Corn, soybean, and safflower tolerance to KIH-485. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate crop response to KIH-485 applied PRE. DeKalb 'DKC35-51' RUR corn, Asgrow 'AG0801' soybean, and 'Finch' safflower were planted perpendicular to each plot length on June 5, 2007. PRE treatments were applied on June 12 at 10:30 am with 87 F air, 71 soil at a 4 inch depth, 52% relative humidity, 25% cloud cover, 9 to 16 mph SE wind, dry soil surface, and wet subsoil. Soil characteristics were 2.8% sand, 63.8% silt, 33.4% clay, silty clay loam texture, 4.4% OM, and pH 7.7. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

PRE application was delayed due to an extended period of rain after planting. Safflower and a few soybean were emerging at the time of PRE applications. The three crops were safe to KIH-485. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Corn, soybean, and safflower tolerance to KIH-485 (Zollinger and Ries).

		14 DAT			28 DAT		
Treatment[1]	Rate	Corn	Soybean	Safflower	Corn	Soybean	Safflower
	(product/A)	------- % injury -------			------- % injury -------		
KIH-485	1oz	0	0	0	0	0	0
KIH-485	2oz	0	0	0	0	0	0
KIH-485	3oz	0	0	0	0	0	0
KIH-485	3.5oz	0	0	0	0	0	0
KIH-485	4oz	0	0	0	0	0	0
KIH-485	5oz	0	0	0	0	0	0
KIH-485	8oz	0	0	0	0	0	0
Dual II Magnum	1.05pt	0	0	0	0	0	0
Dual II Magnum	1.36pt	0	0	0	0	0	0
Dual II Magnum	1.68pt	0	0	0	0	0	0
Dual II Magnum	2pt	0	0	0	0	0	0
Dual II Magnum	3pt	0	0	0	0	0	0
Dual II Magnum	4pt	0	0	0	0	0	0
Dual II Magnum+Reflex	1.1pt+1pt	18	0	83	8	0	80
Dual II Magnum+Reflex	2pt+1pt	27	0	92	17	0	82
Outlook	18fl oz	0	0	0	0	0	0
Prowl	2.6pt	0	0	0	0	0	0
Valor	2oz	0	0	95	0	0	92
Harness	1.49pt	0	13	13	0	10	13
Harness	1.83pt	0	22	75	0	20	75
Harness	2.17pt	0	25	90	0	55	90
Harness	2.74pt	0	52	90	0	70	90
Harness	4.34pt	27	92	92	27	92	92
Untreated		0	0	0	0	0	0
LSD (0.05)		4	3	4	7	4	5

[1]KIH-485 = pyroxasulfone from Kumiai America.

KIH-485 carryover to rotational crops. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted at two locations near Valley City, ND, to evaluate crop response to KIH-485 carryover. At the 'Location A', PRE treatments at were applied on June 7, 2006 at 11:15 am with 73 F air, 66 soil at a 4 inch depth, 31% relative humidity, 0% cloud cover, 5 to 9 mph N wind, dry soil surface, and moist subsoil. Soil characteristics were 61.2% sand, 27.4% silt, 11.4% clay, sandy loam texture, 4.3% OM, and pH 5.5. At the 'Location B', PRE treatments were applied on June 7, 2006 at 10:45 am with 76 F air, 65 soil at a 4 inch depth, 43% relative humidity, 0% cloud cover, 4 to 9 mph N wind, dry soil surface, and moist subsoil. Soil characteristics were 65.2% sand, 23.4% silt, 11.4% clay, sandy loam texture, 2.9% OM, and pH 6.6. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a bicycle-type plot sprayer delivering 17 gpa at 40 psi through 8002 Turbo TeeJet flat-fan nozzles. Both locations were kept weed free during 2006 from applications of glyphosate. Study areas were lightly tilled in the fall and spring to prepare the seed bed for planting in 2007. At both locations, 'Phoenix' canola, 'Nekoma' flax, 'Drummond' Barley, 'Crystal R431' sugarbeet, 'Ensign' navy bean, and 'Maverick' pinto bean were planted perpendicular to each plot length on May 17, 2007. The experiment had randomized complete block design with three replicates per treatment.

On June 18, Locations A and B, there was evidence of previous excessive rain and standing water. All crops were 2 to 6 inches tall. No stunting was observed. Significant crop stunting was found for KIH-485 at 7 oz/A only on canola and sugarbeet. Crop safety to KIH-485 appears to be adequate for most crops planted the year after application. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. KIH-485 carryover to rotional crops, 'Location A' (Zollinger and Ries).

		12 MAT						13 MAT					
Treatment[1]	Rate	Navy	Pinto	Sugarbeet	Canola	Flax	Barley	Navy	Pinto	Sugarbeet	Canola	Flax	Barley
	(product/A)	% injury						% injury					
KIH-485	1.76oz	0	0	0	0	0	0	0	0	0	0	0	0
KIH-485	3.5oz	0	0	10	3	0	0	0	0	2	0	0	0
KIH-485	7oz	0	0	30	15	0	0	0	0	2	5	0	0
Dual II Magnum	1.67pt	0	0	0	0	0	0	0	0	0	0	0	0
Harness	2.27pt	0	0	0	0	0	0	0	0	0	0	0	0
Untreated		0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		NS	NS	10	8	NS	NS	NS	NS	3	6	NS	NS

[1]KIH-485 = pyroxasulfone from Kumiai America.

Table. KIH-485 carryover to rotional crops, 'Location B' (Zollinger and Ries).

		12 MAT						13 MAT					
Treatment[1]	Rate	Navy	Pinto	Sugarbeet	Canola	Flax	Barley	Navy	Pinto	Sugarbeet	Canola	Flax	Barley
	(product/A)	% injury						% injury					
KIH-485	1.4oz	0	0	3	5	0	0	0	0	2	2	0	0
KIH-485	2.8oz	0	0	22	18	0	0	0	0	7	7	0	0
KIH-485	5.6oz	2	5	40	25	0	0	0	0	25	13	0	0
Dual II Magnum	1.33pt	0	0	0	0	0	0	0	0	0	0	0	0
Harness	1.77pt	0	0	0	0	0	0	0	0	0	0	0	0
Untreated		0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		2	6	10	8	NS	NS	NS	NS	7	4	NS	NS

[1]KIH-485 = pyroxasulfone from Kumiai America.

Weed control in transplanted 'Blue Thunder' cabbage. 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'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 May 15. Initial herbicide treatments consisted of herbicides (Dual Magnum, Outlook, Prowl H_20 and Dacthal) applied shortly after transplanting using a CO_2-pressurized sprayer. The remaining treatments (Goal and GoalTender) were applied June 1 and if a repeat application the same rate was applied two additional times with a weekly interval. Crop injury and weed control were evaluated 5 and 10 weeks after initial treatments. Water was not limiting as irrigation was scheduled as needed. Select was applied with MSO on June 28 for post-emergence grass control. Cabbages were harvested August 21 and September 4. Application, environmental, crop, and weed data are listed below:

Date:		5/18/07	6/1/07	6/8/07	6/15/07
Treatment:		Post	Post	Post	Post
Sprayer:	gpa/psi:	20/40	20/40	20/40	20/40
	nozzle:	11001	11001	1101	11001
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

Weed control evaluations indicated that a single application of Goal did not provide adequate weed control. The post-emergence applications of Goal caused more visible injury than GoalTender to cabbage leaves, but head did not show any injury. The greatest total yield from the two harvests was when Prowl H_2O was applied post-transplant at 0.71 lb/A. Average cabbage head weight was greater than 5 lbs. for several herbicide treatments (Dacthal, Outlook, Dual Magnum, and GoalTender). Results indicate that there are several herbicides that could be registered for use on transplanted cabbage.

Table 1. Effect of herbicide on broadleaf weed control 10 WAT, cabbage yield and head quality.

