard	Wild buckwheat	Wild mustard	Wild buckwheat	Redroot pigweed	Green foxtail	Field pea	Lentil	Chickling vetch
	oz/A				%					plants/m^2	
V10206	0.9	0	75	43	53	33	13	33	2	3	4
V10206	1.7	0	87	60	87	50	65	88	2	4	3
V10206	3.4	0	92	62	92	50	95	93	2	3	3
V10206	6.6	27	96	62	97	53	98	97	2	3	2
Pendimethalin+Sulfentrazone	17+1.5	30	88	62	72	50	90	88	2	3	3
Untreated	0	0	0	0	0	0	0	0	2	3	3
CV		53.5	5.8	44.8	7.9	48.9	10.1	8.6	47.6	33.8	34.6
LSD (0.05)		9	8	39	9	35	11	10	1	1	2

Insufficient moisture for germination and establishment resulted in poor plant populations of the crops. Herbicide injury was not observed on crops before 7/2. Field pea and chickling vetch did not produce visible injury at any evaluation. Pyroxasulfone rates of 3.4 oz/A or less did not cause visible injury to lentil either; however, 6.6 oz/A pyroxasulfone caused 27% injury. Pendimethalin and sulfentrazone caused 30% injury to lentil.

Wild mustard and wild buckwheat were present for control evaluation on 7/2, and redroot pigweed and green foxtail emergence occurred before evaluation on 7/22. Pyroxasulfone at 1.7 oz/A provided 87% control of wild mustard on 7/2. Control with this rate of pyroxasulfone or more maintained mustard control but 0.9 oz/A gave only 53% control on 7/22 compared with 75% control on 7/2. Wild buckwheat was less susceptible than wild mustard. Pyroxasulfone at the highest rate only gave 53% control of wild buckwheat on 7/22. Establishment of redroot pigweed and green foxtail was inhibited 2 months after application. Pyroxasulfone at 3.4 or more oz/A gave 95 to 98% control of redroot pigweed but 1.7 oz/A provided 88% green foxtail control.

Preharvest treatment in annual legumes. Howatt, Roach, and Harrington. An experiment was established at Fargo to evaluate visible desiccation of three crops. 'Sterling' field pea, 'Pennil' lentil, and ‚AC Greenfix' chickling vetch were seeded May 14. Treatments were applied to crops as a pre-harvest desiccant on July 30 with 79 F, 58% RH, 0% cloud cover, 3 mph wind at 0, and dry soil at 69 F. Crop vegetation was generally green and pods were maturing. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 38 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.

		8/6	8/6	8/6	8/19	8/19	8/19
Treatment	Rate	Field pea	Lentil	Chickling Vetch	Field pea	Lentil	Chickling Vetch
	oz/A	%					
Glyphosate[a]+MSO+AMS	9+24+12	0	1	0	93	71	73
Flumioxazin+MSO+AMS	0.8+24+12	70	73	65	94	97	88
Glyt+flumioxazin+MSO+AMS	9+0.8+24+12	75	86	69	98	98	91
F7121+NIS+AMS	0.068+0.25+12	1	1	0	92	75	23
F7121+MSO+AMS	0.068+24+12	9	11	8	91	69	28
Glyt+F7121+NIS+AMS	9+0.068+0.25+12	14	20	10	93	83	71
Glyt+F7121+MSO+AMS	9+0.068+24+12	9	20	11	89	80	30
Untreated	0	0	0	0	84	35	0
CV		14.1	14.8	16.8	4	6.2	12.6
LSD		5	6	5	5	7	9

[a] Glyphosate was Buccaneer from West Central.

Glyphsate alone was slow to kill plants. Field pea was naturally declining by 8/19, 3 weeks after application, but lentil and chickling vetch were desiccated less than 75%. In contrast, flumioxazin provided 97 and 88% visible desiccation, respectively. Inclusion of glyphosate with flumioxazin did not improve desiccation on 8/19, but slightly improved ratings generally on 8/6. F7121 was slower to elicit symptoms and did not reach the level of desiccation expressed by flumioxazin.

Pre-emergence herbicides on safflower. Williston, 2008. Neil Riveland

'MonDak' safflower was planted on May 18th into tilled soil that had been fallowed in 2007. We used a planter that had 6 inch row spacing, seeding at 30 lbs/a. All treatments were applied on May 21 with a dry soil surface, 47 degrees F air temperature, 70% clear sky, wind from 51 degrees at 2-3 mph, 79% relative humidity (RH) and a soil temperature of 56 degrees. We used a small plot sprayer with wind cones, mounted on a G-Allis Chalmers tractor to apply the treatments, delivering 20 gals/a at 40 psi through 8002 flat fan nozzles to a 6.67 ft wide area the length of 10 by 30 ft plots. First rain received after application was 0.62 inches on May 24 and 25. The experiment was a randomized complete block design with three replications. Plots were evaluated for crop injury on June 20th and for weed control on June 20th and August 18th. Population densities of Russian thistle were high at 5-8 plants/ft2 and red root pigweed populations were 2-3 plants/ft2. Safflower was machine harvested on September 16th.

Treatment	Product Rate oz/a	Crop Inj %	Ruth -Control-- 6/20 ---- % ----	Ruth -Control-- 8/18 ---- % ----	Rrpw Cntl 6/20 %	Test Weight lbs/bu	Yield lbs/a	Seed Oil %
V 10206	2	0	46	28	65	38.4	307	33.4
V 10206	4	0	58	57	63	39.9	495	33.6
V 10206	6	7	82	70	87	39.8	578	33.7
LINURON	16	0	8	13	12	37.9	442	33.4
VALOR	2	0	78	75	88	40.3	679	33.7
SPARTAN	3	6	83	88	90	40.9	713	33.6
PROWL H2O	32	0	68	57	77	41.4	718	33.7
UNTREATED	0	0	0	0	0	38.8	457	33.3
EXP MEAN		1	53	49	60	39.7	549	33.5
C.V. %		77	23	20	17	2.4	24	0.6
LSD 5%		2	22	17	18	NS	234	NS

HARVESTED PLOT SIZE - 100 FT2

SUMMARY: Spartan, Valor and Prowl H2O treatments tended to give adequate control of Russian thistle and have the highest yields. Slight crop injury was observed Spartan and V-10206 at the 6 oz/a rate.

V-10206 and Spartan on safflower. Williston, 2008. Neil Riveland

'MonDak' safflower was planted on May 8th into tilled soil that had been fallowed in 2007, using a planter that had 7 inch row spacing and seeding at 30 lbs/a. Sonalan and Treflan treatments were applied pre-plant and incorporated two times on May 8 with a dry soil surface, 62 F air temperature, 90% clear sky, wind from 354 degrees at 4-6 mph and 25% Relative Humidity (RH) and a soil temperature of 67 degrees. The V-10206 and Spartan treatments were applied PE on May 13th to a dry soil surface with air temperature of 56 degrees, 10% clear skies, RH 45%, wind from 253 degrees at 2-4 mph and soil temperature of 63 degrees. We used a small plot sprayer with wind cones, mounted on a G-Allis Chalmers tractor to apply the treatments, delivering 20 gals/a (as specified in the protocol) at 40 psi through 8002 flat fan nozzles to a 6.67 ft wide area the length of 10 by 30 ft plots. First rain received after pre-plant application was 0.66 inches on May 9. The experiment was a randomized complete block design with three replications. Plots were evaluated for crop injury on June 18th and for weed control on June 18th and August 17th. Only Russian thistle (Ruth) was rated. Population densities of Russian thistle were high at 10-14 plants/ft2. Safflower was machine harvested on September 16th.

Treatment	Product Rate oz/a	Crop Inj %	Control 6/18 ---- %	Ruth 8/17 ----	Test Weight lbs/bu	Yield lbs/a	Seed Oil %
Untreated Check	0	0	0	0	37.1	128	33.2
V-10206	2	0	3	0	36.4	144	33.4
V-10206	4	5	27	15	37.1	169	33.2
V-10206	6	13	42	12	37.1	202	33.1
Sonalan HFP	48	4	94	92	41.5	723	34.1
Treflan HFP	32	0	88	73	40.4	468	34.4
Spartan	2	0	10	0	38.8	251	33.5
Spartan	2.5	2	27	12	39.2	263	33.8
Spartan	3	7	40	20	40.2	251	33.7
Spartan	4	12	53	37	38.9	226	34.1
EXP MEAN		4	38	26	38.6	283	33.7
C.V. %		78	24	23	2.4	14	.4
LSD 5%		6	16	10	2.1	70	.3

Summary: Only Sonalan and,to a lesser extent, Treflan controlled Russian thistle. V-10206 did not and caused slight crop injury at the highest application rate. Spartan did not provide adequate control of heavy Russian thistle population.

Broadleaf weed control in safflower. Williston,2008. Neil Riveland

'MonDak' safflower was planted on May 8 into land fallowed in 2007 using a planter having 7 inch row spacing, seeding at 30 lbs/a. All treatments were applied post-emergence on June 10 to 3-5 leaf safflower,1-3 Russian thistle. and The soil surface was dry, air temperature was 58 deg F, 90% clear sky, wind from 106degrees at 7-9 mph and 70% RH. Russian thistle was 1-3 inches tall. used a small plot sprayer with wind cones, mounted on a G-Allis Chalmers tractor to apply the treatments, delivering 10 gals/a at 40 psi through 8001 flat fan nozzles to a 6.67 ft wide area the length of 10 by 30 ft plots. First rain received after application was 1.00 inches on June 11. The experiment was a randomized complete block design with three replications. Plots were evaluated for crop injury on June 23 and for weed control on June 23 and August 17. Only Russian thistle (Ruth) was rated. Population densities of Ruth were 6-8/ft2. Safflower was machine harvested on September 16.

Treatment a	Product Rate oz/a	Crop Inj %	% Control Ruth 6/23	Ruth 8/17	Test Weight lbs/b	Yield lbs/a	Seed Oil %OD
Harmony GT+NIS	0.20+0.25%	7	54	70	42.4	930	33.8
Harmony GT+NIS	0.25+0.25%	3	68	65	42.1	787	33.6
Harmony GT+NIS	0.3+0.25%	0	68	80	42.7	1007	34.1
Harmony GT+NIS	0.4+0.25%	7	73	78	42.2	890	34.1
Glean+NIS	0.25+0.25%	3	67	73	41.8	923	34.1
Ally+NIS	0.1+0.25%	12	72	70	42.9	925	34.3
Upbeet+NIS	0.75+0.25%	0	40	27	41.9	681	34.1
Upbeet+NIS	1.0+0.25%	0	47	40	41.9	712	33.9
Upbeet+HarmGT+NIS	1.0+0.25+0.25	12	73	63	41.7	571	33.6
Orion	17	82	85	60	35.9	230	32.3
Callisto+MSO+UAN	3+1.2PT+2.5%	100	80	43	NA	0	NA
Weedy check	0	0	0	0	41.8	407	33.8
HIGH MEAN		100	85	80	42.9	1007	34.3
LOW MEAN		0	0	0	35.9	0	32.3
EXP MEAN		19	61	56	41.6	672	33.8
C.V. %		34	20	30	2.1	21	1.1
LSD 5%		11	20	29	1.9	236	.8
LSD 1%		15	28	39	2.8	320	NS
# OF REPS		3	3	3	2	3	2
F-TRT		86	11	6	9.7	15	4.3

a - NIS = Activator 90 AND MSO from Loveland.

Summary: Orion and Callisto caused severe crop injury.

PRE weed control in sunflower. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Prosper, ND, to evaluate weed control and crop response to treatments applied to Express-tolerant sunflower. Pioneer '63N82' sunflower was planted on May 12, 2008, followed by the application of PRE treatments at 11:00 am with 56 F air, 46 F soil at a four inch depth, 41% relative humidity, 100% clouds, 8 to 12 mph SE wind, dry soil surface and moist subsoil. Soil characteristics were: 27.1% sand, 48.8% silt, 24.1% clay, loam texture, 3.8% OM and 7.1 pH. POST applications were made on June 18 at 9:20 am with 72 F air, 74 F soil surface, 50% relative humidity, 70% clouds, 0 to 3 mph N wind, wet soil surface, wet subsoil, good crop vigor, and no dew present to V4 to V5 sunflower. Weed species present at the time of POST applications were: 1 to 3 inch (5 to 15/yd^2) common lambsquarters; emergence to 3 inch (5 to 30/yd^2) common ragweed; cotyledon to 8 inch (1 to 2/yd^2) wild mustard; 0.5 to 2 inch (20 to 100/ft^2) yellow foxtail; cotyledon to 1 inch (1 to 5/yd^2) redroot pigweed; 1 to 4 inch diameter (1/yd^2) wild buckwheat; and 1 to 3 inch (1/yd^2) hairy nightshade. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plot with a bicycle-type plot sprayer with an attached wind screen 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 with a backpack-type plot sprayer for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

All PRE treatments gave 99% control of wild mustard and redroot pigweed. All POST treatments gave 99% control at 14 and 28 DAT of yellow foxtail, wild mustard, redroot pigweed, common lambsquarters, and hairy nightshade. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. PRE weed control in sunflower (Zollinger and Ries).

		28 DAT - PRE			14 DAT - POST			28 DAT - POST		
Treatments[1]	Rate	Yeft	Colq	Corw	Wibw	Corw	Cocb	Wibw	Corw	Cocb
	(product/A)	--- % control ---			--- % control ---			--- % control ---		
PRE/POST										
Spartan/Express SG+Assure II+Herbimax	4fl oz/0.25oz+8fl oz+1.5pt	50	99	43	77	66	63	80	69	67
Spartan/Express SG+Assure II+Herbimax	4fl oz/0.5oz+8fl oz+1.5pt	53	99	50	82	68	80	82	68	87
KIH-485/Express SG+Herbimax	2.1oz/0.25oz+1.5pt	99	80	50	90	73	63	90	77	82
KIH-485/Express SG+Herbimax	2.1oz/0.5oz+1.5pt	99	77	48	92	78	85	92	78	88
KIH-485/Express SG+Herbimax	2.8oz/0.25oz+1.5pt	99	88	62	90	79	63	90	79	87
KIH-485/Express SG+Herbimax	2.8oz/0.5oz+1.5pt	99	83	60	98	90	87	98	90	90
LSD (0.05)		4	5	5	5	8	5	3	6	9

[1]KIH-485 = pyroxasulfone.

Sunflower PRE weed control. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Valley, ND, to evaluate weed control and crop response to pre-plant treatments. 7 DBP (days before planting) treatments were applied on May 14, 2008 at 10:30 am with with 56 F air, 43 F soil at a four inch depth, 47% relative humidity, 0% clouds, 5 to 10 mph S wind, dry soil surface and moist subsoil. Soil characteristics were: 41.6% sand, 40.4% silt, 18.1% clay, loam texture, 5.1% OM and 7.2 pH. Croplan '551' Imi-tolerant sunflower was planted on May 21. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plot with a bicycle-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.

Sunflower injury was stunting and a slight yellow flash. On June 27 (42 DAT), 99% control of green and yellow foxtail. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. Sunflower PRE weed control (Zollinger and Ries).

		30 DAT	42 DAT		
Treatment[1]	Rate	Snfl[2]	Snfl	Ftba[3]	Mael[4]
	(product/A)	% injury	% injury	- - % control - -	
7 DBP					
Spartan Advance	2pt	0	0	0	30
Spartan Advance	2.5pt	0	7	20	37
Prowl H_2O	2.5pt	0	0	27	20
Spartan	3 fl oz	0	0	30	27
Spartan	4 fl oz	0	0	40	43
Spartan	6 fl oz	0	3	47	58
Prowl H_2O+Spartan	2.5pt+3fl oz	0	0	50	63
KIH-485	2.1oz	0	0	23	43
KIH-485	2.8oz	0	0	40	43
KIH-485	3.5oz	5	0	50	53
KIH-485	4.2oz	10	0	60	89
KIH-485	5.6oz	12	0	75	85
KIH-485	7.8oz	15	3	83	94
Spartan+KIH-485	3fl oz+2.8oz	0	0	67	73
Spartan+KIH-485	3fl oz+3.5oz	0	0	72	77
Spartan+KIH-485	3fl oz+5.6oz	0	0	50	67
Spartan+KIH-485	4fl oz+2.8oz	0	0	53	65
Spartan+KIH-485	4fl oz+3.5oz	0	0	72	81
Spartan+KIH-485	4fl oz+5.6oz	0	0	72	89
Untreated		0	0	0	0
LSD (0.05)		8	5	7	9

[1]KIH-485 = pyroxasulfone.
[2]Snfl = sunflower.
[3]Ftba = foxtail barley.
[4]Mael = marshelder.

PRE marshelder control in sunflower. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Valley, ND, to evaluate weed control and crop response to treatments applied to Express-tolerant sunflower. 7 DBP (days before planting) treatments were applied on May 14, 2008 at 10:10 am with with 54 F air, 43 F soil at a four inch depth, 47% relative humidity, 0% clouds, 5 to 10 mph S wind, dry soil surface and moist subsoil. Soil characteristics were: 41.6% sand, 40.4% silt, 18.1% clay, loam texture, 5.1% OM and 7.2 pH. Pioneer '63N82' sunflower was planted on May 21. POST applications were made on June 26 at 1:30 pm with 82 F air, 87 F soil surface, 31% relative humidity, 10% clouds, 3 to 5 mph SE wind, dry soil surface, wet subsoil, good crop vigor, and no dew present to V6 to V8 (4 to 10 inch) sunflower. Weed species present at the time of POST applications were: 1 to 3 inch (1 to 10/yd^2) yellow foxtail; and 1 to 4 inch (1 to 10/yd^2) marshelder. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plot with a bicycle-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 with a backpack-type plot sprayer for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

No sunflower injury was observed. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. PRE marshelder control in sunflower (Zollinger and Ries).

		42 DAT - 7DBP ratings		14 DAT - POST	
Treatment[1]	Rate	Yeft	Mael	Yeft	Mael
	(product/A)	----- % control -----		----- % control -----	
7 DBP					
Prowl H_2O+Spartan	2.5pt+3fl oz	99	30		
KIH-485	2.1oz	99	43		
KIH-485	2.8oz	99	50		
KIH-485	3.5oz	99	50		
Spartan+KIH-485	3fl oz+2.1oz	99	60		
Spartan+KIH-485	3fl oz+2.8oz	99	73		
Spartan+KIH-485	4fl oz+2.1oz	99	76		
Spartan+KIH-485	4fl oz+2.8oz	99	88		
7 DBP/POST					
Spartan/Express SG+Assure II+Herbimax	3fl oz/0.25oz+8fl oz+1.5pt	99	57	99	99
Spartan/Express SG+Assure II+Herbimax	3fl oz/0.5oz+8fl oz+1.5pt	99	65	99	99
KIH-485/Express SG+Herbimax	2.1oz/0.25oz+1.5pt	99	40	99	99
KIH-485/Express SG+Herbimax	2.1oz/0.5oz+1.5pt	99	42	99	99
KIH-485/Express SG+Herbimax	2.8oz/0.25oz+1.5pt	99	53	99	99
KIH-485/Express SG+Herbimax	2.8oz/0.5oz+1.5pt	99	68	99	99
Untreated		0	0	0	0
LSD (0.05)		NS	13	NS	NS

[1]KIH-485 = pyroxasulfone.

POST grass control in sunflower. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Casselton, ND, to evaluate volunteer grass control. Volunteer DeKalb 'DKC38-92' Roundup Ready corn was planted perpendicular to each plot length on May 13, 2008, followed by the planting of four rows per plot of Mycogen '8N368CL' Imi-resistant sunflower. POST applications were applied on June 30 at 10:00 am with 75 F air, 76 F soil surface, 49% relative humidity, 5% clouds, 1 to 4 mph S wind, moist soil surface, moist subsoil, good crop vigor, and no dew present to V6 to V10 (16 to 28 inch) sunflower. Weed species present at the time of POST applications were: 1 to 6 inch (5 to 20/yd^2) yellow foxtail; and 16 to 24 inch (5 to 20/yd^2) corn. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plot 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.

Targa and Fusilade DX gave near complete volunteer corn control and less yellow foxtail. Select and Select Max gave near complete yellow foxtail control and less volunteer corn control. (Dept of Plant Sciences, North Dakota State University, Fargo).

Table. Post grass control in sunflower (Zollinger and Ries).

		7 DAT		14 DAT		28 DAT	
Treatment	Rate	Yeft	Corn	Yeft	Corn	Yeft	Corn
	(product/A)	- - % control - -		- - % control - -		- - % control - -	
Targa+Herbimax	3fl oz+1% v/v	50	58	50	92	63	99
Targa+Herbimax	4fl oz+1% v/v	50	65	62	96	73	99
Targa+Herbimax	5fl oz+1% v/v	50	70	73	99	83	99
Select+Herbimax	4fl oz+1% v/v	50	65	82	68	78	77
Select+Herbimax	6fl oz+1% v/v	60	73	78	78	92	85
Select Max+Herbimax	6fl oz+1% v/v	83	72	85	78	96	82
Select Max+Herbimax	9fl oz+1% v/v	83	72	90	82	98	92
Fusilade DX+Herbimax	3fl oz+1% v/v	50	67	58	89	68	95
Fusilade DX+Herbimax	4fl oz+1% v/v	62	70	72	91	78	97
Fusilade DX+Herbimax	5fl oz+1% v/v	62	70	78	93	82	98
LSD (0.05)		3	4	4	3	5	3

Weed control in ExpressSun sunflower, Carrington, 2008. (Greg Endres). The experimental design was a randomized complete block with three replicates. The dryland trial was established on a loam soil with 2.8% organic matter and 6.8 pH. Pioneer '63N82' oil sunflower was planted in 30-inch rows on May 22. Best management practices were used for sunflower production. PRE treatments were applied with a CO_2-hand-boom plot sprayer delivering 17 gal/A at 30 psi through 80015 flat fan nozzles on May 22 with 67 F, 31 % RH, 85% clear sky. Rainfall totaling 1.1 inches occurred within 8 days after application of PRE treatments. The sunflower plant population was thinned to about 20,000 plants/A on June 18. POST treatments were applied on June 30 with 77 F, 56% RH, 95% clear sky, and 8 mph wind to V8-stage sunflower, 4-leaf to 2-tiller yellow and green foxtail, 2- to 12-inch tall common lambsquarters, 1- to 4-inch tall prostrate and redroot pigweed, and 2-inch tall to vining wild buckwheat. The trial was harvested with a plot combine on October 27.

PRE Express provided poor or no control of broadleaf weeds (Table 1). PRE Spartan provided excellent control of pigweed (93-96%) and suppression of common lambsquarters (67-68%) and wild buckwheat (75-76%). Common lambsquarters and pigweed control generally were excellent with Spartan and POST Express, while wild buckwheat was suppressed. Foxtail control ranged from 83-96% with Assure II while control was 71-75% with Assure II tank-mixed with Express. No crop injury was noted when visually evaluated on June 27 (PRE treatments), and July 7 and 14 (data not shown). Days required for emergence was similar among treatments (data not shown). Plant stand was similar among treatments (Table 2). Days to reach crop flowering and physiological maturity were less with herbicides compared to the untreated check. Untreated check plots were not harvested due to poor yield and high weed density. Sunflower seed yield, moisture, and test weight were similar among herbicide treatments.

Table 1. Weed control in Express Sun sunflower, Carrington, 2008.

Herbicide			Weed control[1] 6/27			7/14				7/29				8/29			
Treatment[2]	Application[3]	Rate	colq	pwsp	wibw	colq	pwsp	wibw	fota	colq	pwsp	wibw	fota	colq	pwsp	wibw	fota
		fl oz product/A	%														
Express/Assure II + COC	PRE/POST	0.5 oz/8 + 16	40	55	27	40	48	40	83	28	40	40	93	0	0	0	96
Spartan/Express + Assure II + COC	PRE/POST	4.5/0.125 + 8 + 16	68.3	93	76	93	93	73	74	95	88	68	71	99	85	65	75
Spartan/Express + Assure II + COC	PRE/POST	4.5/0.25 + 8 + 16	66.7	96	75	95	99	75	73	98	96	77	74	99	95	80	75
untreated check	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C.V. (%)			4.3	13.7	29.9	2.5	14.9	3.1	11.1	8.5	10.5	4.0	3.8	0.0	21.8	24.2	4.1
LSD (0.05)			4	17	27	3	18	3	13	9	12	4	5	0	19	17	5

[1]colq=common lambsquarters; wibw=wild buckwheat; pwsp=redroot and prostrate pigweed; fota=yellow and green foxtail.
[2]COC=methylated seed oil - Destiny (WinField).
[3]PRE=May 22; POST=June 30.

Table 2. Express Sun sunflower crop response to Express herbicide, Carrington, 2008.

Herbicide			Sunflower[1]					
Treatment[2]	Application[3]	Rate	Stand	Bloom	PM	Yield	Moisture	TW
		fl oz product/A	plt/A	Jday	Jday	bu/A	%	lb/bu
Express/Assure II + COC	PRE/POST	0.5 oz/8 + 16	25675	226	274	435	12.1	31.7
Spartan/Express + Assure II + COC	PRE/POST	4.5/0.125 + 8 + 16	30325	223	274	614	11.1	32.6
Spartan/Express + Assure II + COC	PRE/POST	4.5/0.25 + 8 + 16	24125	223	275	782	11.0	31.8
untreated check	x	x	26120	230	276	x	x	x
C.V. (%)			11.1	0.4	0.1	35.0	9.6	1.8
LSD (0.05)			NS	2	1	NS	NS	NS

[1]Bloom=date of initial flowering (R5); PM=date of physiological maturity (R9).

[2]COC=methylated seed oil - Destiny (WinField).

[3]PRE=May 22; POST=June 30.

Use of an Experimental Compound to Replace Paraquat as a Harvest Aid in Sunflower (#07-P04).
Kirk Howatt, Brian Jenks, Michael Moechnig, and Phil Stahlman.

Experiments were established to evaluate the response of sunflower to herbicides applied at three desiccation stages. The effect of application timing on sunflower yield and quality was evaluated in field research studies located near Minot and Fargo, ND; Brookings, SD; and Hays, KS. The experiment was established with a randomized, complete-block design having four replicates. Each researcher chose a locally adapted sunflower hybrid and established populations consistent with local practices. Hybrids at Minot, Brookings, and Hays were NuSun type while the hybrid at Fargo was a high-oleic type. Plots consisted of 12 rows of sunflower 9 m in length. Pests were managed with appropriate practices to minimize competition and stress.

Treatments were applied with a CO_2-pressurized boom to the center 10 rows of sunflower by the length of the plot (Table 1). The treatment list included a control and a factorial arrangement of three application timings and four desiccants for a total of 13 treatments. Targeted application timings included achene moistures of 50%, 40%, and 30%. Desiccants included paraquat at 420 g ai/ha plus non-ionic surfactant at 0.25% vol/vol, saflufenacil at 50 g ai/ha plus methylated seed oil at 1% vol/vol and ammonium sulfate at 1600 g ai/ha, glyphosate at 840 g ae/ha plus ammonium sulfate at 1600 g/ha, and glyphosate at 840 g/ha plus saflufenacil at 25 g/ha with methylated seed oil at 1% vol/vol and ammonium sulfate at 1600 g/ha. Paraquat was applied in 180 L/ha spray volume while other desiccant treatments were applied in 90 L/ha spray volume.

Table 1. Application dates for sunflower desiccation near Minot, Fargo, Brookings, and Hays.

Targeted achene moisture (%)	Minot	Fargo	Brookings	Hays
50	August 31	September 4	August 30	September 14
40	September 12	September 9	September 7	September 21
30	September 20	September 19	September 14	October 1

Evaluation of desiccation was performed and moisture content was measured at four 7-d intervals after treatment. Moisture content was calculated based on fresh and oven dried samples of 10 plants. At the final evaluation date for each treatment, 40 plants were harvested to estimate yield. Subsamples were used to determine moisture, test weight, oil content, oil composition, germination, and emergence. Regression was used to determine the date of harvest based on receptacle moisture. Other parameters were subjected to analysis of variance to determine effects of desiccant and timing. Means separation were performed using Fisher's protected LSD at $P = 0.05$ level of significance.

Results

Noticeable desiccation was observed with each treatment after each application timing (data not shown). However, visible necrosis overestimated the actual desiccation and drying effect of each treatment. Actual moisture contents were essential to correlate with timing of harvest. The receptacle moisture content was the most restrictive based on desired moistures at harvest of 15% achene moisture and 40% receptacle moisture.

More benefit to using a desiccant was documented in Minot and Fargo than Brookings and Hays (Table 2). Brookings especially had unusually warm, dry weather during maturation that facilitated natural desiccation and precluded effect of the herbicides. Herbicide application at 30% moisture allowed earlier harvest in Minot and Fargo by about 5 to 8 d, but the choice of herbicide did not substantially affect the date of harvest. Glyphosate, which was presumed to result in slow drying because of the mode of action and symptomology development, was not result in consistently slower sunflower drying compared with other herbicides. Conversely, paraquat did not reduce the time to harvest more than other herbicides.

Table 2. Predicted harvest date following treatment with desiccant relative to untreated sunflower, expressed as days earlier harvest with chemical desiccation.