							Yield		Head		Core	
Trt	Treatment	Rate	Colq	Rrpw	Copu	Fipc	Total	Head	Height	Diameter	Height	Diameter
No		lb ai/A	---------- % ----------				lb/plot	lb	---------- inches ----------			
1	Hand-weeded		100	100	100	100	47	4.8	5.8	6.9	2.4	1.2
2	Goal	0.06	81	71	80	78	28	3.0	5.1	6.0	2.3	1.2
3	Goal (3)*	0.06	91	100	98	96	48	4.9	6.2	7.3	3.2	1.4
4	Goal Tender	0.25	98	100	94	97	54	5.4	6.2	7.3	2.6	1.4
5	Goal Tender	0.19	90	98	96	83	45	4.5	5.5	6.9	2.9	1.3
6	Goal Tender (3)*	0.06	81	100	100	96	47	5.2	6.0	7.2	3.0	1.4
7	Dual Magnum	1.4	91	98	94	95	52	5.4	5.8	7.2	3.1	1.5
8	Outlook	0.98	98	96	91	97	57	5.8	6.0	7.9	3.2	1.4
9	Prowl H_2O	0.71	98	91	96	95	60	6.3	6.3	8.0	3.3	1.3
10	Dacthal	10.5	100	92	95	30	57	5.9	6.3	7.7	2.7	1.3
LSD (P=.05)			5	11	14	11	13	1.6	1.5	0.5	1.0	0.6

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

Weed control in transplanted 'Silver Dynasty' cabbage. 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 'Slver 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 May 15. Initial herbicide treatments consisted of herbicides (Dual Magnum, Outlook, Prowl H_20 and Dacthal) applied shortly after transplanting using a CO_2-pressurized sprayer. The remaining treatments (Goal and GoalTender) were applied June 1 and if a repeat application the same rate was applied two additional times with a weekly interval. Crop injury and weed control were evaluated 5 and 10 weeks after initial treatments. Water was not limiting as irrigation was scheduled as needed. Select was applied with MSO on June 28 for post-emergence grass control. Cabbages were harvested August 14 and 28. Application, environmental, crop, and weed data are listed below:

Date:		5/18/07	6/1/07	6/8/07	6/15/07
Treatment:		Post	Post	Post	Post
Sprayer:	gpa/psi:	20/40	20/40	20/40	20/40
	nozzle:	11001	11001	1101	11001
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

Weed control evaluations indicated that a single application of Goal did not provide adequate weed control. The post-emergence applications of Goal caused more visible injury than GoalTender to cabbage leaves, but head did not show any injury. The greatest total yield from the two harvests was when GoalTender was applied postemergence at 0.25 lb/A. Prowl H_2O did not provide adequate season-long redroot pigweed or field pennycress control, but did have cabbage with the second highest average head weight, which was attributed to cabbage's competitiveness. Results indicate that there are several herbicides that could be registered for use on transplanted cabbage.

Table 1. Effect of herbicide on broadleaf weed control 10 WAT, cabbage yield and head quality.

							Yield		Head		Core	
Trt	Treatment	Rate	Colq	Rrpw	Copu	Fipc	Total	Head	Height	Diameter	Height	Diameter
No		Lb ai/A	---------- % ----------				lb/plot	lb	---------- inches ----------			
1	Hand-weeded		100	100	100	100	46	4.7	6.7	7.0	2.3	1.2
2	Goal	0.06	91	70	70	70	26	2.7	5.7	5.7	2.0	1.0
3	Goal (3)*	0.06	91	100	100	92	48	5.0	6.6	7.0	2.4	1.1
4	Goal Tender	0.25	96	91	96	95	57	6.1	7.1	7.4	2.5	1.3
5	Goal Tender	0.19	90	93	81	90	47	5.1	6.8	7.3	2.5	1.1
6	Goal Tender (3)*	0.06	80	96	98	93	44	4.8	6.8	7.0	2.6	1.1
7	Dual Magnum	1.4	90	98	86	95	53	5.3	6.6	7.0	2.6	1.3
8	Outlook	0.98	95	94	85	97	40	4.4	6.5	7.0	2.4	1.2
9	Prowl H_2O	0.71	90	70	91	80	52	5.7	7.1	7.5	2.7	1.3
10	Dacthal	10.5	98	86	92	45	45	4.8	6.8	7.2	2.4	1.2
LSD (P=.05)			10	12	9	13	13	1.1	0.4	0.5	0.5	0.1

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

Camelina response to herbicide applied to soil. Kirk Howatt, Ronald Roach, and Janet Harrington. Preplant incorporated (PPI) treatments were applied and incorporated with 2 cultivator passes, camelina was seeded, and preemergence (Pre) treatments were applied at Fargo, ND. All treatments were applied May 3, with application conditions of 56 F air temperature, 42% RH, 0% cloud-cover, 20 mph wind at 135° and moist soil at 54 F. The treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to a 7 ft wide area the length of 10 by 30 ft plot. The experiment was a randomized complete block design with 4 replicates.

Treatment	Rate	Growth stage	6/19 Camolina
	oz ai/A		% injury
Trifluralin	12	PPI	37
Trifluralin	12	Pre	13
Ethalfluralin	12	PPI	0
Ethalfluralin	12	Pre	0
Pendimethalin	12	PPI	0
Pendimethalin	12	Pre	0
Metribuzin-DF	4	PPI	99
Metribuzin-DF	4	Pre	98
Mesotrione	3	PPI	99
Mesotrione	3	Pre	99
Dimethenamid-p	12	PPI	96
Dimethenamid-p	12	Pre	92
Acetochlor	20	PPI	96
Acetochlor	20	Pre	93
Metolachlor	16	PPI	10
Metolachlor	16	Pre	5
Sulfentrazone	3	PPI	99
Sulfentrazone	3	Pre	99
Untreated	0		0
CV			5
LSD (P=0.05)			4

Metribuzin, mesotrione, dimethenamid, acetochlor, and sulfentrazone caused substantial injury and nearly eliminated the entire stand. Few plants remained in these plots regardless of preplant incorporation or preemergence application. Even trifluralin caused injury that resulted in slight stand reduction and a more open canopy than other dinitroanalin herbicides. Trifluralin was three times as injurious to camelina when incorporated compared with preemergence application. Metolachlor also caused more injury when incorporated but injury only reached 10%. Ethafluralin and pendimethalin did not cause visible injury with either application method. The study was terminated after initial observation because of excessive water damage.

Residual Olympus and Everest effect on Canola and Barley. Langdon 2007. John Lukach. The site was no tillage wheat stubble which had 20 by 50 foot Olympus and Everest treatments applied in 2006. A heavy flush of false chamomile was sprayed with 0.5oz Harmony Extra + 0.25%NIS +0.67pt Starane on May 7, at 8pm. Foxtail barley, mostly fall emerged, was rated May 29 the sprayed with Roundup 1qt/a. 'Glenn' hrsw, 'Stellar' barley and 'Dekalb 5010 RR' canola were seeded on May 31. The crops were seeded in 13 foot wide strips resulting in four reps of 13 by 20 foot plots for each crop. Harvest plot size was 52" by 15 feet. An application of Stinger 2oz/a was applied to reduce broadleaf weeds in all crops.

		May 29	---------- Canola ----------									-------6 row Barley----------					------- HRSW -------			
2006	2006	Control	--- Jul 13 ---		-- Aug 29 --							Jul 13	Aug 29				Aug 29			
Treatment	Rate	Foba	Inj	std red	Inj	wioa	Yield	Ht	flower	pm		Inj	wioa	bu/a	tw	ht	Wioa	Yield	Twt	Ht
	oz/a	%	%	%	%	plt/yd2	lb/a	cm	July	Aug		%	plt/yd2	bu/a	lb/bu	cm	plt/yd2	bu/a	lb/bu	cm
Olympus+NIS	0.2+0.25%	11.3	0.8	0.0	0.6	3.9	1314	125	11.5	24.5		0.0	2.0	53.0	48.1	91.5	2.3	39.8	60.7	97.5
Olympus+NIS	0.4+0.25%	36.3	5.0	0.0	3.8	3.1	1246	122	12.5	24.8		0.3	3.3	57.4	47.1	79.0	2.8	35.4	60.4	95.5
Olympus+NIS	0.6+0.25%	48.8	3.8	3.8	9.4	2.5	1337	116	12.5	26.3		4.5	1.0	46.6	46.8	93.0	2.3	32.0	60.4	94.0
Olympus+NIS	0.8+0.25%	65.0	8.8	13.8	17.5	0.8	1422	126	12.3	28.5		6.3	2.3	55.3	47.3	90.3	2.5	43.2	60.3	100.3
Everest+NIS	0.6+0.25%	13.8	0.0	0.0	0.0	1.6	1788	116	11.5	25.5		0.0	4.3	35.1	46.9	67.8	3.3	37.0	60.9	89.0
Olym+Ever+NIS	0.2+0.3+0.25%	8.8	0.0	0.0	0.0	2.4	1436	122	10.8	24.8		0.0	3.5	61.4	47.9	73.8	2.5	39.1	61.0	96.0
Olym+Ever+NIS	0.4+0.6+0.25%	43.8	5.0	6.3	4.4	1.9	1464	119	12.0	26.3		1.8	3.0	60.8	47.6	76.3	2.0	40.5	61.0	99.3
Untreated	----	0.0	1.3	0.0	0.6	2.6	1566	117	11.3	25.3		0.0	3.3	43.9	46.5	72.0	3.0	38.6	60.7	99.8
	LSD 5%	13.3	NS	NS	6.7	NS	300	NS	NS	1.7		2.7	NS	15.6	NS	12.5	NS	NS	NS	NS
	C.V. %	31.7	173.1	218.7	100.3	80.1	14	7	7.7	4.6		113.9	49.9	20.5	2.2	10.6	47.9	13.6	1.4	6.8

Flower is Date in July that canola started flowering.
pm – Date in August that canola was physiologically mature.