Desiccant treatment	Minot	Fargo	Brookings	Hays
	—— d earlier harvest compared with untreated ——			
50% moisture				
Paraquat	37	14	5	6
Saflufenacil	32	12	2	6
Glyphosate	31	14	8	3
Glyphosate + saflufenacil	35	15	4	6
40% moisture				
Paraquat	25	11	0	5
Saflufenacil	27	7	-1	5
Glyphosate	17	9	0	3
Glyphosate + saflufenacil	26	12	0	5
30% moisture				
Paraquat	8	7	-2	1
Saflufenacil	9	6	0	2
Glyphosate	3	8	-2	1
Glyphosate + saflufenacil	7	5	-1	0

Harvest could occur about 3 w earlier in Minot and 10 d earlier in Fargo when herbicides were applied at 40% moisture compared to untreated sunflower (Table 2). At this timing, Hays experienced a benefit of about 5 d earlier harvest, but Brookings did not demonstrate a benefit unless treatments were applied near 50% moisture. Treatment this early in the sunflower maturation process raises concerns of limited yield or poor quality from interfering with seed development.

Treatment, even at 50% moisture, did not affect yield (data not shown). Average yield across treatments was 2200, 2350, 2530, and 2470 kg/ha at Minot, Fargo, Brookings, and Hays, respectively. Likewise, treatments did not affect oil composition of either seed type averaged across locations (Table 3).

Table 3. Fatty acid content of oil from sunflower treated with chemical desiccants.

Fatty acid	Carbon designation	NuSun type	High-oleic type
		% ± standard deviation	
Palmitic	16:0	4.85 ± 0.53	2.83 ± 0.08
Stearic	18:0	3.24 ± 0.41	3.35 ± 0.25
Oleic	18:1	59.59 ± 6.08	88.84 ± 0.64
Linoleic	18:2	29.99 ± 5.96	2.69 ± 0.35
Arachidic	20:0	0.27 ± 0.03	0.27 ± 0.02
Gondic	20:1	0.22 ± 0.02	0.27 ± 0.01
Behenic	22:0	0.83 ± 0.1	0.83 ± 0.07
Lignoceric	24:0	0.23 ± 0.06	0.28 ± 0.03

Interactions of location, herbicide, and application timing did not affect oil content, test weight, or germination. Therefore, main effect of herbicide or application timing was analyzed across the other factor. Herbicide application at 50% moisture caused slightly lower oil content compared with the control, but application at 40 or 30% moisture did not affect oil content of sunflower (Table 4). Test weight was not reduced with application at 50% moisture relative to the untreated sunflower, but test weight of achenes from sunflower treated at 50% moisture was less than sunflower treated at 30% moisture. While these differences were small, the trends indicate that physiological maturity of sunflower occurs between 40 and 50% achene moisture. At physiologic maturity, artificial desiccation of any type should not affect yield or quality parameters.

Table 4. Herbicide application timing effect on sunflower oil content and test weight averaged across herbicide and location.

Application achene moisture %	Oil content	Test weight
	%	g/1000
Untreated	48.0	43.9
50	46.7	43.1
40	47.8	44.1
30	48.1	45.1
LSD (0.05%)	0.7	1.3

Choice of herbicide did not affect oil content or test weight (Table 5). However, paraquat or saflufenacil tended to reduce each parameter when applied at 50% moisture. This tendency may develop into an interaction with a second year of data and should be examined carefully after next season.

Table 5. Herbicide effect on sunflower oil content and test weight averaged across application timing and location.

Herbicide	Oil content	Test weight
	%	g/1000
Untreated	48.0	43.9
Paraquat	47.8	43.7
Saflufenacil	47.0	45.0
Glyphosate	47.5	45.0
Glyphosate + saflufenacil	47.8	44.2
LSD (0.05%)	NS	NS

An interaction occurred between location and treatments for germination. Individual location analysis showed that germination was not affected by treatment at Brookings or Hays with average germination of 95 and 47% across treatments, respectively. For Minot and Fargo, herbicide choice did not affect germination (data not shown). Application timing affected germination differently between Minot and Fargo. Germination was less with seed harvested from sunflower treated at 50% moisture than other treatments in Minot (Table 6). This is consistent with the trend of reduced quality demonstrated for oil content and test weight as affected by application timing.

The result in Fargo was different and highlights the need for chemical desiccation to allow earlier harvest. Late-season cool, wet weather caused a substantial decline in the germination of sunflower, 48% for untreated sunflower that were weathered compared with 94 to 95% germination when plants were chemically desiccated and harvested before the inclement weather began (Table 6). Germination of seed from plants treated at 30% moisture was 52%. However, this seed could have been harvested a week earlier based on receptacle moisture, which may have been soon enough to avoid the weathering resulting in poor germination.

Table 6. Herbicide application timing affected the germination of progeny seed averaged across herbicide at Minot and Fargo.

Application achene moisture %	Minot	Fargo
	%	%
Untreated	95	48
50	88	94
40	94	96
30	96	52
LSD (0.05%)	3	3

Germination tests indicated that vigor may have been influenced by some of the treatments because hypocotyls and radicles were shorter than other treatments. An emergence test was performed as a measure of plant vigor. Glyphosate reduced the emergence of sunflower when applied at 50% moisture to parent plants (Table 7). Seedlings from plants treated with saflufenacil typically emerged, but the hypocotyl arch and cotyledons quickly turned brown with exposure to light. Samples have been sent to BASF Corporation to determine whether herbicide residue on the surface of the achene is causing this injury or whether translocation is delivering saflufenacil to the seed in large enough amount to kill the seedling. Treatment only affected height of surviving plants for seedlings from Minot when saflufenacil or glyphosate, 2.7 cm, or the combination, 0.5 cm, was applied at 50% moisture compared with the untreated seedlings, 5.7 cm.

Table 7. Number of plants, out of five, that emerged from a depth of 3 cm in peat-based growth media and survived for 14 d.

Desiccant treatment	Minot	Fargo	Brookings	Hays
	number of plants			
Untreated	4.5	4.2	5.0	3.5
50% moisture				
Paraquat	3.2	4.7	5.0	4.5
Saflufenacil	0.5	1.0	1.7	1.2
Glyphosate	1.0	2.7	1.5	2.2
Glyphosate + saflufenacil	0.2	2.7	2.5	2.7
40% moisture				
Paraquat	4.5	5.0	4.7	3.2
Saflufenacil	1.7	2.0	4.2	2.7
Glyphosate	4.2	2.5	4.7	3.0
Glyphosate + saflufenacil	2.5	2.7	4.2	1.2
30% moisture				
Paraquat	4.2	4.0	4.7	3.7
Saflufenacil	4.7	4.7	5.0	3.7
Glyphosate	4.7	3.5	5.0	3.2
Glyphosate + saflufenacil	5.0	4.0	5.0	4.0
LSD (0.05%)	1.0	1.2	0.6	1.7

An experiment was conducted to evaluate the response of all four hybrids to these herbicides under a common environment. This experiment was conducted at Hays, KS. The experiment description and results are discussed in the accompanying file (NSA 07-P04 objective 2).

Sunflower desiccation with saflufenacil. Howatt, Roach, and Harrington. 'Mycogen 8HZ88DM' sunflower was seeded and a preemergence treatment for weed control of sulfentrazone at 3 oz ai/A was applied on May 20. Desiccation treatments were applied to physiologically mature sunflower at 30% seed moisture on September 21 with 63°F, 41% RH, 20% cloud cover, and soil at 60°F. Treatments were applied with a tractor mounted sprayer delivering 8.5 gpa at 38 psi through TT 11001 nozzles, except for treatment 1 which was delivered at 17 gpa at 46 psi through TT 11002 nozzles, applied to a 20 ft wide area the length of 25 ft wide by 30 ft long plots. The experiment was a randomized complete block design with three replicates. Visible desiccation was rated for leaf, stalk, and head portions of the plant and whole plant. Actual moisture content was determined was not completed for this publication.

			Leaf				Stalk				Head				Whole plant			
Treatment	Rate	Spr Vol.	9/28	9/30	10/3	10/9	9/28	9/30	10/3	10/9	9/28	9/30	10/3	10/9	9/28	9/30	10/3	10/9
	oz/A	gpa	%															
Paraquat+NIS	6+0.25%	17	60	82	96	99	10	15	43	82	30	33	53	95	53	72	87	94
Saflufenacil+MSO+AMS	0.26+1%+24	8.5	23	68	90	98	5	33	63	88	5	33	53	92	20	65	83	95
Saflufenacil+MSO+AMS	0.36+1%+24	8.5	22	78	96	99	7	40	77	92	5	33	67	93	20	73	90	96
Saflufenacil+MSO+AMS	0.72+1%+24	8.5	25	68	92	99	7	32	70	90	8	33	60	94	23	63	88	96
Glyphosate[a]+MSO+AMS	12+1%+24	8.5	23	23	78	98	5	12	30	77	5	13	40	90	23	30	67	91
Glyt+Saflufenacil+MSO+AMS	12+0.26+1%+24	8.5	27	53	88	98	5	13	53	88	7	15	43	92	28	50	78	92
Flumioxazin+MSO+AMS	1+0.25G+24	8.5	27	47	65	89	7	13	12	60	5	18	23	83	25	50	53	85
Glyt+Flumioxazin+MSO+AMS	12+1+0.25G+24	8.5	27	27	67	88	5	10	10	53	5	7	27	87	22	23	57	83
Untreated	0		22	22	53	80	5	5	8	53	5	5	15	73	20	25	47	77
			14	24	8	3	40	34	12	9	44	32	14	4	14	19	9	4
			7	21	12	5	4	11	8	12	6	12	10	7	6	16	12	7

[a] Glyphosate was Buccaneer from West Central.

Visible desiccation tends to underestimate the actual moisture content of plant tissues. Actual drying lags behind visual ratings but has followed consistent relationships among the treatments in previous experiments. Paraquat was very effective at desiccating leaf tissue, which also resulted in high whole plant desiccation compared to other treatments at initial evaluation. However, stalk desiccation after paraquat was low compared with saflufenacil. Flumioxazin produced less desiccation than saflufenacil when each was applied alone, and the effect took longer to develop with flumioxazin than saflufenacil. Glyphosate tended to temper the effect of saflufenacil, but the response of the combination typically was better than glyphosate alone.

Adjuvant effect on saflufenacil desiccation of sunflower. Howatt, Roach, and Harrington. 'Mycogen 8HZ88DM' sunflower was seeded and a preemergence weed control treatment of sulfentrazone at 3 oz ai/A was applied on May 20. Desiccation treatments were applied to physiologically mature sunflower at 30% seed moisture on September 24 with 74°F, 20% RH, 5% cloud cover, 4 to 5 mph wind at 270°, and wet soil. Treatments were applied with a tractor mounted sprayer delivering 8.5 gpa at 38 psi through TT11001 nozzles, except for treatment 4 which was delivered at 2 gpa at 30 psi through EVS 400067 nozzles, to an area 20 ft wide the length of 25 ft wide by 30 ft long plots. The experiment was a randomized complete block design with three replicates. Visible desiccation was rated for leaf, stalk, and head portions of the plant and whole plant.

			Leaf				Stalk				Head				Whole plant			
Treatment	Rate	Vol.	9/28	9/30	10/3	10/9	9/28	9/30	10/3	10/9	9/28	9/30	10/3	10/9	9/28	9/30	10/3	10/9
	oz/A	gpa	%															
Saflufenacil+MSO+AMS	0.36+1%+24	8.5	25	72	90	98	5	40	70	92	7	33	50	93	20	67	85	95
Saflufenacil+Agridex+AMS	0.36+1%+24	8.5	22	47	87	99	5	18	38	87	7	22	37	90	20	47	78	92
Saflufenacil+NIS+AMS	0.36+0.25%+24	8.5	20	43	73	97	5	17	27	78	5	18	33	92	20	43	67	88
Saflufenacil+MSO+AMS	0.36+1%+24	2	25	47	77	97	5	20	43	83	8	22	43	92	20	47	70	88
Untreated	0		23	23	57	88	5	5	10	70	5	8	20	88	20	27	50	82
C.V.			16	26	10	2	0	45	29	4	38	25	19	3	0	24	11	3
LSD 5%			NS	23	14	3	NS	17	20	6	NS	10	13	5	NS	21	14	5

Four days after application, 9/28, was too soon to detect any differences among treatments. MSO was a substantially better adjuvant for saflufenacil by 9/30, only 2 days later. This improved activity was still apparent on 10/3 for stalk and head evaluation, but leaf, and consequently whole plant, ratings were similar between MSO and Agridex. NIS generally gave the least enhancement of saflufenacil activity. Saflufenacil activity was better when applied in 8.5 gpa than 2 gpa for most evaluations. Saflufenacil with MSO in 2 gpa provided similar visible desiccation to saflufenacil with Agridex in 8.5 gpa.

Performance of preharvest desiccants in sunflower, Carrington, 2008. (Greg Endres). The field experiment was conducted at the NDSU Carrington Research Extension Center to test selected herbicides for effectiveness of preharvest desiccation in sunflower. The experimental design was a randomized complete block with three replicates. Mycogen '8N358CL' sunflower was planted in 30-inch rows on May 14. Best management practices were used for sunflower production. Preharvest treatments were applied with a CO_2-hand-boom plot sprayer delivering 19 gal/A at 35 psi through 8001 flat fan nozzles on September 25 with 67 F, 69 % RH, 70% clear sky, and no wind to R9 stage (physiologically mature) sunflower. Visual evaluation of sunflower plant desiccation was conducted on September 30, and October 3 and 9 using the scale of 0-9 (0=100% brown and 9=100% green). The trial was harvested on October 27 with a plot combine.

Valor and Valor plus glyphosate provided the highest amount of sunflower plant tissue desiccation when evaluated 5 days after application (DAT) (Table). Glyphosate and Valor plus glyphosate provided the highest amount of tissue desiccation when evaluated 14 DAT. Seed moisture content at harvest was similar among treatments. Seed yield and quality were similar among treatments.

Table.

Herbicide		Sunflower plant desiccation			Sunflower seed			
		30-Sep	3-Oct	9-Oct	Yield	Moisture	Test weight	Oil
Treatment[1]	fl oz product/A	0-9[2]			lb/A	%	lb/bu	%
untreated check	x	6	4	3	597	9.6	30.8	41.6
Valor+Superb HC+AMS	2 oz+32+1%	3	3	2	753	9.2	30.1	42.4
untreated check	x	6	4	2	965	9.7	31.4	43.1
Valor+glyt+Superb HC+AMS	2 oz+22+32+1%	4	1	0	736	9.2	31.1	42.9
glyt+Superb HC+AMS	22+32+1%	5	3	1	744	9.2	31.4	43.4
C.V. (%)		17.7	42.2	40.4	25.3	3.1	3.3	2.9
LSD (0.05)		2	NS	1	NS	NS	NS	NS

[1]Superb HC=high surfactant oil concentrate (Winfield); AMS=Cornbelt Amstik (West Central); glyt=RU WeatherMax (4.5 lb ae).
[2]0=brown and 9=green.

Transplanted ornamental response to propoxycarbazone soil residue, location 1. Howatt, Roach, and Harrington. An experiment was established to determine the response of ornamentals transplanted into an area that had been treated with propoxycarbazone as a potential quackgrass management strategy. Pre-transplant treatments were applied May 21 with 57°F, 13% RH, 0% cloud cover, 1 mph wind at 0°, and dry soil at 59°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 38 psi through 11001 TT nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The center 4 ft of each plot along the whole length was tilled with a PTO-driven rototiller. Dusty miller, marigold, petunia, and salvia ornamental plants were transplanted into the tilled area May 21 and June 4. Irrigation was performed to ensure survival of transplants. The experiment was a randomized complete block design with four replicates.

		6/4	6/4	6/4	6/4	6/20	6/20	6/20	6/20	7/8	7/30
Treatment	Rate	dusty miller	marigold	petunia	salvia	dusty miller	marigold	petunia	salvia	All	All
	oz/A	%									
Propoxycarbazone	1	0	0	0	0	0	0	0	0	0	0
Propoxycarbazone	0.5	0	0	0	0	0	0	0	0	0	0
Propoxycarbazone	0.25	0	0	0	0	0	0	0	0	0	0
Propoxycarbazone	0.12	0	0	0	0	0	0	0	0	0	0
Propoxycarbazone	0.06	0	0	0	0	0	0	0	0	0	0
Untreated	0	0	0	0	0	0	0	0	0	0	0
CV		0	0	0	0	0	0	0	0	0	0
LSD		0	0	0	0	0	0	0	0	0	0

Propoxycarbazone residue in the soil did not cause injury to ornamental transplants.

Transplanted ornamental response to propoxycarbazone soil residue, location 2. Howatt, Roach, and Harrington. An experiment was established to determine the response of ornamentals transplanted into an area that had been treated with propoxycarbazone as a potential quackgrass management strategy. Pre-transplant treatments were applied May 21 with 58°F, 9% RH, 0% cloud cover, 4 mph wind at 0°, and dry soil at 52°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 38 psi through 11001 TT nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The center 4 ft of each plot along the whole length was tilled with a PTO-driven rototiller. Dusty miller, marigold, petunia, and salvia ornamental plants were transplanted into the tilled area May 21 and June 4. Irrigation was performed to ensure survival of transplants. The experiment was a randomized complete block design with three replicates.

		6/4	6/4	6/4	6/4	6/20	6/20	6/20	6/20	7/7	7/30
Treatment	Rate	Dusty miller	marigold	petunia	salvia	Dusty miller	marigold	petunia	salvia	All	All
	oz/A	%									
Propoxycarbazone	1	0	0	0	0	0	0	0	0	0	0
Propoxycarbazone	0.5	0	0	0	0	0	0	0	0	0	0
Propoxycarbazone	0.25	0	0	0	0	0	0	0	0	0	0
Propoxycarbazone	0.12	0	0	0	0	0	0	0	0	0	0
Propoxycarbazone	0.06	0	0	0	0	0	0	0	0	0	0
Untreated	0	0	0	0	0	0	0	0	0	0	0
CV		0	0	0	0	0	0	0	0	0	0
LSD		0	0	0	0	0	0	0	0	0	0

Propoxycarbazone residue in the soil did not cause injury to ornamental transplants.

<u>Weed control in transplanted cabbage.</u> Harlene Hatterman-Valenti and Collin Auwarter..

A study was conducted at the NDSU Horticulture Research and Arboretum site near Absaraka, ND to evaluate herbicide treatments for crop safety and weed control in transplanted 'Blue Thunder' and 'Silver Dynasty' cabbage. The soil is a Spottswood sandy loam with 2.0% O.M. and 7.2 pH.. Plots were 2 rows (3 ft row spacing) by 10 ft arranged in a randomized complete block design with four replicates. Seedlings were transplanted at 2 ft centers on June 9. Water was not limiting as drip irrigation was scheduled as needed. Cabbages were harvested August 13. Application data are listed below:

Date:		6/9/08	6/17/08	6/25/08	7/2/08
Treatment:		Pre	Post	Post	Post
<u>Sprayer</u>:	gpa/psi:	20/40	20/40	20/40	20/40
	nozzle:	8002	8002	8002	8002
Air temperature (F):		72	63	60	69
Wind (mph):		8	6	5	3
Soil moisture:		adequate	excessive	excessive	excessive
Cloud cover (%):		5	10	10	25

Table 1. Effect of herbicide on broadleaf weed control 8 WAT, cabbage yield and head quality.

							Yield		Head		Core		Head
Trt	Treatment	Rate	Colq	Rrpw	Copu	Bygr	Total	Head	Height	Diameter	Height	Diameter	Density
No	Blue Thunder	lb ai/A	%				cwt/a	lb	inches				(1-5)
1	Hand-weeded		100	100	100	100	398	7.0	8.1	6.2	3.0	1.5	3.5
2	Goal	0.06	66	95	98	55	408	7.3	8.6	6.8	3.5	1.6	3.4
3	Goal (3)*	0.06	86	94	95	86	403	6.8	8.6	6.6	3.6	1.5	3.4
4	Goal Tender	0.25	94	98	96	55	414	7.2	8.2	6.7	3.2	1.6	3.8
5	Goal Tender	0.19	84	93	93	88	434	7.6	8.2	6.3	2.8	1.6	3.9
6	Goal Tender (3)*	0.06	65	84	95	55	341	8.1	8.6	6.5	2.8	1.5	3.8
7	Dual Magnum	1.4	81	96	94	99	415	7.2	8.3	6.3	2.7	1.5	3.8
8	Outlook	0.98	89	100	98	100	471	7.8	8.5	6.4	2.8	1.5	3.5
9	Prowl H_2O	0.71	80	91	95	93	351	6.9	8.9	6.6	3.1	1.6	3.9
10	Dacthal	10.5	85	94	98	96	383	7.3	8.2	6.4	2.9	1.5	3.8
	Silver Dynasty	LSD (P=.05)	18	12	8	13	148	1.3	0.4	0.6	0.5	0.2	0.7
1	Hand-weeded		100	100	100	100	421	6.0	8.0	6.2	2.8	1.5	3.8
2	Goal	0.06	65	73	89	79	452	6.4	7.8	6.7	2.8	1.4	3.3
3	Goal (3)*	0.06	70	85	93	75	423	6.6	7.4	6.3	2.9	1.4	3.5
4	Goal Tender	0.25	81	86	99	75	454	7.3	8.0	6.4	2.9	1.4	3.8
5	Goal Tender	0.19	48	68	70	60	431	6.8	8.0	6.0	3.1	1.5	3.6
6	Goal Tender (3)*	0.06	68	87	96	63	468	5.8	7.4	6.1	2.7	1.3	3.5
7	Dual Magnum	1.4	81	98	89	99	427	6.2	7.8	6.3	2.9	1.4	3.9
8	Outlook	0.98	80	86	88	99	450	7.5	7.8	5.8	2.4	1.5	3.6
9	Prowl H_2O	0.71	83	70	91	98	459	5.8	7.5	6.3	2.3	1.3	3.4
10	Dacthal	10.5	81	79	98	100	469	6.4	7.8	6.1	2.6	1.4	3.8
LSD (P=.05)			27	37	23	27	134	1.4	0.7	0.6	0.5	0.2	0.5

* Treatment consists of three sequential applications with a 1 wk interval.

Weed control in grapes. Harlene Hatterman-Valenti and Collin Auwarter.

An experiment was initiated at an NDSU Experiment Station site near Kindred, ND to to evaluate the influence of cultural and chemical weed management strategies on weed control and plant growth in newly established grapes. The trial was arranged as a split plot with three cultural (landscape fabric, wheat straw, and wood chips) and one chemical (flumioxazin at 0.375 lb ai/A + oryzalin at 3 lb ai/A) weed management strategies as the main plot and four grape cultivars (DM8521, MN1131, MN1200, and St. Croix) as sub-plots, replicated three times. Two year old grape plants were transplanted May 25, 2008 with two plants per experimental unit. Weed management treatments were applied the same day. Herbicides were tank-mixed with glyphosate (1 lb ae/A) using a CO2-pressurized backpack sprayer with a 2-nozzle boom since weeds were present. Annual weeds were removed by hand (perennials treated with glyphosate) prior to the application of the mulches. Soil volumetric water content and soil temperature at 4-inch depths were recorded hourly in each main plot. No supplemental water was provided.

Sprayer:	
GPA	20
PSI	30
Nozzle	8002 flat-fan

Application Date:	5/25/2008
Application Timing:	POST/PRE
Air Temperature:	67 F
Rel. Humidity:	70%
Wind Velocity	5
Soil Moisture:	adequate
% Cloud Cover:	20

Table 2. Weed control 5 and 15 weeks after treatment.

Treatment	5 WAT					16 WAT			
	Colq	Howe	Yeft	Cath	Dali	Colq	Howe	Yeft	Dali
Landscape fabric	87	97	88	77	70	90	92	90	60
Wheat straw	85	88	86	80	58	87	86	77	49
Wood chips	88	96	90	52	56	80	83	80	48
Herbicides	89	90	90	56	83	85	87	63	60
LSD 0.05	5	7	8	10	12	4	3	7	9

Summary: Weed control evaluations 5 weeks after treatment (WAT) indicated that all treatments provided satisfactory control ($\geq$ 85%) of common lambsquarters, horseweed, and yellow foxtail. Glyphosate applied just prior to the application of wood chips or wheat straw did not provide the anticipated control of Canada thistle or dandelion. Populations were variable, but more prevalent in these treatments. Spot applications with glyphosate reduced the Canada thistle population and eliminated the dandelions. Weed control evaluations were similar at 16 WAT except that the yellow foxtail control decreased in the chemical treatment. Soil water content was greater within the wheat straw mulch treatment than other treatments and soil temperature was cooler until September when the soil temperature within the chemical treatment began to reflect the much cooler night temperatures. Soil water content was lowest and soil temperature had the greatest daily fluctuation within the chemical treatment. Soil temperature and soil water content differences did not affect vine growth (stem number and stem height) but may affect winter hardiness, bud break, fruit production, or fruit ripening. These factors will be evaluated the next two years as well as weed control to determine if cultural weed management methods are feasible strategies for grape production in North Dakota.

Onion weed control - Absaraka. Harlene Hatterman-Valenti and Collin Auwarter.

An experiment was conducted using drip irrigation at a site near Absaraka, ND to the effect of early-season weed control on onion grade and yield. The field was field cultivated prior to planting. Teton, was planted May 8, 2008. Fertilizer, insecticides and fungicides were applied as needed. Application information is provided below. The experiment was a randomized complete block design with four replicates.

Sprayer: GPA	20	20	20	20
PSI	40	40	40	40
Nozzle	8002 flat-fan	8002 flat-fan	8002 flat-fan	8002 flat-fan
	A	B	C	D
Application Date:	5/8/2008	5/14/2008	5/19/2008	8/1/2008
Time of Day:	12:00	11:00	12:30	13:00
Application Timing:	PRE	PRE	PRE	POST
Air Temperature, Unit:	50 F	58 F	61 F	80 F
Wind Velocity, Unit:	0	5 MPH SSW	8 MPH SE	5 MPH E
Soil Moisture:	inadequate	inadequate	inadequate	adequate
% Cloud Cover:	100	0	50	0

Table 2. Onion grade and yield.

Treatment	Rate Product/A	Applic timing	0 - 2.25 in	2.25 - 3 in	3 – 4 in.	> 4 in.	Total
			Cwt/a				
Goal	8 oz	C	3	18	61	13	95
Buctril	24 oz	C	45	96	115	9	266
Goal	2 oz	C	23	92	91	17	224
Buctril	6 oz	C	42	72	110	9	233
Goal + Prowl	6 oz + 4 pt	C	0	25	54	70	150
Buct + Prowl	24 oz + 4 pt	C	5	26	201	50	282
Goal + Prowl	2 oz + 3 pt	C	9	30	176	60	274
Buct + Prowl	6 oz + 3 pt	C	9	39	129	104	280
RU+Dacthal +AMS	22 oz+10 lb +17 lb/100gl	C	28	81	204	81	394
RU + Prowl + AMS	22 oz+4 pt +17 lb/100gl	C	37	84	174	65	360
Dacthal	10 lb	A	45	69	155	28	298
Dac + Chateau	8 lb + 1 oz	B + D	30	99	156	20	304
Dac + Chateau	8 lb + 2 oz	B + D	36	68	97	10	211
Dac + Chateau + Prowl H20	8 lb + 2 oz + 1.5 pt	B + D + D	35	72	155	36	298
Dac + Outlook	8 lb + 21 oz	B + D	40	93	131	0	264
Dac + Dual Mag	8 lb + 2 pt	B + D	51	84	94	9	237
Dac + Prowl	8 lb + 3 pt	B + D	42	96	89	0	227
Untreated			4	0	0	0	4
LSD 0.05			23	54	110	66	156

Summary: Yield and grade results generally mimicked weed control with the exception of treatments 1 and 3 where significant crop injury decreased plant population. Treatments that provided the greatest weed control also tended to produce the largest diameter onion. The treatment of Roundup + Dacthal + AMS as a delayed preemergence application had the greatest total yield as well as the highest amount of bulbs with a diameter of three inches or more.

Adjuvants improve micro-rate herbicide efficacy for weed control in onion, Oakes, ND.

Loken, James R., Harlene Hatterman-Valenti, Collin Auwarter, and Walt Albus. An experiment was conducted at the Oakes Irrigation Research Site to compare early-season, broadleaf weed control of bromoxynil or oxyflourfen (water based formulation) applied as micro-rates plus adjuvants to the same herbicides applied as micro-rates without adjuvants for weed control in onion (*Allium cepa* L.). The soil was an Embden sandy loam with 2.4% organic matter and 6.7 pH. Onion variety 'Teton' pelleted seed was planted at 285,000 seeds/A using a Monosem four row double-line planter on April 23. Plots were 6 ft wide by 17 ft long and arranged in a randomized complete block design with four replicates. At time of weed cotyledon stage (May 16) herbicides were applied as micro-rates at 1/8 of their lowest labeled rates every 7 days, with four total applications. Herbicide micro-rates were applied with a CO_2 pressurized backpack sprayer. A standard application of bromoxynil and oxyfluorfen was applied on June 24 (4-leaf stage) to control broadleaf weeds. Another standard application of bromoxynil and oxyfluorfen was made on July 1 (5-6-leaf stage) as a final late-season broadleaf weed control measure. Standard applications were applied using a tractor mounted sprayer. Best management practices were used for fertility, disease, insect, and grass weed control. Treatments were evaluated for overall control of redroot pigweed (*Amaranthus retroflexus* L.) and common lambsquarters (*Chenopodium album* L.) after all micro-rate treatments were completed using a visual evaluation on June 30. On September 24, 5 ft of the middle two rows of each plot were harvested for grade and yield analysis. After harvest, onions were allowed to cure and then were graded. Split and diseased bulbs were graded as culls regardless of diameter.