Late fall and early spring, 2007, emergence of foxtail barley was reduced by in no-tillage plots to which Olympus and Everest had been applied on June 27 of 2006. Wild oats was also slightly reduced in June of 2007, non-significant. Canola and Barley showed little injury except at the 0.8 oz/a Olympus rate and had significant yield differences that don't agree between crops.

Weed control in Liberty Link Canola, Langdon 2007. John Lukach. 'Invigor 5550' canola was seeded May 1 at 5 lb/a. Treatments were applied June 4 on 4 leaf canola. Weeds included 4 leaf wild buckwheat, 5 leaf wild oat and vol. hrsw, emerged to 3 inch lambsquarter, common mallow and vol flax, and thick cotyledon stage redroot pigweed. Conditions at 10:30am were 62°F, 55%RH, north wind at 12 mph, partly cloudy and foliage dry. A tractor mounted CO2 sprayer with wind shield was used delivering 10 gpa, 40 psi, 4.5 mph, DG8001.5 tips with four 20 inch spaced nozzles on 25ft plots. The experiment had a RCBD design with four replications.

Treatment	Rate	8-Jun	1-Aug									
	oz/a	Inj	Colq	Rrpw	Vflax	Coma	Wibu	Vwht	Wioa	Yield	Ht	Oil
		% Control								lb/a	cm	%
Liberty, old,+SelectMax+AMS	32+3+1.5lb	0	99	100	100	100	97	100	98	2197	122	44.3
Liberty, old,+SelectMax+AMS	28+3+1.5lb	0	93	100	100	98	90	100	100	2141	121	45.0
Liberty, old,	32	0	98	100	100	100	93	99	98	2135	120	45.9
Liberty, new,+SelectMax+AMS	28+3+1.5lb	0	94	100	99	99	97	100	100	2106	121	45.8
Liberty, new,	32	0	99	100	100	100	98	99	98	2100	120	45.0
Liberty, new,+AMS	32+1.5lb	0	99	100	99	100	99	100	99	2094	121	44.9
Untreated	----	0	0	0	0	0	0	0	0	1816	122	43.5
LSD 5%		NS	2.6	0.5	1.4	2.0	8.7	0.8	2.4	173.4	NS	NS
C.V. %		0	2.1	0.4	1.1	1.6	7.1	0.6	1.9	5.6	2.9	1.6

Old and New – Potential adjuvant change in formulation

Chickling Vetch Response to Spartan and Beyond Herbicides

Eric Eriksmoen, Hettinger, ND

'AC Greenfix' chickling vetch was seeded on May 4. Pre-emergence (PRE) treatments were applied on May 8 with 58° F, 69% RH, clear sky and northwest wind at 4 mph. Post-emergence (POST) treatments were applied on May 24 to 6 node (2" tall) chickling vetch, to one inch tall kochia (kocz), 2 leaf Persian darnel (peda) and to 2 leaf wild oat (wiot) with 59° F, 37% RH, mostly clear sky and northwest wind at 9 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to 3 by 23 foot plots. The trial was a randomized complete block design with four replications. Kochia, Persian darnel and wild oat populations averaged 14, 18 and 4 plants per square foot, respectively. Plots were evaluated for crop injury on June 9, for crop establishment on June 20 and for crop injury and weed control on June 26. Persian darnel was evaluated only in one rep. The trial was harvested on August 8.

	Treatment	Application Rate	App. timing	Crop Stand	6/9 inj	June 26 inj	June 26 kocz	June 26 peda	June 26 wiot	Seed Yield
		product oz/A		#/ft^2	% control					lbs/A
1	Spartan	4	PRE	7	2	0	99	0	0	1656
2	Spartan	8	PRE	7	2	0	99	0	0	2359
3	Beyond + NIS + UAN	4 + 0.25% + 2.5%	POST	6	2	0	50	99	99	1299
4	Beyond + NIS + UAN	8 + 0.25% + 2.5%	POST	7	2	0	50	99	99	1591
5	Spartan /	4 /	PRE							
	Beyond + NIS + UAN	4 + 0.25% + 2.5%	POST	7	4	0	96	99	99	1672
6	Spartan /	8 /	PRE							
	Beyond + NIS + UAN	8 + 0.25% + 2.5%	POST	6	3	0	99	99	99	1640
7	Untreated	0		7	0	0	0	0	0	990
	C.V. %			26.3	107	0	2.4	--	0	15.5
	LSD 5%			NS	NS	NS	3	--	1	368

Summary

Crop injury was minor with slight leaf chlorosis which quickly diminished. Crop stands were not affected by treatments. The kochia population in this trial was known to have ALS resistant biotypes. Beyond treatments alone (trts 3 & 4) provided relatively poor kochia control but provided excellent season long Persian darnel and wild oat control. Spartan alone treatments (trts 1 & 2) provided excellent kochia control but did not control Persian darnel or wild oats. The combination of these two herbicides provided excellent season long control of kochia, Persian darnel and wild oats. All treatments had significantly higher seed yields than the untreated check except for the low rate of Beyond alone (trt 3). Chickling vetch appears to have excellent tolerance to Spartan and Beyond herbicides.

Chickling Vetch response to Sulfentrazone. Kirk Howatt, Ronald Roach, and Janet Harrington. 'AC Greenfix' chickling vetch was seeded at Fargo, ND, and preemergence treatments applied May 14 with 72 F, 43% RH, 35% cloud-cover, wind 4 mph at 0° and damp soil with dry top at 70 F. Post treatments (3-5L) were applied to three- to five-leaf chickling vetch on June 12 with 83 F, 66% RH, 10% cloud-cover, 19 mph wind at 180°, and moist soil at 68 F. All treatments were applied with a backpack sprayer delivering 17 and 8.5 gpa at 35 psi through 11002TT and 11001TT nozzles, respectively, 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.

			Chickling vetch	
Treatment	Rate	Grow	6/11	6/19
	oz ai/A	Stg	% injury	
Sulfentrazone	4	Pre	0	0
Sulfentrazone	8	Pre	0	0
Imazamox+NIS+UAN	0.5+0.25%+2.5%	3-5L	0	0
Imazamox+NIS+UAN	1+0.25%+2.5%	3-5L	0	0
Suen/Imazamox+NIS+UAN	4/0.5+0.25%+2.5%	Pre/3-5L	0	0
Suen/Imazamox+NIS+UAN	8/1+0.25%+2.5%	Pre/3-5L	0	0
Untreated	0		0	0
CV			0	0
LSD			0	0

Treatments did not cause visible injury prior to rain events that left several inches of standing water on the study area. Drainage efforts removed much of the water after several days but saturated soils remained for more than 2 weeks. Like flax and camelina, chickling vetch appears to not be able to withstand extended periods of saturated soil. The study was terminated because the only injury observed seemed correlated with soil moisture.

Cuphea response to herbicides. Kirk Howatt, Ronald Roach, and Janet Harrington. Cuphea was seeded to a study area near Prosper, ND. Treatments were applied June 21 with 70 F, 42% RH, 75% cloud-cover, 5 mph wind at 360°, and dry soil at 76 F. Treatments were applied to 3 inch tall cuphea with a backpack sprayer delivering 8.5 gpa at 35 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.

		6/28	7/3
Treatment	Rate	Cuphea	
	oz ai/A	% injury	
Imazamethabenz+NIS	3+0.25%	6	1
Imazamethabenz+NIS	5+0.25%	10	9
Clopyralid	2	6	0
Metribuzin-DF+NIS	3+0.25%	40	52
Pyraflufen+NIS	0.026+0.25%	31	30
Bromoxynil	3	12	11
Bromoxynil&pyrasulfotol	3	60	65
Untreated	0	0	0
CV		28	34
LSD (0.5)		9	10

These herbicides were selected from a greenhouse trial as having the greatest potential for broadleaf weed control in cuphea. Many other herbicides were evaluated but caused extensive injury in the greenhouse and were not included in this study. Imazamox caused severe injury in the greenhouse but imazamethabenz did not appear to cause injury. In the field, imazamethabenz at 5 oz/A only caused 9% injury 14 DAT. Development of the plants did not appear inhibited. Bromoxynil at 3 oz/A cause about 12% injury but plants seemed to recover more effectively than in the greenhouse. A slightly higher rate may be possible to improve weed control if increased injury is acceptable. Clopyralid caused an initial response rated at 6% injury 7 DAT, but plants could not be discerned from untreated plants by 14 DAT.