Herbicide application dates, timings, and environmental conditions for Oakes, 2008.

Application Date:	5-16	5-26	6-3	6-9	6-24	7-1
Onion Stage:	loop	flag-1 lf	1-2 lf	2 lf	4 lf	5-6 lf
Air Temp., (F):	75	50	53	61	75	75
Wind speed, (MPH):	5	4	6.5	2.7	5	5
Operating Pressure:	40 psi	40 psi	40 psi	40 psi	40 psi	40 psi
Nozzle Type:	Flat Fan	Flat Fan	Flat Fan	Flat Fan	Flat Fan	Flat Fan
Nozzle Size:	8002	8002	8002	8002	8002	8002
Spray Volume, GPA:	20	20	20	20	20	20

Results: Micro-rate herbicide applications plus adjuvants provided excellent control of common lambsquarters at the highest application rates regardless of herbicide and regardless of adjuvant. These applications provided superior control to the herbicide treatments without adjuvant. Redroot pigweed control was excellent across all herbicides and all application timings, due to the late emergence and poor weed growth during the early season. Large grade yields were significantly greater with the high and medium application rates regardless of adjuvant, except where no adjuvant was included, where only the highest rate was significantly greater.

Table. Effect of adjuvant on herbicide efficacy and yield for weed control in onion at Oakes, ND.

Treatment			Visual Evaluations		Yield		
Herbicide	Adjuvant	Rate (herbicide + adjuvant)	colq[1]	rrpw[2]	Medium[3]	Large[4]	Total
		-(product/A)-	-% control-		-lbs/A-		
Oxyflourfen	MSO	2 oz + 0.5% v/v	95.0	100	15395.3	32771.4	51407.9
Oxyflourfen	MSO	1 oz + 0.5% v/v	85.0	100	22147.7	21427.5	46816.3
Oxyflourfen	MSO	0.5 oz + 0.5% v/v	62.5	100	20437.1	11343.9	38353.3
Oxyflourfen	POC	2 oz + 1 pt/A	95.0	100	13864.8	22867.9	39523.8
Oxyflourfen	POC	1 oz + 1 pt/A	87.5	100	18186.3	23588.2	44025.3
Oxyflourfen	POC	0.5 oz + 1 pt/A	53.8	100	14495.1	1530.5	24038.4
Oxyflourfen	None	2 oz	73.8	100	28539.9	9993.5	44025.3
Oxyflourfen	None	1 oz	48.8	100	9363.3	10173.5	25658.9
Oxyflourfen	None	0.5 oz	28.8	100	3511.2	0	8733.1
Bromoxynil	MSO	4 oz + 0.5% v/v	100	100	19896.9	29080.1	53118.5
Bromoxynil	MSO	2 oz + 0.5% v/v	93.5	100	19266.9	29530.3	52578.3
Bromoxynil	MSO	1 oz + 0.5% v/v	65.0	100	16565.8	15485.4	40334.0
Bromoxynil	POC	4 oz + 1 pt/A	100	100	22867.9	35202.2	62931.9
Bromoxynil	POC	2 oz + 1 pt/A	82.3	100	28810.0	30430.6	64462.4
Bromoxynil	POC	1 oz + 1 pt/A	62.5	87.5	17916.2	16205.7	39793.8
Bromoxynil	None	4 oz	87.5	100	22507.8	31511.0	58430.3
Bromoxynil	None	2 oz	40.0	100	6392.3	3331.2	14585.1
Bromoxynil	None	1 oz	27.5	100	2520.9	540.2	9543.3
Hand weeded check	--	--	100	100	20167.0	540.2	30160.5
Weedy check	--	--	0	0	0	0	1080.4
LSD	--	--	16.8	3.8	8884.9	15238.5	20658.6

[1]common lambsquarters, [2]redroot pigweed, [3]medium grade is 2.25-3 in, [4]large grade is 3 in and >, [5]oxyfluorfen water based formulation

Micro-rate application timings for weed control in onion, Oakes, ND. Loken, James R., Harlene Hatterman-Valenti, Collin Auwarter, and Walt Albus. An experiment was conducted at the North Dakota State Research Arboretum to evaluate the most effective number of sequential micro-rate applications for early-season, broadleaf weed control in onion (*Allium cepa* L.). The soil was an Embden sandy loam with 2.4% organic matter and 6.7 pH. Onion variety 'Teton' pelleted seed was planted at 285,000 seeds/A using a Monosem four row double-line planter on April 23. Plots were 6 ft wide by 17 ft long and arranged in a randomized complete block design with four replicates. At time of weed cotyledon stage (May 16) herbicides were applied as micro-rates at 1/8 of their lowest labeled rates every 7 days, with three, four, and five total applications. Herbicide micro-rates were applied with a CO_2 pressurized backpack sprayer. A standard application of bromoxynil and oxyfluorfen was applied on June 24 (4-leaf stage) to control broadleaf weeds. Another standard application of bromoxynil and oxyfluorfen was made on July 1 (5-6-leaf stage) as a final late-season broadleaf weed control measure. Standard applications were applied using a tractor mounted sprayer. Best management practices were used for fertility, disease, insect, and grass weed control. Treatments were evaluated for overall control of redroot pigweed (*Amaranthus retroflexus* L.) and common lambsquarters (*Chenopodium album* L.) after all micro-rate treatments were completed using a visual evaluation on June 30. On September 24, 5 ft of the middle two rows of each plot were harvested for grade and yield analysis. After harvest, onions were allowed to cure and then were graded. Split and diseased bulbs were graded as culls regardless of diameter.

Herbicide application dates, timings, and environmental conditions for Oakes, 2008.

Application Date:	5-16	5-26	6-3	6-9	6-16	6-24	7-1
Onion Stage:	loop	flag-1 lf	1-2 lf	2 lf	3 lf	4 lf	5-6 lf
Air Temp., (F):	75	50	53	61	70	75	75
Wind speed, (MPH):	5	4	6.5	2.7	4	5	5
Operating Pressure:	40 psi	40 psi	40 psi	40 psi	40 psi	40 psi	
Nozzle Type:	Flat Fan	Flat Fan	Flat Fan	Flat Fan	Flat Fan	Flat Fan	
Nozzle Size:	8002	8002	8002	8002	8002	8002	
Spray Volume, GPA:	20	20	20	20	20	20	

Results: Visual ratings indicated excellent common lambsquarters control with bromoxynil and oxyfluorgen applied four or five times, and bromoxynil applied four or five times and oxyfluorfen applied five times provided control similar to that of the untreated check. Redroot pigweed control was excellent across all herbicides and all application timings, due to the late emergence and poor weed growth during the early season. There were no yield differences within herbicides across application timings. This indicates the importance of season long weed control as weed emergence continued through the entire growing season, further reducing yields.

Table. Effect of adjuvant on herbicide efficacy and yield for weed control in onion at Oakes, ND.

Treatment			Visual Evaluations		Yield		
Herbicide	Adjuvant	Rate (herbicide + adjuvant)	colq[1]	rrpw[2]	Medium[3]	Large[4]	Total
		product/A	% control		lbs/A		
Oxyflourfen[5]	MSO	1 oz + 0.5% v/v	87.5	100	13324.6	32231.2	48256.8
Oxyflourfen	MSO	1 oz + 0.5% v/v	94.8	100	15125.3	36462.7	54108.8
Oxyflourfen	MSO	1 oz + 0.5% v/v	98.8	100	20257.1	25839.0	49517.2
Bromoxynil	MSO	2 oz + 0.5% v/v	81.3	100	17286.0	31150.8	51047.7
Bromoxynil	MSO	2 oz + 0.5% v/v	90.0	100	16565.8	31420.9	50597.6
Bromoxynil	MSO	2 oz + 0.5% v/v	94.8	100	20257.1	37182.9	59591.7
Hand weeded check	--	--	100	100	20167.0	540.2	30160.5
Weedy check	--	--	0	0	0	0	1080.4
LSD	--	--	8.4	0	7083.1	12659.1	12135.3

[1]common lambsquarters, [2]redroot pigweed, [3]medium grade is 2.25-3 in, [4]large grade is 3 in and >, [5]oxyfluorfen water based formulation

Adjuvants improve micro-rate herbicide efficacy for weed control in onion, Absaraka, ND. Loken, James R., Harlene Hatterman-Valenti, Collin Auwarter. An experiment was conducted at the North Dakota State Research Arboretum to compare early-season, broadleaf weed control of bromoxynil or oxyflourfen (water based formulation) applied as micro-rates plus adjuvants to the same herbicides applied as micro-rates without adjuvants for weed control in onion (*Allium cepa* L.). The soil was a Spottswood sandy loam with 2.0% O.M., 7.2 pH, and soybean as the previous crop. Onion variety 'Teton' pelleted seed was planted at 220,000 seeds/A using a Milton four row double-line planter on May 4. Plots were 6 ft wide by 20 ft long and arranged in a randomized complete block design with four replicates. At the time weeds reached the cotyledon stage (May 21), the herbicides bromoxynil or oxyflourfen (water based formulation) plus MSO were applied as micro-rates at 1/8 of their lowest labeled rates approximately every 7 days, with four total applications. Herbicide micro-rates were applied with a CO_2 pressurized backpack sprayer. A standard application of bromoxynil (1.5 pt/A) and oxyfluorfen (4 oz/A) was applied on July 17 (5-6-leaf stage) as a final late-season broadleaf weed control measure. Best management practices were used for fertility, disease, insect, and grass weed control. Treatments were evaluated for overall control of redroot pigweed (*Amaranthus retroflexus* L.) and common lambsquarters (*Chenopodium album* L.) after all micro-rate treatments were completed using a visual evaluation on July 3. On October 17, 5 ft of the middle two rows of each plot were harvested for grade and yield analysis. After harvest, onions were allowed to cure and then were graded. Split and diseased bulbs were graded as culls regardless of diameter.

Herbicide application dates, timings, and environmental conditions for Absaraka, 2008.

Application Date:	5-21	5-28	6-5	6-14	7-17
Onion Stage:	PRE	Loop-flag	1 lf	1½-2 lf	5-6 lf
Air Temp., (F):	57	68	58	72	73
Wind Speed, (MPH):	1	7	2.5	2.5	5
Operating Pressure:	40 psi	40 psi	40 psi	40 psi	40 psi
Nozzle Type:	Flat Fan	Flat Fan	Flat Fan	Flat Fan	Flat Fan
Nozzle Size:	8002	8002	8002	8002	8002
Spray Volume, GPA:	20	20	20	20	20

Results: Micro-rate herbicide applications plus adjuvants provided excellent control of common lambsquarters at the highest application rates regardless of herbicide and regardless of adjuvant. These applications provided superior control to the herbicide treatments without adjuvant. Redroot pigweed control was excellent across all herbicides and all application timings, due to the late emergence and poor weed growth during the early season. Large grade yields were significantly greater with the high and medium application rates regardless of adjuvant, except with the treatments with bromoxynil plus MSO and the treatments with no adjuvant included, where only the highest rate was significantly greater.

Table. Effect of adjuvant on herbicide efficacy and yield for weed control in onion at Absaraka, ND.

Treatment			Visual Evaluations		Yield		
Herbicide	Adjuvant	Rate (herbicide + adjuvant)	colq[1]	rrpw[2]	Medium[3]	Large[4]	Total
		-(product/A)-	-% control-		-lbs/A-		
Oxyflourfen	MSO	2 oz + 0.5% v/v	73.8	100	5491.9	38803.5	45645.8
Oxyflourfen	MSO	1 oz + 0.5% v/v	47.5	100	10623.7	25929.0	40063.9
Oxyflourfen	MSO	0.5 oz + 0.5% v/v	40.0	100	4951.8	20077.0	31420.9
Oxyflourfen	POC	2 oz + 1 pt/A	63.8	100	6212.2	28449.9	36642.7
Oxyflourfen	POC	1 oz + 1 pt/A	55.0	100	9543.3	29440.2	41414.4
Oxyflourfen	POC	0.5 oz + 1 pt/A	33.8	100	9903.5	9363.3	22507.9
Oxyflourfen	None	2 oz	30.0	100	3511.3	6392.2	13144.6
Oxyflourfen	None	1 oz	26.3	100	7652.7	10353.6	20977.3
Oxyflourfen	None	0.5 oz	13.8	100	9903.5	7472.6	22597.9
Bromoxynil	MSO	4 oz + 0.5% v/v	99.8	100	12424.3	47986.7	64192.3
Bromoxynil	MSO	2 oz + 0.5% v/v	86.3	100	11253.3	33131.5	47716.6
Bromoxynil	MSO	1 oz + 0.5% v/v	60.0	100	12154.3	28089.8	45015.7
Bromoxynil	POC	4 oz + 1 pt/A	92.5	100	11974.2	46366.1	60681.1
Bromoxynil	POC	2 oz + 1 pt/A	76.3	99.8	14675.1	39253.6	58520.3
Bromoxynil	POC	1 oz + 1 pt/A	46.3	100	12064.2	16205.6	33761.7
Bromoxynil	None	4 oz	42.5	100	11433.9	33131.5	48616.9
Bromoxynil	None	2 oz	23.8	100	9273.2	5581.9	20887.3
Bromoxynil	None	1 oz	12.5	100	8553.0	2700.9	17646.2
Hand weeded check	--	--	100	100	5581.9	5221.8	17286.0
Weedy check	--	--	0	0	0	0	540.2
LSD	--	--	13.0	0.1	6255.8	14153.7	14675.0

[1]common lambsquarters, [2]redroot pigweed, [3]medium grade is 2.25-3 in. [4]large grade is 3 in and >, [5]oxyfluorfen water based formulation

Micro-rate application timings for weed control in onion, Absaraka, ND. Loken, James R., Harlene Hatterman-Valenti, Collin Auwarter. An experiment was conducted at the North Dakota State Research Arboretum to evaluate the most effective number of sequential micro-rate applications for early-season, broadleaf weed control in onion (*Allium cepa* L.). The soil was a Spottswood sandy loam with 2.0% O.M., 7.2 pH, and soybean as the previous crop. Onion variety 'Teton' pelleted seed was planted at 220,000 seeds/A using a Milton four row double-line planter on May 4. Plots were 6 ft wide by 20 ft long and arranged in a randomized complete block design with four replicates. At the time weeds reached the cotyledon stage (May 21), the herbicides bromoxynil or oxyflourfen (water based formulation) plus MSO were applied as micro-rates at 1/8 of their lowest labeled rates approximately every 7 days, with three, four, or five total applications. Herbicide micro-rates were applied with a CO_2 pressurized backpack sprayer. A standard application of bromoxynil (1.5 pt/A) and oxyfluorfen (4 oz/A) was applied on July 17 (5-6-leaf stage) as a final late-season broadleaf weed control measure. Best management practices were used for fertility, disease, insect, and grass weed control. Treatments were evaluated for overall control of redroot pigweed (*Amaranthus retroflexus* L.) and common lambsquarters (*Chenopodium album* L.) after all micro-rate treatments were completed using a visual evaluation on July 3. On October 17, 5 ft of the middle two rows of each plot were harvested for grade and yield analysis. After harvest, onions were allowed to cure and then were graded. Split and diseased bulbs were graded as culls regardless of diameter.

Herbicide application dates, timings, and environmental conditions for Absaraka, 2008.

Application Date:	5-21	5-28	6-5	6-14	6-19	7-17
Onion Stage:	PRE	Loop-flag	1 lf	1½-2 lf	2 lf	5-6 lf
Air Temp., (F):	57	68	58	72	80	73
Wind Speed, (MPH):	1	7	2.5	2.5	3	5
Operating Pressure:	40 psi	40 psi	40 psi	40 psi	40 psi	40 psi
Nozzle Type:	Flat Fan	Flat Fan	Flat Fan	Flat Fan	Flat Fan	Flat Fan
Nozzle Size:	8002	8002	8002	8002	8002	8002
Spray Volume, GPA:	20	20	20	20	20	20

Results: Visual ratings indicated excellent common lambsquarters control with bromoxynil applied five times, and this was the only treatment that provided control similar to that of the untreated check. Oxyflourfen provided fair to poor control of common lambsquarters regardless of application timings. Redroot pigweed control was excellent across all herbicides and all application timings, due to the late emergence and poor weed growth during the early season. There were no yield differences within herbicides across application timings. This indicates the importance of season long weed control as weed emergence continued through the entire growing season, further reducing yields.

Table. Effect of adjuvant on herbicide efficacy and yield for weed control in onion at Absaraka, ND.

Treatment			Visual Evaluations		Yield		
Herbicide	Adjuvant	Rate (herbicide + adjuvant)	colq[1]	rrpw[2]	Medium[3]	Large[4]	Total
		product/A	% control		lbs/A		
Oxyflourfen[5]	MSO	1 oz + 0.5% v/v	80.0	99.8	15845.5	28089.8	49157.1
Oxyflourfen	MSO	1 oz + 0.5% v/v	87.5	100	14855.2	43665.2	64192.3
Oxyflourfen	MSO	1 oz + 0.5% v/v	98.3	100	10443.6	35472.3	51497.9
Bromoxynil	MSO	2 oz + 0.5% v/v	62.5	100	9003.2	24578.6	36642.8
Bromoxynil	MSO	2 oz + 0.5% v/v	71.3	100	3781.3	23318.1	31691.0
Bromoxynil	MSO	2 oz + 0.5% v/v	65.0	100	8462.9	20977.3	32321.2
Hand weeded check	--	--	100	100	5581.9	5221.8	17286.0
Weedy check	--	--	0	0	0	0	0
LSD	--	--	9.1	0.3	6109.4	15247.3	16615.6

[1]common lambsquarters, [2]redroot pigweed, [3]medium grade is 2.25-3 in, [4]large grade is 3 in and >, [5]oxyfluorfen water based formulation

Influence of Tillage and Herbicides in Onion - 2007 & 2008. Sarah Gegner, Harlene Hatterman-Valenti, Walt Albus, Collin Auwarter

Objectives

The main objective for this research is to evaluate the potential for strip-tillage in onion production and to understand the influence of strip-tillage on factors such as weed seed germination, soil moisture content, soil temperature, and erosion control. In addition, the effect of strip-tillage on herbicide efficacy in onion prior to the two-leaf growth stage will be evaluated.

Materials and Methods

A field experiment was conducted during the 2007 and 2008 field seasons at the North Dakota State University Research Extension Center near Oakes, North Dakota, on an Embden loam soil. The experiment was set up as 2X4 factorial in 2007 and a strip plot with herbicide as the whole plot and tillage as the subplot in 2008. The whole plot consisted of strip-tillage or conventional tillage; the subplots consisted of herbicide treatments. The strips were made fall 2006 and 2008 and again in the spring right before planting, using a shank type unit; the conventional tillage treatment was Roto-tilled twice in the fall and again before planting. Onion cultivar Teton was planted April 20, 2007 and April 23, 2008 in double rows at a rate of 250,000 and 285,000 seeds per acre, respectively. Plots were 6 feet wide and 17 feet long with 4 feet allies between each replicate.

Herbicides included DCPA (Dacthal), pendimethalin (Prowl H20), oxyfluorfen (Goaltender), and bromoxynil (Buctril). DCPA and pendimethalin were applied as pre-emergence herbicides on April 30, 2007 and May 1, 2008; post-emergence applications with reduced rates of oxyfluorfen or bromoxynil (micro-rates) were made at four weekly intervals starting when annual broadleaf weeds reached the cotyledon to first true-leaf stage. The first application was made on May 16, 2007 and 2008. Pre-emerge applications were applied at 10 lbs/acre and 1.5 pt/acre for DCPA and pendimethalin, respectively. Micro-rate applications were applied at 2 oz/acre and 4 oz/acre for oxyfluorfen and bromoxynil, respectively. The entire experiment received a post-emergence application of clethodim (Select) after the onions had reached the two-leaf growth stage and an application of dimethenamid-P (Outlook) when onions were at the five-leaf stage, to help minimize late-season weeds. Best management practices were used for fertility, irrigation, disease, and insect control throughout the entire experiment.

Herbicide effectiveness was evaluated through weed counts using a square foot area in the center of each plot. Visual ratings were taken seven days after the fourth micro-rate application to also evaluate weed control; a scale of 0-100 percent control was used where 0 equals no control and 100 equals complete control. Annual broadleaf weeds of most concern were common lambsquarters, redroot pigweed, and hairy nightshade. Weed counts were taken seven days after each herbicide micro-rate application.

Plots were hand harvested on September 4, 2007 and September 24, 2008. Onion bulbs were graded into four classes according to USDA standards: small (1-2 ¼ inches), medium (2 ¼-3 inches), large (3-4 inches) and colossal (4+ inches). Total marketable yield included grades medium and large.

Results

Micro-rate herbicide applications made prior to the two-leaf growth stage did not injure onions during establishment in either 2007 or 2008 field seasons(data not shown).

During the 2007 field season, tillage had an effect on the germination of common lambsquarters and redroot pigweed. There were significantly more weed seedlings in the conventionally tilled treatments than the strip-tilled treatments. Hairy nightshade was significantly reduced with the weekly applications of herbicide. Common lambsquarters weed seedlings were significantly greater in the pendimethalin treatment. Redroot pigweed and hairy nightshade were best controlled with micro-rate applications of oxyfluorfen and bromoxynil (data not shown).

During the 2008 field season, there was little to no redroot pigweed pressure in all treatments. Common lambsquarters and hairy nightshade weed pressure was significantly reduced with the weekly applications of herbicides (Figures 1-4). DCPA had significantly greater hairy nightshade weed pressure than the other three herbicides (Figures 1 and 2). Results of 2008 showed no significant differences in tillage on weed seed germination (Figures 1-4).

In 2007 and 2008, onion yield grade did vary between tillage system and herbicide but generally was only numerically higher with the strip tillage and herbicide treatment for the various onion grades. Results of 2007 indicated a significant increase in onions graded between 3- and 4-inch diameters within the strip-tilled treatments (data not shown).

Conclusions

Yield data indicated that strip tillage has the potential to yield significantly the same as conventional tillage. With the added savings of a strip-tilled system, it may be more economical to utilize a strip-tillage system for onion production.

Figure 1. Hairy Nightshade weed counts in strip-tillage averaged across reps for 2008 field season. Weed counts were taken at 4 weekly intervals starting May 23, 2008.

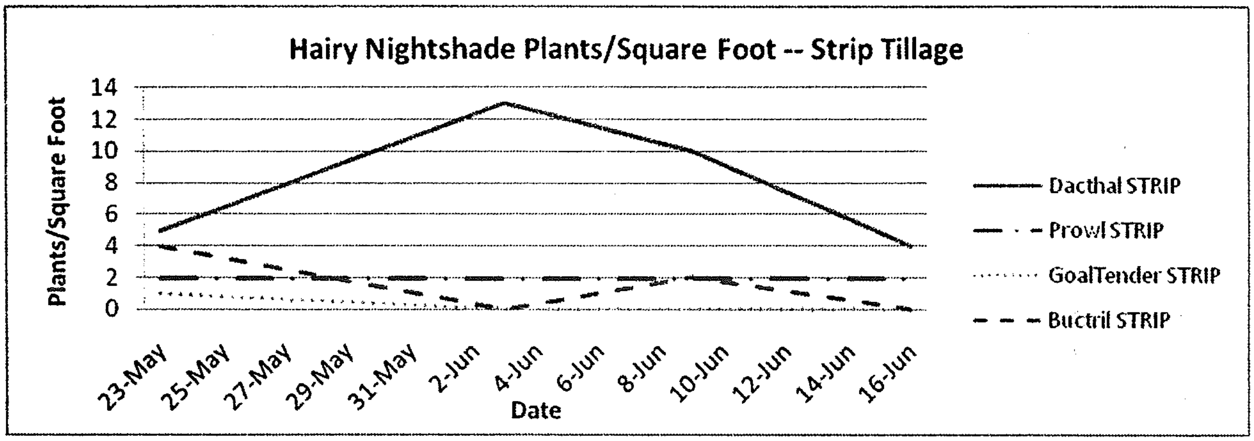


Figure 2. Hairy Nightshade weed counts in conventional tillage averaged across reps for the 2008 field season. Weed counts were taken at 4 weekly intervals starting May 23, 2008.

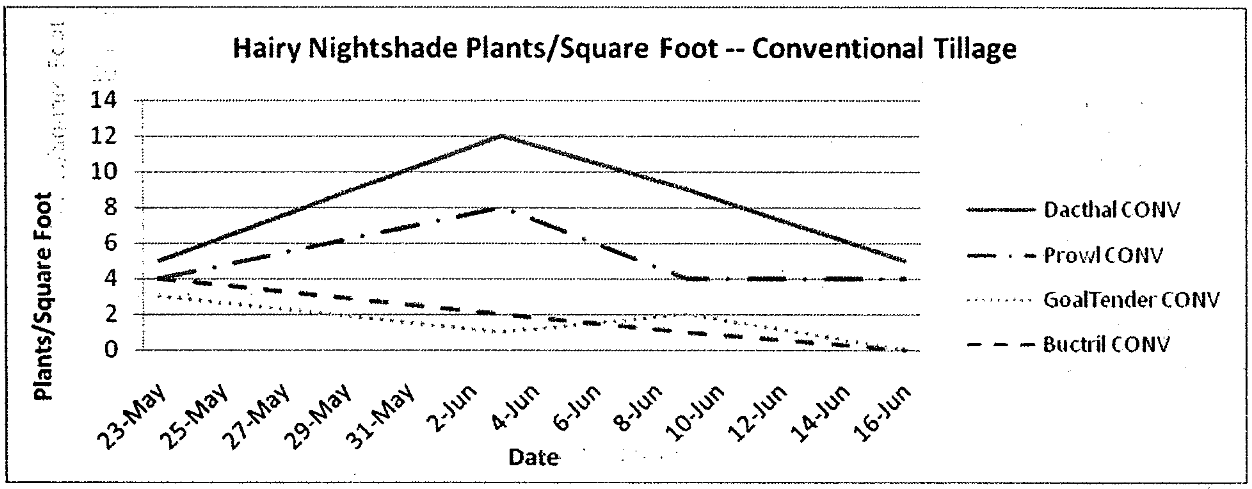


Figure 3. Common Lambsquarters weed counts in strip-tillage averaged across reps for the 2008 field season. Weed counts were taken at 4 weekly intervals starting May 23, 2008.

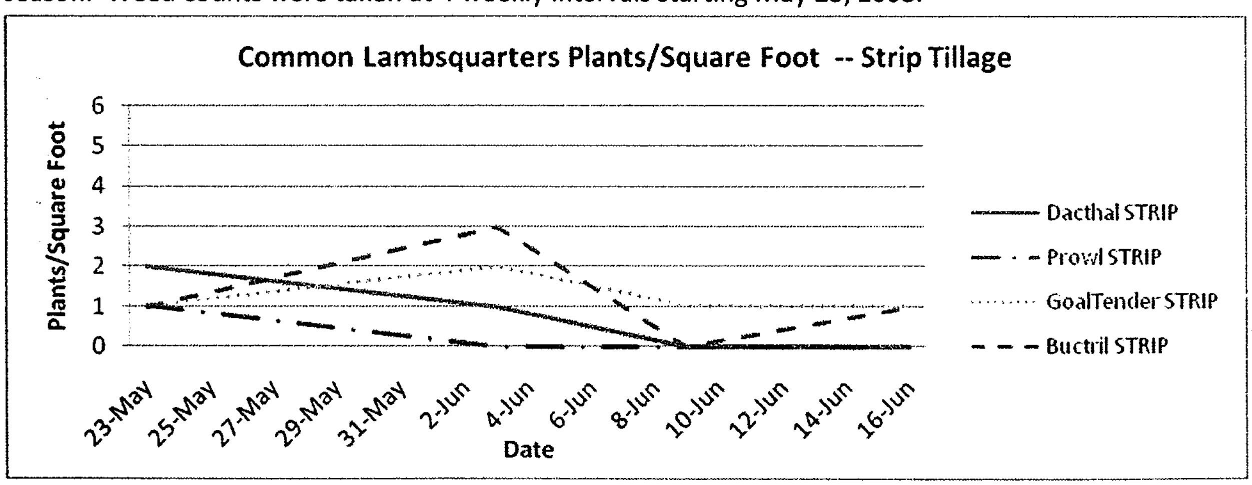
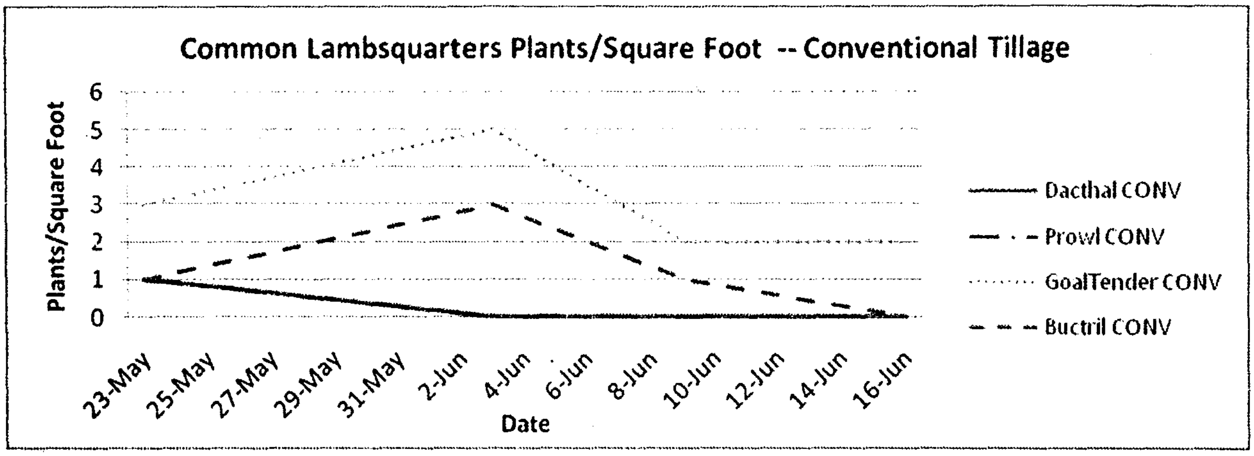


Figure 4. Common Lambsquarters weed counts in conventional tillage averaged across reps for the 2008 field season. Weed counts were taken at 4 weekly intervals starting May 23, 2008.