Grass weed control with clethodim in dry edible bean, Carrington, 2007. (Greg Endres)
The field experiment was conducted at the NDSU Carrington Research Extension Center to test grass weed control and dry bean tolerance to Loveland Products clethodim and adjuvants. The experimental design was a randomized complete block with three replicates. 'Maverick' pinto bean was planted on June 18 in 30-inch rows into previously-seeded spring wheat. Herbicide treatments were applied with a CO_2-hand-boom plot sprayer delivering 10 gal/A at 30 psi through 8001 flat fan nozzles to the center 6.7 ft of 10 by 25 ft plots. Treatments were applied on June 28 with 55 F, 76% RH, 100% cloudy sky, and 4 mph wind to unifoliolate beans, 6- to 8-inch tall (jointing stage) wheat and 2- to 4-inch tall (tillering) leaf yellow and green foxtail. The trial was over-sprayed with Basagran at 32 fl oz plus MSO at 32 fl oz/A on July 2 to control broadleaf weeds.

Volunteer wheat control was good (82-88%) when evaluated about 2 wk after application (WAA) and excellent (94-96%) 4 WAA with LI 6213 or LI6190 at 12 fl oz/A plus adjuvants (Table). Foxtail control was good (80-83%) 2 WAA with LI 6213 or LI6190 at 12 fl oz/A plus adjuvants. LI6190 at 12 fl oz/A plus Quad7 provided excellent control (94%) of foxtail. Minor leaf chlorosis and necrosis was observed on the pinto bean, likely due to response to Basagran plus MSO.

Table.

Herbicide		Grass control[1] 7/13		7/26	Crop injury	
Treatment	fl oz product/A	Spwh	Fxtl	Spwh	7/13	7/26
		%			0-9[2]	
LI 6213	6	65	65	72	1.5	1.5
LI 6190	6	67	72	76	2.0	2.0
LI 6213	12	73	78	90	1.5	1.5
LI 6190	12	70	76	87	1.0	1.0
LI 6213 + LI 6193-11	6 + 1%	72	72	89	1.5	1.5
LI 6190 + LI 6193-11	6 + 1%	74	77	88	1.5	1.5
LI 6213 + LI 6193-11	12 + 1%	82	83	94	2.0	2.0
LI 6190 + LI 6193-11	12 + 1%	88	80	96	1.5	1.5
LI 6190 + Quad7	12 + 1%	83	94	94	1.5	1.5
untreated check		0	0	0	0	0
mean		67	70	79	1.5	1.0
C.V. (%)		4.8	9.0	2.3	27.5	57.2
LSD (0.05)		6	11	3	0.5	1.0

[1]Spwh = spring wheat; Fxtl = yellow and green foxtail.
[2]0 = no injury; 9 = severe leaf chlorosis to necrosis.

Weed control in dry bean. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Thompson, ND, to evaluate crop response and weed efficacy to herbicide treatments applied PPI and PRE to four dry bean types. PPI treatments were applied on May 25 at 9:00 with 52 F air, 51 F soil at a four inch depth, 42% relative humidity, 100% cloud cover, 3 to 5 mph E wind, dry soil surface, and moist subsoil and immediately double incorporated with a field cultivator operating at a 2 to 2.5 inch depth, followed by the planting of 'Montcalm' kidney bean,' Maverick' pinto bean,'T-39' black bean, and 'Ensign' navy bean perpendicular to each plot length. PRE treatments were applied on May 25 at 10:15 am with 52 F air, 51 F soil surface, 42% relative humidity, 100% cloud cover, 3 to 5 mph E wind, dry soil surface, and moist subsoil. Soil characteristics were 16.3% sand, 57.9% silt, 25.8% clay, 4.5% OM, and pH 7.9. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a bicyle-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-fan nozzles for PPI and PRE treatments. The experiment had randomized complete block design with three replicates per treatment.

PPI treatments were safe to dry bean and controlled weeds. Lower rates of KIH-485 were safe to dry beans and controlled weeds. Injury type was stunting. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Weed control in dry bean (Zollinger and Ries).

		30 DAT - PPI and PRE							
Treatment[1]	Rate	Pinto	Navy	Kidney	Black	Yeft	Rrpw	Colq	Kochia
	(product/A)	------ % injury ------				----- % control -----			
PPI									
Eptam+Sonalan	3.5pt+2pt	0	0	0	2	99	99	99	94
Eptam+Permit	3.5pt+0.67pt	5	0	8	8	99	99	99	84
Eptam+Treflan	3.5pt+1pt	1	0	6	5	99	99	99	88
Sonalan	3.5pt	2	1	6	8	99	90	93	82
PRE									
Prowl+Permit	3pt+0.67oz	10	5	8	12	99	99	99	93
KIH-485	2.1oz	1	1	1	2	99	96	99	91
KIH-485	2.8oz	5	5	5	6	99	99	99	94
KIH-485	4.2oz	6	6	6	6	99	99	99	99
KIH-485	5.6oz	10	10	10	10	99	99	99	99
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		2	1	2	4	NS	3	2	5

[1]KIH-485 = pyroxasulfone from Kumiai America.

Dry bean tolerance to KIH-485. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Thompson, ND, to evaluate crop response and weed efficacy to herbicide applications applied PRE to four dry edible bean types. 'Montcalm' kidney bean, ' Maverick' pinto bean, 'T-39' black bean, and 'Ensign' navy bean were planted perpendicular to each plot length on May 25, 2007. PRE treatments were applied on May 25 at 10:40 with 52 F air, 51 F soil at a four inch depth, 46% relative humidity, 100% cloud cover, 3 to 5 mph E wind, dry soil surface, and moist subsoil. Soil characteristics were 16.3% sand, 57.9% silt, 25.8% clay, 4.5% OM, and pH 7.9. POST treatments were applied on June 25 at 9:55 am with 73 F air, 74 F soil surface, 77% relative humidity, 100% cloud cover, 10 to 15 mph SE wind, dry soil surface, wet subsoil, excellent crop vigor, and no dew present to V2 to V3 bean types. Weed species present in plots with PRE applications were: 1 to 4 inch (5 to 15/ft^2) yellow foxtail; and 1 to 6 inch (5 to 15/ft^2) kochia. Weed species present in POST only applications were: 2 to 6 inch (5 to 20/ft^2) yellow foxtail; 2 to 10 inch (5 to 20/ft^2) kochia; 1 to 4 inch (5 to 20/ft^2) redroot pigweed, and 1 to 4 inch (5 to 20/ft^2) common lambsquarters. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a bicycle-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-fan nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles with a backpack-type plot sprayer for POST treatments. The experiment had randomized complete block design with three replicates per treatment.

On June 25, all dry bean types were 2 to 3 trifoliates. All dry bean types had burning and speckling on unifoliate and first trifoliate, which cause is unknown but could be from excess water or hail. Newer leaves were unaffected. Plants were chlorotic and with holes. The grower sprayed the micro-rate containing Reflex which could have drifted and caused speckling. There was stand loss and injury in some plots from standing water.

In Permit plots on July 2 (7 dat), there was no bean injury. Permit had no activity on foxtail, common lambsquarters, or kochia. Redroot pigweed was stunted and yellow. All treatments except Permit applied POST had 0% control of common lambsquarters and 99% of redroot pigweed at PRE/14/28 DAT ratings. Yield was not taken due to excess standing water throughout study.

Injury comments: Low KIH-485 rates showed visual signs of stunting and chlorosis and high rates showed visual signs of stunting, chlorosis, and slight stand loss.

The x rate for soil type was 2.1 oz/A. Dry bean safety to KIH-485 was greater at early evaluations and injury increased over time indicating root uptake. Injury increased as rate increased, although Spartan treatments showed no injury. KIH-485 completely controlled kochia even at the lowest rate indicating lower rates could be used which may provide greater dry bean tolerance. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table cont. Dry bean tolerance to KIH-485 (Zollinger and Ries).

Treatment[1]	Rate	14 DAT - POST						28 DAT - POST					
		Pinto	Navy	Kidney	Black	Yeft	Koch	Pinto	Navy	Kidney	Black	Yeft	Koch
	(product/A)	------ % injury ------				% control		------ % injury ------				% control	
PRE													
KIH-485	2.1oz	0	0	2	5	99	81	18	12	10	5	99	81
KIH-485	2.8oz	3	3	5	8	99	99	10	12	15	15	99	99
KIH-485	3.5oz	5	5	8	10	99	99	12	17	17	18	99	99
KIH-485	4.2oz	5	5	8	12	99	99	8	18	27	25	99	99
KIH-485	5.6oz	13	13	20	23	99	99	17	17	22	23	99	99
KIH-485	7oz	30	30	38	35	99	99	28	38	45	45	99	99
Spartan	3 fl oz	0	0	0	0	55	99	0	0	0	0	55	99
Spartan	4fl oz	0	0	0	0	73	99	0	0	0	0	73	93
Permit	0.67oz	0	0	0	0	40	30	0	0	0	0	40	30
Spartan+KIH-485	3fl oz+2.8oz	2	0	3	5	99	99	0	0	0	2	99	99
Spartan+KIH-485	3fl oz+3.5oz	5	0	9	9	99	99	5	10	10	10	99	99
Spartan+KIH-485	4fl oz+2.8oz	5	0	8	10	99	99	5	0	8	8	99	99
Spartan+KIH-485	4fl oz+3.5oz	5	0	9	12	99	99	5	0	10	10	99	99
Permit+KIH-485	0.67oz+2.8oz	3	0	3	5	99	99	3	0	7	8	99	99
Permit+KIH-485	0.67oz+3.5oz	7	7	15	18	99	99	12	15	20	20	99	99
PRE/POST													
Permit/Permit+NIS+ AMS	0.67oz/0.67oz+0.25% v/v+ 2lb	0	0	0	0	42	23	0	0	0	0	42	23
POST													
Permit+NIS+AMS	0.67oz+0.25% v/v+2lb	0	0	0	0	0	3	0	0	0	0	0	3
Untreated		0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		10	10	15	16	9	8	6	6	12	10	9	8

[1]KIH-485 = pyroxasulfone from Kumiai America, NIS = nonionic surfactant = R-11; AMS = ammonium sulfate.

Table. Dry bean tolerance to KIH-485 (Zollinger and Ries).

Treatment[1]	Rate	31 DAT - PRE					
		Pinto	Navy	Kidney	Black	Yeft	Kochia
	(product/A)	- - - - - - - - % injury - - - - - - - -				- - % control - -	
PRE							
KIH-485	2.1oz	0	0	2	2	99	99
KIH-485	2.8oz	2	2	2	2	99	99
KIH-485	3.5oz	7	5	7	5	99	99
KIH-485	4.2oz	5	3	3	3	99	99
KIH-485	5.6oz	13	13	17	17	99	99
KIH-485	7oz	25	25	25	25	99	99
Spartan	3 fl oz	0	0	0	0	48	99
Spartan	4fl oz	0	0	0	0	73	99
Permit	0.67oz	0	0	0	0	47	30
Spartan+KIH-485	3fl oz+2.8oz	3	0	5	5	99	99
Spartan+KIH-485	3fl oz+3.5oz	5	0	6	6	99	99
Spartan+KIH-485	4fl oz+2.8oz	5	0	7	7	99	99
Spartan+KIH-485	4fl oz+3.5oz	5	0	6	7	99	99
Permit+KIH-485	0.67oz+2.8oz	3	0	3	3	99	99
Permit+KIH-485	0.67oz+3.5oz	5	5	10	12	99	99
PRE/POST							
Permit/Permit+NIS+AMS	0.67oz/0.67oz+0.25% v/v+2lb	0	0	0	0	42	23
POST							
Permit+NIS+AMS	0.67oz+0.25% v/v+2lb						
Untreated		0	0	0	0	0	0
LSD (0.05)		7	7	8	8	4	2

[1]KIH-485 = pyroxasulfone from Kumiai America, NIS = nonionic surfactant = R-11; AMS = ammonium sulfate.

Dry edible bean herbicide programs. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Thompson, ND, to evaluate crop response and weed efficacy to herbicide programs in dry beans. 'Montcalm' kidney bean, ' Maverick' pinto bean, 'T-39' black bean, and 'Ensign' navy bean were planted perpendicular to each plot length on May 25, 2007. PRE treatments were applied on May 25 at 10:30 with 52 F air, 51 F soil at a four inch depth, 45% relative humidity, 100% cloud cover, 3 to 5 mph E wind, dry soil surface, and moist subsoil. Soil characteristics were 16.3% sand, 57.9% silt, 25.8% clay, 4.5% OM, and pH 7.9. POST treatments were applied on June 25 at 9:45 am with 73 F air, 74 F soil surface, 77% relative humidity, 100% cloud cover, 10 to 15 mph SE wind, dry soil surface, wet subsoil, excellent crop vigor, and no dew present to V2 to V3 dry edible bean types. Weed species present in plots with PRE applications were: 1 to 5 inch (1/ft^2) yellow foxtail; 1 to 6 inch (5 to 10/ft^2) kochia (in treatment 3 only); 1 to 5 inch (1/yd^2) kochia (in treatment 4 only); and 1 to 3 inch (10 to 25/yd^2) redroot pigweed. Weed species present in POST only applications were: 2 to 8 inch (5 to 20/ft^2) yellow foxtail; 2 to 10 inch (10 to 20/ft^2) kochia; 2 to 7 inch (10 to 30/ft^2) redroot pigweed; and 1 to 4 inch (1 to 3/yd^2) common lambsquarters. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a bicycle-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-fan nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles with a backpack-type plot sprayer for POST treatments. The experiment had randomized complete block design with three replicates per treatment.

Soil-applied Reflex was safe to dry bean and improved weed control. The NDSU Dry Bean Micro-rate applied POST did control common lambsquarters and kochia because of the large weed size at application. Weeds should be no larger than 2 inches tall. Yield was not taken due to excess standing water throughout study and hail. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Dry edible bean herbicide programs (Zollinger and Ries).

		30 DAT - PRE								7 DAT - POST							
Treatment[1]	Rate	Pinto	Navy	Kidney	Black	Yeft	Rrpw	Colq	Kochia	Pinto	Navy	Kidney	Black	Yeft	Rrpw	Colq	Kochia
	(product/A)	------ % injury ------				------ % control ------				------ % injury ------				------ % control ------			
PRE																	
Dual Magnum+Reflex	1.12pt+1pt	0	0	10	10	92	99	93	90	0	0	0	0	95	99	93	83
Dual Magnum+Reflex	0.825pt+0.75pg	10	5	10	13	96	99	95	83	2	2	2	2	94	99	95	73
PRE/POST																	
Dual Magnum/Reflex+NIS	1.67pt/0.75pt+0.25% v/v	0	0	7	5	91	92	73	69	7	7	7	7	99	99	85	83
Prowl H_2O/Rezult+Raptor+NIS	2.5pt/1.6pt+2fl oz+0.25% v/v	0	0	0	0	90	63	64	58	17	17	17	17	96	99	83	82
POST																	
Rezult+Raptor+Reflex+Select+MSO	1pt+1fl oz+4fl oz+2fl oz+1pt									8	8	8	8	94	94	50	70
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		3	2	2	2	7	3	4	8	6	6	6	6	6	3	4	7

[1]NIS = nonionic surfactant = R-11; MSO = methylated seed oil = Scoil.

Dry edible bean desiccation, 2007. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Hatton, ND to evaluate dry edible bean desiccation treatments. 'Ensign' navy bean was planted on June 11, 2007. 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 4 at 11:40 am, with 73 F air, 76 F soil surface, 43% relative humidity, 75% clouds, 3 to 8 mph S wind, dry soil surface, damp subsoil, and no dew present to naturally senescent dry bean. Dry bean senescence at application was quantified in the following manner: 85% green pods,14% yellow pods, 1% leather pods, and 40 to 60% leaf drop. Treatments were applied to the center 6.7 feet vo the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-tan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Treatments were applied before dry bean senescence to create treatment separation. All treatments increased dry bean desiccation. 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, as well as in 2007, 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 two years, probably due to favorable conditions of sunlight and moderate temperatures after application. Organosilicones, Syl-Tac and Dyne-Amic, did not increase control. Dyne-Amic in 2006 showed excellent control, although the rate used was higher than used conventioanlly. In-Place generally did not enhance desiccation. Aim is labeled at 1 to 2.0 oz/A with an NIS, MSO, or COC. Gramoxone Inteon is labeled at 1.2 to 2.0 pt/A with an nonionic surfactant. Valor is expected to be registered in 2008 at 1.5 oz/A with an MSO. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Dry edible bean desiccation, 2007 (Zollinger and Ries).