Simulated glyphosate drift to seed potatoes. Harlene M. Hatterman-Valenti and Collin P. Auwarter.
A study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate the effect of glyphosate drift to daughter tubers when the herbicide was applied the previous year to potatoes at different growth stages. The study was conducted on loamy sand soil with 1.8 % organic matter and 7.7 pH. Onions were grown the previous year. Plots were 4 rows by 25 ft arranged in a randomized complete block design with four replicates. Seed pieces (2 oz) were taken from plot samples placed into cold storage at 65° F with approximately 90% RH until the following year at which time they were planted on 36 inch rows and 12 inch spacing (May 13). The previous year glyphosate was applied to irrigated Russet Burbank potatoes at the tuber hook stage (TH), tuber set stage (TI), early bulking stage (EB), and late tuber bulking/early senescence stage (LB) at rates one-third, one-sixth, one-twelfth, and one-twenty-forth the standard use rate (0.25, 0.125, 0.0625, and 0.0313 lb ae/A). The plots were 2 rows by 10 ft arranged in a randomized complete block design with four replicates. Extension recommendations were used for cultural practices. Plots were desiccated on September 19, harvested October 11 and graded into the various categories after harvest.

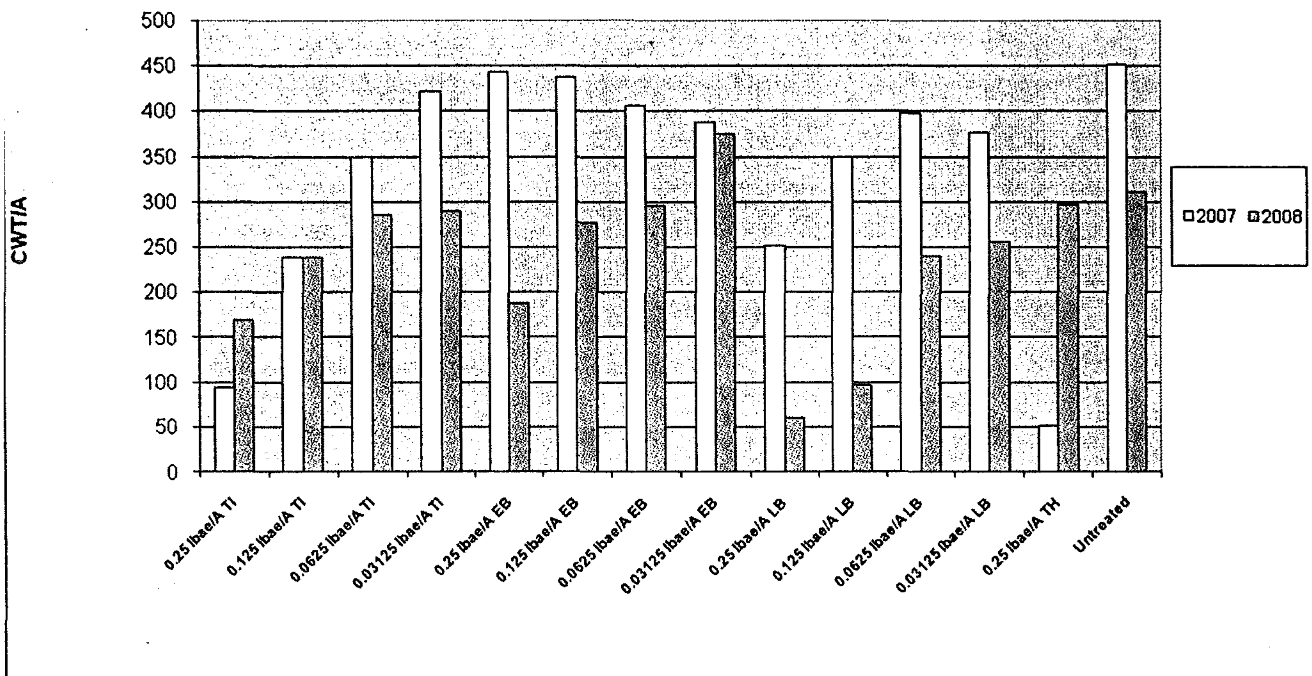


Figure 1. CWT/A of marketable tubers from 2007 and 2008

Total yield was reduced when daughter tubers were planted from plants receiving glyphosate at the TI, EB, and LB stages and significantly increased at the TH stage in 2008. (Figure 1). Potatoes treated with 0.25 lb/A glyphosate at the TH stage in 2007 produced significantly more tubers in 2008 primarily due to the early application in the season and not much glyphosate moving into the seed tubers (Figure 2). Potatoes treated with 0.25 and 0.125 lb/A at the LB stage showed a yield loss of 200 and 100 cwt/A, respectively, compared to the untreated during 2007. In 2008, seed from these two treatments resulted in a loss of 329 and 250 cwt/A compared to the untreated.

Potatoes treated with 0.25 lb/A glyphosate at the LB stage in 2007 and replanted in 2008 had nearly two-thirds of total yield unmarketable.

Potatoes treated at the tuber hooking stage had a significantly lower yield of tubers >4 oz with 51 cwt/A in 2007. In contrast, replanted seed had a yield of 297 cwt/A of tubers >4 oz in 2008.

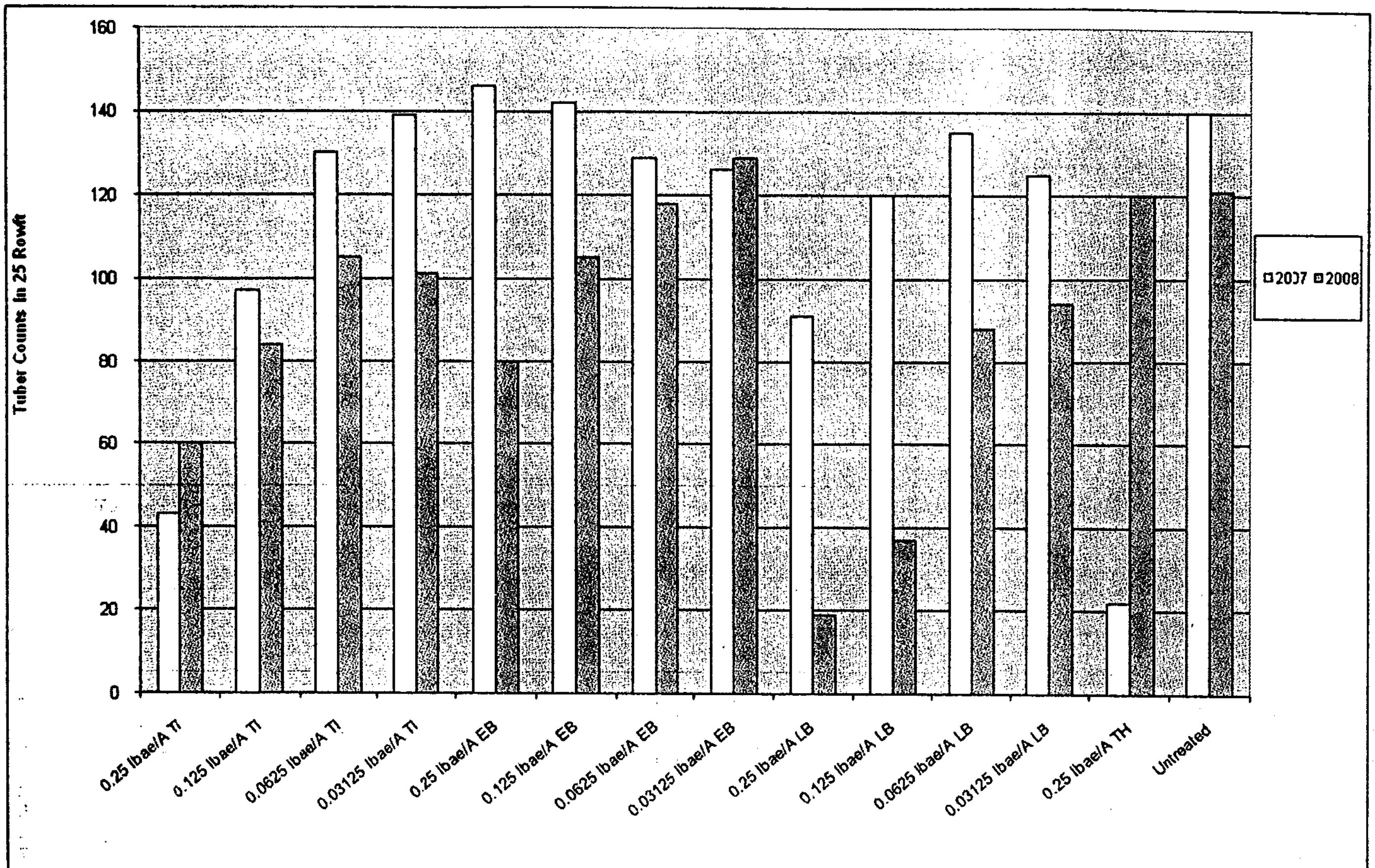


Figure 2. 2007 vs 2008 >4 Ounce Tuber Counts

Simulated Glyphosate Drift in Potatoes at Different Growth Stages. Harlene M. Hatterman-Valenti and Collin P. Auwarter. A study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate glyphosate drift on potatoes at different growth stages. The study was conducted on loamy sand soil with 1.8 % organic matter and 7.7 pH. Onions were grown the previous year. Plots were 4 rows by 25 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 on May 13. The objective of this study was to compare the injury from glyphosate applied to irrigated Russet Burbank potatoes at the tuber hook stage (TH), tuber set stage (TI), early bulking stage (EB), and late tuber bulking/early senescence stage (LB). Potatoes were planted on June 2 using a Harrison double-row planter with 12 inch spacing between seed pieces and 36 inches between rows. Glyphosate was applied at rates one-third, one-sixth, one-twelfth, and one-twenty-forth the standard use rate (0.25, 0.125, 0.0625, and 0.0313 lb ae/A) on June 26, July 7, July 23, and August 25 with a CO_2 pressurized sprayer equipped with 8002 flat-fan nozzles with a spray volume of 30 GPA and a pressure of 40 psi. The amount of AMS added to the spray solution was also reduced accordingly. Field design was a randomized complete block, factorial arrangement, with four replications. Extension recommendations were used for cultural practices. Vines were desiccated 2 weeks prior to harvest with diquat (0.5 lb ai/A), and flailed one day prior to harvest. Harvesting was done with a single-row Hasia harvester on October 19.
Application, environmental, and crop data are listed below:

Date:		6/26	7/7	7/23	8/25
Treatment:		POST	POST	POST	POST
Sprayer:	GPA:	30	30	30	30
	PSI:	40	40	40	40
	Nozzle:	8002	8002	8002	8002
Temperature:	Air (F):	72	71	73	72
	Soil (4 inch):	71	75	73	77
Rel. hum. (%)		50	66	50	85
Wind (mph)		8	6	9	6
Soil moisture:		Adequate	Adequate	Adequate	Adequate
Cloud cover:		20	50	20	60

Summary: Total yield from plants treated with 0.25 lb/A glyphosate at the TH, TI, and EB stages or with 0.125 lb/A glyphosate at the TI and EB stages were significantly lower than any other treatment, except 0.063 lb/A glyphosate at the TI stage. Results were similar for marketable tubers except that plants treated with 0.063 lb/A glyphosate at the TI stage also had significantly less marketable tubers. Glyphosate caused an increase in cull tubers when potatoes were treated with 0.25 or 0.125 lb/A at TI in comparison to the untreated. Glyphosate also depressed tuber growth. Fewer 4 to 6 oz tubers were produced when potatoes were treated with 0.25 lb/A glyphosate at the TH, TI, and EB stages. Likewise, fewer 6 to 10 oz tubers were produced when potatoes were treated with 0.25 lb/A glyphosate at the TH, TI, and EB stages, or with 0.125 lb/A glyphosate at the TI and EB stages, or with 0.063 lb/A glyphosate at the TI stage. Large tuber production (>10 oz) was decreased when plants were treated with 0.25 lb/A glyphosate at the TH, TI, or LB stages, or when treated with 0.125 lb/A glyphosate at the TI and EB stages, or when treated with 0.063 lb/A glyphosate at the TI stage.
The negative tuber yield effect from simulated glyphosate drift was most severe at the TH, TI, and EB stages. Total yield was reduced 2X, 2X, and 1.9X, respectively, when plants were treated with 0.25 lb/A glyphosate at the TH, TI, and EB stages, and marketable yield was reduced 2.7X, 4X, and 3.4X, respectively, when plant were treated with 0.25 lb/A glyphosate at the TH, TI, and EB stages, compared to the untreated. It was concluded that the effect of air temperature on vine growth and tuber production contributed to the differences between years.

Table 1. Yield and grade after glyphosate spray drift to potatoes.

Treatment	Tuber Stage	Rate	<4 oz	4-6 oz	6-8 oz	8-10oz	10-12 oz	>12 oz	total
			----------CWT/A----------						
Glyphosate AMS	TH	0.25 lb ae/A 4 lb/100 gal	149bc	55cd	24c	8c	5c	4c	244c
Glyphosate AMS	TI	0.25 lb ae/A 4 lb/100 gal	206a	78bcd	28c	11c	4c	1c	328bc
Glyphosate AMS	TI	0.125 lb ae/A 2 lb/100 gal	155bc	121ab	68ab	34bc	17bc	23abc	418ab
Glyphosate AMS	TI	0.0625 lb ae/A 1 lb/100 gal	125bc	132a	99a	65a	37a	38ab	495a
Glyphosate AMS	TI	0.0313 lb ae/A 0.5 lb/100 gal	161b	60cd	28c	12c	4c	8bc	274c
Glyphosate AMS	EB	0.25 lb ae/A 4 lb/100 gal	138bc	97abc	49bc	28c	8c	5c	325bc
Glyphosate AMS	EB	0.125 lb ae/A 2 lb/100 gal	140bc	136a	98a	59ab	27ab	29abc	489a
Glyphosate AMS	EB	0.0625 lb ae/A 1 lb/100 gal	108c	117ab	95a	60ab	37a	48a	465a
Glyphosate AMS	EB	0.0313 lb ae/A 0.5 lb/100 gal	140bc	135a	100a	58ab	28ab	39ab	499a
Glyphosate AMS	LB	0.25 lb ae/A 4 lb/100 gal	138bc	135a	101a	57ab	34ab	37ab	502a
Glyphosate AMS	LB	0.125 lb ae/A 2 lb/100 gal	124bc	128a	99a	60ab	37abc	32abc	480a
Glyphosate AMS	LB	0.0625 lb ae/A 1 lb/100 gal	120bc	130a	104a	60ab	28a	42a	483a
Glyphosate AMS	LB	0.0313 lb ae/A 0.5 lb/100 gal	118bc	48d	30c	20c	12abc	31abc	259c
Untreated			131bc	134a	100a	70a	32a	51a	518a

:heminova metribuzin for weed control in irrigated potatoes. Harlene Hatterman-Valenti and Collin Auwarter.

ı study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ID to evaluate crop safety and weed control with Cheminova metribuzin on irrigated Russet Burbank. ıpplication information is provided below. The experiment was a randomized complete block design with four eplicates.

Sprayer: GPA	20	20
PSI	40	40
Nozzle	8002 flat-fan	8002 flat-fan
Application Date:	6/4/2008	6/26/2008
Application Timing:	PRE	POST
Air Temperature:	55 F	70 F
Rel. Humidity:	92%	60%
Wind Velocity	4	8
Soil Moisture:	Normal	Normal
% Cloud Cover:	90	50

'able 2. Weed control 20, 40, and 80 days after treatment.

Treatment	Rate	Applic	20DAA			40 DAA			80 DAA		
	lb ai/A	timing	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft
ntreated			0	0	0	0	0	0	0	0	0
etribuzin	0.5	A	100	100	95	100	100	94	98	100	99
etribuzin	1.0	A	100	100	96	100	98	97	100	100	96
:ncor	0.5	A	100	100	88	100	99	94	100	100	98
etribuzin	0.25	B	0	0	0	100	100	94	99	100	96
etribuzin	0.5	B	0	0	0	100	100	97	100	100	98
:ncor	0.25	B	0	0	0	99	96	90	100	100	96
SD 0.05			---	---	7	1	4	4	2	---	4

ummary: For the preemergence application, the 2L bottles (mixed16 hours prior to application) were difficult o get the Metribuzin into solution again. Possibly not enough room to agitate even though the Sencor bottles nixed easily. There were no mixing problems with the postemergence Metribuzin applications. No crop injury vas observed and all treatments generally provided good season-long weed control.

Reflex for weed control in irrigated potatoes. Harlene Hatterman-Valenti and Collin Auwarter.

A study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate crop safety and weed control with Reflex on irrigated Russet Burbank. Application information is provided below. The experiment was a randomized complete block design with four replicates.

Sprayer: GPA	20	20
PSI	40	40
Nozzle	8002 flat-fan	8002 flat-fan
Application Date:	6/4/2008	6/26/2008
Application Timing:	PRE	POST
Air Temperature:	55 F	70 F
Rel. Humidity:	92%	60%
Wind Velocity	4	8
Soil Moisture:	Normal	Normal
% Cloud Cover:	90	50

Table 2. Weed control 20, 40, and 80 days after treatment.

Treatment	Rate	Applic	20DAA			40 DAA			80 DAA		
	oz ai/A	timing	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft
Untreated			0	0	0	0	0	0	0	0	0
Reflex	4	A	90	99	88	94	98	95	95	100	98
Reflex	8	A	99	98	85	97	100	90	100	100	100
Dual Magnum	15.3	A	88	99	98	91	100	100	98	100	100
Reflex+Dual Mag	4+15.3	A	98	100	99	94	100	100	99	99	98
Boundary	19.4	A	100	100	98	100	100	98	99	99	99
Boundary+Reflex	19.4+4	A	100	100	100	99	100	99	99	100	100
Boundary+Reflex	19.4+2	A	100	100	100	99	100	99	99	100	99
Dual Mag+Sencor	15.3+3	A	100	100	99	99	100	100	99	100	100
Dual Mag+Matrix	15.3+ 0.25	A	100	100	99	98	100	99	99	100	98
Matrix + MSO	0.375	B	0	0	0	90	99	98	96	100	99
LSD 0.05			4	2	6	6	2	4	4	1	2

Summary: No crop injury was observed and all treatments generally provided excellent season-long weed control.

'riCore for weed control in irrigated potatoes. Harlene Hatterman-Valenti and Collin Auwarter.

ι study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ID to evaluate crop safety and weed control with TriCore on irrigated Russet Burbank. Application information ; provided below. The experiment was a randomized complete block design with four replicates.

Sprayer: GPA	20	20
PSI	40	40
Nozzle	8002 flat-fan	8002 flat-fan
Application Date:	6/4/2008	6/26/2008
Application Timing:	PRE	POST
Air Temperature:	55 F	70 F
Rel. Humidity:	92%	60%
Wind Velocity	4	8
Soil Moisture:	Normal	Normal
% Cloud Cover:	90	50

'able 2. Weed control 20, 40, and 80 days after treatment.

Treatment	Rate	Applic		20DAA			40 DAA			80 DAA	
	lb ai/A	timing	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft
ntreated			0	0	0	0	0	0	0	0	0
'iCore	0.5	A	100	100	98	100	100	92	100	100	98
'iCore+Matrix	0.375+ 0.047	A	100	100	98	100	100	95	100	100	98
:iCore+Matrix+ 'owl H2O	0.375+ 0.047 +1.0	A	100	100	99	99	100	96	100	100	98
:iCore + utlook	0.375+ 1.0	A	100	100	100	100	100	94	100	100	96
riCore+Matrix	0.375+ 0.047	B	0	0	0	100	100	94	100	100	98
SD 0.05			---	---	---	2	---	7	---	---	4

Summary: No crop injury was observed and all treatments generally provided excellent season-long weed :ontrol.

V-10206 for weed control on dryland potatoes. Harlene Hatterman-Valenti and Collin Auwarter.

An experiment was conducted at NDSU Fargo, ND to evaluate crop safety and weed control with V-10206 on Red Norland. The field was field cultivated prior to planting. Red Norland, was planted June 23, 2008. Fertilizer, insecticides and fungicides were applied as needed. Potatoes were hilled on July 15. Application information is provided below. The experiment was a randomized complete block design with four replicates.

Sprayer: GPA	20
PSI	40
Nozzle	8002 flat-fan
Application Date:	7/15/2008
Time of Day:	12:00
Application Timing:	PRE
Air Temperature:	65 F
Rel. Humidity:	70%
Wind Velocity	0
Soil Moisture:	adequate
% Cloud Cover:	10

Table 2. Weed control 10 and 40 days after treatment.

Treatment	Rate	Injury	10 DAA			40 DAA		
	lb ai/A		Rrpw	Colq	Yeft	Rrpw	Colq	Yeft
		%						
V-10206	0.106	5	98	80	97	100	100	97
V-10206	0.213	5	96	93	100	95	100	98
Chateau	0.047	10	96	89	93	91	100	97
Dual Magnum	1.2	0	85	83	99	93	100	96
V10206+Chateau	0.106 + 0.047	19	97	96	100	96	100	99
V10206+Chateau	0.213 + 0.047	22	97	96	99	99	100	100
Untreated		0	0	0	0	0	0	0
LSD 0.05		10	14	20	9	6	---	4

Summary: Injury from V-10206 was slight stunting whereas stem necrosis occurred with Chateau. Direct herbicide contact or contact shortly after application with the emerging stems were determined to be responsible for the observed injury as the clay loam soil clumped during the hilling procedure leaving large air spaces and plants emerged shortly after hilling. All provided season-long control of the main annual broadleaf and grass species that infest potato land.

<u>V-10206 for weed control in irrigated potatoes.</u> Harlene Hatterman-Valenti and Collin Auwarter.

A study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate crop safety and weed control with V-10206 on irrigated Russet Burbank. Application information is provided below. The experiment was a randomized complete block design with four replicates.

<u>Sprayer</u>: GPA	20
PSI	40
Nozzle	8002 flat-fan

Application Date:	6/4/2008
Application Timing:	PRE
Air Temperature:	61 F
Rel. Humidity:	77%
Wind Velocity	4
Soil Moisture:	Normal
% Cloud Cover:	90

Table 2. Weed control 20, 40, and 80 days after treatment.

Treatment	Rate	20DAA				40 DAA					80 DAA		
	lb ai/A	Injury	Colq	Rrpw	Yeft	Injury	Colq	Rrpw	Yeft	Wibu	Colq	Rrpw	Yeft
Untreated		0	0	0	0	0	0	0	0	0	0	0	0
V-10206	0.106	0	100	99.3	92.5	0	98.3	100	91.3	91.3	100	100	91.3
V-10206	0.213	2.5	100	100	97.5	1.3	100	100	87.5	93.8	100	100	93.8
Chateau	0.047	11.3	100	97.5	97.5	5	100	95	81.3	93.8	100	100	87.5
Dual Magnum	1.2	0	100	100	88.8	0	93.8	100	90	85	96	100	88.8
V10206+Chateau	0.106 + 0.047	17.5	100	100	98.8	8.8	100	100	90	95	100	100	91.3
V10206+Chateau	0.213 + 0.047	8.8	100	100	100	6.3	100	100	92.5	95	100	100	90
Outlook	0.84	0	100	100	95	0	100	100	90	93.8	100	100	91.3
LSD 0.05		3.5	---	1.5	3.7	2.0	4.1	5.2	8.0	4.1	2.5	0	10.8

<u>Summary:</u> All Chateau treatments caused some potato injury as did the high rate of V-10206. However, by 80 DAA all symptoms of injury were not noticeable. Weed control with V-10206 treatments were similar to Dual II Magnum and Outlook treatments. All treatments provided good season-long weed control.

V-10142 for weed control in dryland potatoes. Harlene Hatterman-Valenti and Collin Auwarter.

An experiment was conducted at NDSU Fargo, ND to evaluate crop safety and weed control with V-10142 on Red Norland. The field was field cultivated prior to planting. Red Norland, was planted June 23, 2008. Fertilizer, insecticides and fungicides were applied as needed. Potatoes were hilled on July 15. Application information is provided below. The experiment was a randomized complete block design with four replicates.

Sprayer: GPA	20	20
PSI	40	40
Nozzle	8002 flat-fan	8002 flat-fan
Application Date:	7/15/2008	8/18/2008
Time of Day:	12:00	10:00
Application Timing:	PRE	POST
Air Temperature:	65 F	80 F
Rel. Humidity:	70%	65%
Wind Velocity	0	5
Soil Moisture:	Below normal	Above normal
% Cloud Cover:	0	25

Table 2. Weed control 10 and 40 days after treatment.

Treatment	Rate lb ai/A	Applic timing	Injury	10 DAA Rrpw	10 DAA Colq	10 DAA Yeft	40 DAA Rrpw	40 DAA Colq	40 DAA Yeft
			%						
V-10142	0.2	A	0	94	70	100	92	100	100
V-10142	0.3	A	0	99	70	99	99	100	97
V-10142	0.4	A	2	95	69	100	87	100	97
V10142 + V10142 + Dyna-A-Pak	0.2+0.2 + 1%	A+B	1	97	76	100	95	100	99
V10142 + V10142 + Dyna-A-Pak	0.3+0.3 + 1%	A+B	0	96	75	100	95	100	99
V10142 + V10142 + Dyna-A-Pak	0.4+0.2 + 1%	A+B	0	99	65	99	95	100	95
Sencor + Dual Magnum + Matrix + NIS	0.2+1.0 +0.016 +0.25%	A+B	0	97	96	100	97	100	99
Untreated			0				0	0	0
LSD 0.05			2	8	32	1	14	---	5

Summary: Injury from V-10142 was very minor stunting. V-10142 control of common lambsquarters was below satisfactory control (≥85%) at 10 DAA. Plants were very small but present. However, by the end of the season all treatments provided satisfactory control of the main annual broadleaf and grass species that infest potato land.

-10142 for weed control in irrigated potatoes. Harlene Hatterman-Valenti and Collin Auwarter.

. study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, D to evaluate crop safety and weed control with V-10206 on irrigated Russet Burbank. Application ıformation is provided below. The experiment was a randomized complete block design with four replicates.

;prayer: GPA	20	20
PSI	40	40
Nozzle	8002 flat-fan	8002 flat-fan
Application Date:	6/4/2008	6/26/2008
Application Timing:	PRE	POST
Air Temperature:	55 F	70 F
Rel. Humidity:	92%	60%
Wind Velocity	4	8
Soil Moisture:	Normal	Normal
% Cloud Cover:	90	50

'able 2. Weed control 20. 40, and 80 days after treatment.

Treatment	Rate	Applic	20DAA			40 DAA			80 DAA		
	lb ai/A	timing	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft
ntreated			0	0	0	0	0	0	0	0	0
·10142	0.2	A	100	100	92.3	99.8	100	86.3	93.8	98.8	100	97.5
·10142	0.3	A	100	100	97.3	100	100	82.5	92.5	100	100	95
·10142	0.4	A	100	100	97	99.8	100	87.5	93.8	100	100	97.5
10142 + 10142 + Dyna- ·Pak	0.2+0. 2 + 1%	A+B	100	100	92.5	98.8	100	90	95	100	100	98.8
10142 + 10142 + Dyna- ·Pak	0.3+0. 3 + 1%	A+B	100	100	89.8	100	100	90	91.3	100	100	97.5
10142 + 10142 + Dyna- ·Pak	0.4+0. 2 + 1%	A+B	100	100	92.5	100	100	86.3	96.3	100	100	93.8
10142+DualII ag+V10142+ yna-A-Pak	0.2+1.0 +0.2+ 1%	A+B	100	100	95.8	100	100	91	93.8	100	100	97.5
atrix+DualII ag + Matrix + IS	0.016+1 +0.016 +0.25 %	A+B	98.8	100	99.5	100	100	97.3	90	100	100	98.8
ualII ag+Sencor V10142+Dyna- -Pak	1.0+0.2 +0.2+1 %	A+B	100	100	100	100	100	96.3	93.8	98.8	100	97.5
ualII lag+Sencor Matrix+NIS	.0+0.2+ 0.016+ 0.25%	A+B	100	100	100	100	100	96.3	91.3	100	100	98.8
SD 0.05			1.09	---	6.07	1.15	---	5.56	3.18	1.56	---	3.66

Summary: No crop injury was observed and all treatments generally provided good season-long weed control.