Treatment[1]	Rate	3 DAT					7 DAT				
		leaf[2]	vine[3]	green[4]	yellow[5]	leather[6]	leaf	vine	green	yellow	leather
	(product/A)	% control					% control				
Aim+N-Tense	2oz+3qt/100gal	57	3	40	56	4	68	7	23	62	15
Gramoxone Inteon+N-Tense	1.5pt+3qt/100gal	67	5	30	65	5	75	12	17	59	24
Valor+N-Tense	1.5oz+3qt/100gal	70	5	30	65	4	72	13	15	63	22
Aim+Scoil	2oz+1.5pt	60	7	33	63	4	68	13	22	69	9
Gramoxone Inteon+Scoil	1.5pt+1.5pt	65	10	35	60	5	73	15	22	58	20
Valor+Scoil	1.5oz+1.5pt	65	11	23	72	5	73	18	18	48	33
Aim+Dyne-Amic	2oz+4fl oz	40	2	40	50	2	62	5	40	50	7
Gramoxone Inteon+Dyne-Amic	1.5pt+4fl oz	55	6	38	59	3	67	10	22	66	12
Valor+Dyne-Amic	1.5oz+4fl oz	45	4	33	61	3	57	5	23	68	9
Aim+Syl-Tac	2oz+4fl oz	40	2	47	51	2	53	5	40	52	8
Gramoxone Inteon+Syl-Tac	1.5pt+4fl oz	45	3	43	55	2	62	8	25	67	8
Valor+Syl-Tac	1.5oz+4fl oz	43	4	40	58	2	50	6	35	58	7
Aim+Scoil+In-Place	2oz+1.5pt+0.25fl oz	50	2	33	64	3	67	12	22	72	6
Gramoxone+Scoil+In-Place	1.5pt+1.5pt+6fl oz	63	7	35	62	3	72	12	20	70	10
Valor+Scoil+In-Place	1.5oz+1.5pt+0.25fl oz	58	8	30	66	4	73	18	13	72	15
Aim+Scoil+In-Place	1.5oz+1.5pt+0.25fl oz	42	2	38	60	2	62	7	17	75	8
Gramoxone+Scoil+In-Place	1.125pt+1.5pt+6fl oz	50	5	40	58	2	62	7	20	72	10
Valor+Scoil+In-Place	1.125oz+1.5pt+0.25fl oz	60	7	27	71	3	69	11	10	72	18
Valor+Dyne-Amic+In-Place	1.5oz+4fl oz+0.25fl oz	45	3	32	67	1	57	5	25	70	5
Valor+Syl-Tac+In-Place	1.5oz+4fl oz+0.25fl oz	43	3	35	64	1	52	7	27	67	7
Valor+Dyne-Amic+In-Place	1.125oz+4fl oz+0.25fl oz	45	2	33	66	1	48	4	25	68	4
Valor+Syl-Tac+In-Place	1.125oz+4fl oz+0.25fl oz	45	3	28	70	2	50	5	23	72	5
Aim+Gramoxone Inteon+Scoil	2oz+0.5pt+1.5pt	43	2	35	63	2	58	9	22	73	5
Aim+Herbimax	2oz+1qt	48	4	30	68	2	57	6	23	70	7
Valor+Herbimax	1.5oz+1qt	52	5	30	68	2	60	9	23	68	9
Gramoxone Inteon+R-11	1.5pt+0.25% v/v	55	5	27	64	3	62	7	18	73	8
Untreated		32	1	38	61	1	35	2	33	68	2
LSD (0.05)		5	2	6	6	1	10	6	11	11	14

[1]N-Tense = surfactants + water conditioning agents; Scoil = methylated seed oil; Dyne-Amic and Syl-Tac = methylated seed oil + organosilicone surfactants; In-Place = deposition + drift retardants; Herbimax = petroleum oil concentrates; R-11 = nonionic surfactant.
[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, 2007 (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				
Aim+N-Tense	2oz+3qt/100gal	78	19	18	53	29	86	48	10	32	58
Gramoxone Inteon+N-Tense	1.5pt+3qt/100gal	82	28	17	45	38	91	62	8	19	73
Valor+N-Tense	1.5oz+3qt/100gal	83	42	11	37	52	94	76	5	7	91
Aim+Scoil	2oz+1.5pt	82	28	17	45	38	90	67	2	10	85
Gramoxone Inteon+Scoil	1.5pt+1.5pt	82	28	17	40	43	91	77	11	18	80
Valor+Scoil	1.5oz+1.5pt	89	37	9	17	71	95	78	3	2	95
Aim+Dyne-Amic	2oz+4fl oz	73	17	30	43	27	87	70	6	13	82
Gramoxone Inteon+Dyne-Amic	1.5pt+4fl oz	77	17	20	57	23	88	68	12	25	63
Valor+Dyne-Amic	1.5oz+4fl oz	70	12	22	62	17	83	53	17	27	57
Aim+Syl-Tac	2oz+4fl oz	67	9	33	52	15	82	50	13	13	73
Gramoxone Inteon+Syl-Tac	1.5pt+4fl oz	74	23	22	48	30	86	60	15	20	65
Valor+Syl-Tac	1.5oz+4fl oz	60	9	37	54	9	76	42	27	35	38
Aim+Scoil+In-Place	2oz+1.5pt+0.25fl oz	72	13	20	65	15	77	37	15	43	42
Gramoxone+Scoil+In-Place	1.5pt+1.5pt+6fl oz	82	22	18	55	27	92	63	8	33	58
Valor+Scoil+In-Place	1.5oz+1.5pt+0.25fl oz	81	30	13	57	30	89	52	7	22	72
Aim+Scoil+In-Place	1.5oz+1.5pt+0.25fl oz	72	23	18	47	35	87	52	9	24	67
Gramoxone+Scoil+In-Place	1.125pt+1.5pt+6fl oz	72	13	22	62	17	83	52	5	23	72
Valor+Scoil+In-Place	1.125oz+1.5pt+0.25fl oz	80	22	8	18	74	91	57	3	15	82
Valor+Dyne-Amic+In-Place	1.5oz+4fl oz+0.25fl oz	70	8	25	57	18	82	33	10	23	67
Valor+Syl-Tac+In-Place	1.5oz+4fl oz+0.25fl oz	62	9	25	62	13	75	33	25	37	42
Valor+Dyne-Amic+In-Place	1.125oz+4fl oz+0.25fl oz	57	6	25	68	7	77	37	15	28	57
Valor+Syl-Tac+In-Place	1.125oz+4fl oz+0.25fl oz	60	7	20	70	10	73	37	13	22	65
Aim+Gramoxone Inteon+Scoil	2oz+0.5pt+1.5pt	64	11	15	70	15	72	20	17	42	32
Aim+Herbimax	2oz+1qt	63	8	18	70	12	73	33	13	42	45
Valor+Herbimax	1.5oz+1qt	70	13	20	67	13	78	38	10	52	38
Gramoxone Inteon+R-11	1.5pt+0.25% v/v	77	17	18	48	33	87	63	12	18	70
Untreated		43	4	32	64	4	58	18	23	55	22
LSD (0.05)		11	19	11	20	28	10	18	9	18	27

[1]N-Tense = surfactants + water conditioning agents; Scoil = methylated seed oil; Dyne-Amic and Syl-Tac = methylated seed oil + organosilicone surfactants; In-Place = deposition + drift retardants; Herbimax = petroleum oil concentrates; R-11 = nonionic surfactant.
[2]Leaf = % dry leaf and leaf drop.
[3]Vine = % vine desiccation.
[4]Green = % green pods.
[5]Yellow = % yellow pods.
[6]Leather = % brown/dry pods.

Dry pea tolerance to linuron, diuron, and KIH-485. (Jenks, Willoughby, Mazurek). 'Majoret' dry pea was seeded April 25 at 150 lb/A into 7.5-inch rows into standing stubble. Herbicide treatments were applied preemergence (PRE) on May 1. Individual plots were 10 x 30 ft and replicated three times.

The objective of this study was to determine dry pea tolerance to experimental herbicides applied PRE. All herbicides in this study are experimental and not labeled for PRE use, except for Spartan. Approximately 13 inches of rain fell in May and early June. Diuron and KIH-485 caused moderate to severe dry pea injury. Linuron and Atrazine caused minor crop injury. Diuron treatments caused a 200-800 lb/A yield reduction. KIH-485 treatments also caused a slight yield reduction. Linuron and Atrazine treatments were similar in yield to Prowl and Spartan.

			Dry pea				
			Crop injury			Yield	Test wt.
Treatment	Rate	Timing	Jun 2	Jun 21	Jul 9	Jul 26	Jul 26
			----------%----------			lb/A	lb/bu
Prowl H2O	2.6 pt	PRE	1	0	0	2814	65.9
Linuron + Prowl H2O	1 lb + 2.6 pt	PRE	3	3	1	2784	66.0
Linuron + Prowl H2O	1.5 lb + 2.6 pt	PRE	3	4	1	2639	65.7
Linuron + Prowl H2O	2 lb + 2.6 pt	PRE	3	8	4	2797	65.9
Diuron + Prowl H2O	1.5 lb + 2.6 pt	PRE	13	32	21	2510	65.8
Diuron + Prowl H2O	2 lb + 2.6 pt	PRE	36	48	41	2255	65.8
Diuron + Prowl H2O	2.5 lb + 2.6 pt	PRE	67	78	70	1900	65.4
Spartan + Prowl H2O	3 oz + 2.6 pt	PRE	5	7	3	2809	65.7
KIH-485 + Prowl H2O	0.15 lb ai + 2.6 pt	PRE	14	24	20	2592	65.6
KIH-485 + Prowl H2O	0.225 lb ai + 2.6 pt	PRE	18	32	27	2466	65.8
KIH-485 + Prowl H2O	0.3 lb ai + 2.6 pt	PRE	21	37	28	2346	65.4
Atrazine + Prowl H2O	0.38 lb ai + 2.6 pt	PRE	7	11	4	2738	65.6
Atrazine + Prowl H2O	0.5 lb ai + 2.6 pt	PRE	8	17	12	2788	65.5
Untreated Check			0	0	0	2426	65.6
LSD (0.05)			6.1	14.1	17.7	261.2	0.69
CV			25.5	39.1	63.7	6.1	0.6

Weed control in field pea, Williston. 2006. Neil Riveland, WREC.

'Mozart' yellow field pea was planted notill on May 9 into land cropped to durum in 2005 using a planter with 7 inch row spacing at 150 lbs/a. All PE treatments were applied on May 16 to a dry soil surface with 70 F, 36% RH, 95% clear sky and 3-5 mph SSW wind with topsoil at 60 F. Basagran & Raptor post emergence treatment was applied on June 1 to 2.5-3 inch peas and 0.5 TO 1 inch Russian thistle with 81 degree F, 20% RH, 70% clear Wind W 2-3 mph and dry plant and soil surfaces, with soil temperature at 75 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 0.12 inch on May 21 and 0.38 inch on May 24. First rain event after Raptor treatment was 0.17 inches on June 4. 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. Weed density was light. Peas were machine harvested on July 27.

Treatment*	Product Rate	Timing	Rate Unit -/a	Plant Density Plts/ft^2	— % Crop — Injury June	July	Cntrl Ruth %	Test Weight lbs/b	Grain Yield bus/a
Spartan+Prowl H2O	3+2.6	PE	fl oz+pts	6.4	0	0	93	66.7	14.4
Lorox+Prowl H2O	0.5+2.6	PE	lbs+pts	6.8	8	0	47	66.0	15.1
Karmex+Prowl H2O	1.6+2.6	PE	lbs+pts	6.7	7	5	83	64.8	15.8
KIH-485+Prowl H2O	0.15+2.6	PE	lbs+pts	7.6	0	0	75	65.5	14.7
Lorox	0.5	PE	lbs	6.0	3	0	50	64.9	14.5
Karmex	1.6	PE	lbs	6.5	0	7	88	65.7	14.5
KIH-485	0.15	PE	lbs	6.7	8	5	78	64.9	15.8
Prowl H2O+Express	2.6+0.167	PE	pts+oz	6.7	0	0	82	64.7	17.0
Prowl H2O& Basagran/Raptor+MSO+28%N	2.6 & 1/2+1%+1	PE/Post	pts/ oz+%V/V+qt	6.5	0	8	93	65.2	13.7
Untreated	0	none	none	6.4	0	0	0	64.1	15.1
EXP MEAN				6.6	3	3	69	65.2	15.1
C.V. %				11.1	130	86	21	1.3	12.7
LSD 5%				NS	6	4	25	NS	NS

* Assure II was applied to all treatments on June 4 at a rate of 0.7 pt/a.

Summary: Late season drought reduced yield potential of the peas. Lorox and Karmex caused some crop injury. No statistical yield differences occurred. Spartan with Prowl H2O and Basagran and Raptor with Prowl H2O provided the best weed control.

Broadleaf weed control in field pea, Williston, 2007. Neil Riveland. WREC.

'Scuba' green field pea was planted on May 3 into tilled durum stubble from 2006 using a JD 750 notill drill with 7 inch row spacing at 150 lbs/a. All PE treatments were applied on May 9 to a dry soil surface with 70 F, 50% RH, 100% clear sky and 4-8 mph south wind (196 degrees) with topsoil at 59 F. Post emergence treatments were applied on June 2 to 3-4 inch peas and 0.5 TO 1 inch Russian thistle (Ruth), 0.5 to 3 inch wild mustard (Wimu) and less than 1 inch redroot pigweed (Rrpw) with 70 degree F, 62% RH, 95% clear, Wind NW (325 degrees) at 0-3 mph and dry 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. First rain received after PE applications was 0.21 inch on May 13 and 0.70 inch on May 14. First rain event after post application was 0.11 inches on June 6. The experiment was a randomized complete block design with three replications. Plots were evaluated for crop injury and weed control on June 19 and July 30. Weed density were: Ruth, 1-2/ft2, Wimu, 5-6/ft2 and 1-2 ft2 Rrpw. Peas were machine harvested on July 30.

Treatment*	Product	Timing	Rate Unit	% Crop injury		Control			Test Wght	Grain Yield
						Ruth	Wimu	Rrpw		
	Rate		-/a	June	July	%			lbs/b	bus/a
Spartan+Prowl H2O	3+2.6	PE	fl oz+pts	5	7	78	88	96	64.8	40.3
Lorox+Prowl H2O	0.5+2.6	PE	Lbs+pts	0	0	0	0	0	64.3	31.5
Karmex+Prowl H2O	1.6+2.6	PE	lbs+pts	15	8	80	98	96	65.2	31.8
KIH-485+Prowl H2O	0.15+2.6	PE	lbs+pts	17	13	85	90	96	65.1	38.8
Lorox	0.5	PE	lbs	5	7	32	86	75	64.6	36.2
Karmex	1.6	PE	lbs	8	5	87	98	93	64.7	45.0
KIH-485	0.15	PE	lbs	7	5	62	82	92	64.9	38.5
Prowl H2O+Express	2.6+0.167	PE	pts/a+oz	7	7	90	70	92	65.2	41.3
Prowl H2O&Basagran+Raptor+MSO+28%N	2.6&1/2+1%+1	PE/POST	pts+oz+v/v+qt	75	47	98	99	99	65.4	32.3
Untreated	0	None	0	0	0	0	0	0	64.6	33.3
Pursuit+NIS	2+0.25%	POST	oz/a+v/v	0	0	63	23	62	65.0	37.3
Prowl+Pursuit+NIS	2.6+2+0.25%	POST	pts+oz+v/v	7	2	83	62	82	65.9	38.5
Basagran+MSO	1.5+1%	POST	pts/a+v/v	27	17	93	96	73	64.4	40.5
Basagran+Raptor+MSO+28%N	1+2+1%+1	POST	pts+oz+v/v+qt	50	43	96	99	98	65.8	36.0
EXP MEAN				16	11	68	71	75	65.0	37.2
C.V. %				32	60	20	18	16	0.8	11.4
LSD 5%				9	12	23	21	20	NS	7.1

* Assure II was applied to all treatments on June 5 at a rate of 0.8 pt/a.
NIS = Activator 90 from Loveland
MSO = MSO from Loveland

Summmary: One treatment, Lorox + Prowl, was included in the analysis but since no broadleaf weed control was noted for that treatment, results may be questionable. Considerable crop injury occurred with Basagran/Raptor treatments. Karmex provided very good weed control but pea yields were as low as the untreated check, indicating crop injury was significant.

Weed control in direct-seeded field pea. Gregory J. Endres and Blaine G. Schatz. Weed control and field pea response to selected soil- and POST-applied herbicides were evaluated in a randomized complete-block design with three replicates. The field experiment was conducted on a Heimdahl loam soil with 6.9 pH and 3.2% organic matter at the NDSU Carrington Research Extension Center. Herbicide treatments were applied with a CO_2 pressurized hand-held plot sprayer at 17 gal/A at 35 psi through 8002 flat-fan nozzles. Fall treatments were applied November 9, 2006 with 31 F, 70% RH, 25% clear sky, and 9 mph wind. On May 7, inoculated 'Admiral' field pea was seeded into standing wheat stubble in 7-inch rows at a rate of 300,000 pure live seeds/A. PRE treatments were applied on May 3 with 52 F, 66% RH, 40% clear sky, and 10 mph wind. Rainfall totaled 1.1 inches within 2 d following PRE application. Early POST (EPOST) treatments were applied on May 24 with 47 F, 78% RH, clear sky, and no wind to 3- to 4-inch tall field pea, 1- to 3-leaf foxtail (green and yellow) and 2-leaf redroot pigweed. POST treatments were applied on June 8 with 47 F, 82% RH, clear sky, and 10 mph wind to 6- to 8-inch tall field pea, 1- to 4-leaf foxtail, 0.5- to 1-inch tall common lambsquarters, and 2- to 4-leaf pigweed. Average plant density in untreated plots in early June: field pea = 11 plants/ft^2, foxtail = 5 plants/ft^2, and broadleaf weeds = 1 to 2 plants/ft^2. Preharvest (PH) treatments were applied on July 17 with 80 F, 66% RH, 50% clear sky, and 4 mph wind to physiologically-mature field pea. The trial was harvested with a plot combine on August 1.

Weed control was excellent with all herbicide treatments except Linuron (Table). No crop injury was observed with the fall or spring PRE treatments (data not shown). Slight pea height reduction occurred with treatments that included bentazon+sethoxydim+MSO+UAN (Table). PH crop desiccation treatments were highly effective for whole plant dry down when visually evaluated 1 wk after application. Seed yield was similar among treatments, likely due to low crop injury, a competitive crop stand and low weed density. Test weight with linuron was lower than the untreated check, while other herbicide treatments were similar to the untreated check.

Table. Weed control and crop response with soil- and POST-applied herbicides in direct-seeded field pea, Carrington, 2007.

			July 3			Field pea				
						Plant height reduction		Brown foliage		
Treatment[1]	Application timing[2]	Rate	Foxtail spp.[3]	Common lambs-quarters	Redroot pigweed	6/22	7/6	7/25	Seed yield	Test weight
		lb ai/A	----------% control ----------			---------- % ----------			bu/A	lb/bu
Untreated	x	x	0	0	0	0	0	x	45.5	64.7
Pendimethalin/ bentazon+sethoxydim+MSO+UAN	Fall/POST	1.5/0.5+ 0.1+1%+2pt	98	99	98	3	3	x	47.3	64.2
Sulfentrazone/ bentazon+sethoxydim+MSO+UAN	Fall/POST	0.105/0.5+ 0.1+1%+2pt	99	99	99	4	3	x	42.9	64.5
Sulfentrazone/ bentazon+sethoxydim+MSO+UAN	PRE/POST	0.105/0.5+ 0.1+1%+2pt	99	99	99	7	3	x	51.4	64.4
Pendimethalin/ bentazon+sethoxydim+MSO+UAN	PRE/POST	1.5/0.5+ 0.1+1%+2pt	99	99	99	8	2	x	48.8	64.4
Sulfentrazone+pendimethalin/ bentazon+sethoxydim+MSO+UAN	PRE/POST	0.07+0.75/ 0.5+0.1+1%+2pt	99	99	99	3	2	x	46.1	64.7
Imazethapyr/ bentazon+sethoxydim+MSO+UAN	PRE/POST	0.016/0.5+ 0.1+1%+2pt	99	99	99	7	3	x	50.0	64.1
Linuron	PRE	0.5	70	78	78	0	0	x	57.3	63.7
Linuron	PRE	1	68	96	91	0	0	x	56.7	64.0
KIH 485	PRE	0.15	91	98	99	0	2	x	54.3	64.7
KIH 485	PRE	0.3	98	99	99	0	0	x	54.4	64.4
Imazamox/ bentazon+sethoxydim+MSO+UAN	POST	0.016/1+ 0.2 +1%+2pt	96	99	98	12	5	x	43.8	65.0
Imazamox/ bentazon+sethoxydim+MSO+UAN	POST	0.016/0.5+ 0.1+1%+2pt	98	99	94	4	2	x	47.6	64.5
Imazamox/ bentazon+sethoxydim+MSO+UAN	EPOST	0.016/0.5+ 0.1+1%+2pt	90	96	94	2	2	x	51.2	64.7
Imazamox+bentazon+sethoxydim+MSO +UAN/ Imazamox+bentazon+sethoxydim+MSO +UAN	EPOST/ POST	0.008+0.5+ 0.1+1%+2pt/ 0.008+0.5+ 0.1+1%+2pt	99	99	99	12	7	x	47.6	64.8
Imazamox/ bentazon+sethoxydim+MSO+UAN	POST	0.032/1+ 0.2 +1%+2pt	96	99	98	9	0	x	40.3	65.3
Sulfentrazone+imazethapyr/ flumioxazin+MSO	PRE/PH	0.105+0.016/ 0.063+2pt	96	99	99	0	0	96	55.9	64.7
Sulfentrazone+imazethapyr/ paraquat+NIS	PRE/PH	0.105+0.016/ 0.5+0.25%	96	99	99	0	0	100	49.5	64.7
C.V. (%)			15	5	6	85	163	1	14	1
LSD (0.05)			21	8	8	6	NS	2	NS	0.7

[1]MSO=Destiny, a methylated seed oil from WinField, St. Paul, MN; Pendimethalin=Prowl H_2O, BASF; UAN=urea ammonium nitrate. Paraquat=Gramoxone Inteon, Syngenta; NIS=Preference, a nonionic surfactant from WinField, St. Paul, MN.

[2]Fall=November 9, 2006; PRE=May 3, 2006; EPOST=May 24; POST=June 8; PH=July 17.

[3]Foxtail spp.=yellow and green.

Preemergence herbicides in flax. Kirk Howatt, Ronald Roach, and Janet Harrington. 'Omega' flax was seeded May 11 at Fargo, ND, and preemergence treatments were applied May 11 with 64 F, 40% RH, 100% cloud-cover, 6 mph wind at 75°, and wet soil at 62 F. Treatments were applied with a backpack sprayer delivering 17 gpa at 35 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.

Treatment	Rate	6/19 Flax
	oz ai/A	% injury
Sulfentrazone	4	0
Mesotrione	1.5	0
Mesotrione	3	0
Tembotrione	2	0
Tembotrione	4	1
KIH-485	2	1
KIH-485	3	10
KIH-485	4	15
Flucarbazone	0.28	15
Flucarbazone	0.42	32
Untreated	0	0
CV		185
LSD (P=0.05)		18

Sulfentrazone, mesotrione, and tembotrione caused less than 2% injury regardless of rate. KIH-485 was safe at 2 oz/A but 3 and 4 oz/A resulted in 10 and 15% injury, respectively. More research will be conducted to determine whether KIH-485 can be used safely in flax to provide adequate weed control. Flucarbazone caused more injury in this study than previous experiments. The response of flax to flucarbazone may have been accentuated by excessive rainfall. Additional evaluations were not performed because of flood damage.

Weed control in flax with mesotrione. Kirk Howatt, Ronald Roach, and Janet Harrington. Pre-plant treatments (7dbp) were applied 7 days prior to planting on May 3 with 69 F, 29% RH, 5% cloud-cover, 13 mph wind at 180°, and moist soil at 58 F. 'Omega' flax was seeded at Fargo, ND, and preemergence treatments were applied May 11 with 64 F, 40% RH, 85% cloud-cover, 6 mph wind at 75°, and wet soil at 62 F. Post treatments were applied to 4-inch flax on June 12 with 83 F, 66% RH, 10% cloud-cover, 19 mph wind at 180°, and moist soil at 68 F. All treatments were applied with a backpack sprayer delivering 8.5 gpa at 30 to 35 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.

			6/19	6/29
Treatment	Rate	Grow	Flax	
	oz ai/A	Stg	% injury	
Untreated	0	-	2	0
Mesotrione	1.5	7 dbp	1	1
Mesotrione	3	7 dbp	2	0
Mesotrione	6	7 dbp	2	4
Mesotrione	1.5	Pre	1	0
Mesotrione	3	Pre	0	1
Mesotrione	6	Pre	16	39
Mesotrione/brox&MCPA5	3+8	Pre/4"	40	36
Mesotrione/bromoxynil+NIS	3/4+0.25%	Pre/4"	15	21
Mesotrione/MCPA	3/4	Pre/4"	9	9
Bromoxynil+NIS	4+0.25%	4"	24	23
MCPA	4	4"	2	2
Bromoxynil&MCPA5	8	4"	17	32
Sulfentrazone	3	7 dbp	0	0
Sulfentrazone	3	Pre	0	0
Bromoxynil&pyrasulfotole	2.5	4"	35	37
Bromoxynil&pyrasulfotole	3	4"	55	52
CV			77	76
LSD (P=0.05)			14	17

Mesotrione at 1.5 or 3 oz/A applied before flax emergence caused 2% injury or less to flax. A substantial difference occurred between timings at 6 oz/A mesotione, with the preemergence application causeing 39% injury compared with 4% when applied 7 DBP. All treatments with bromoxynil caused more than 20% injury 6/29, which was believed to be influenced by excessive rainfall and saturated soils that inhibited metabolism. Sulfentrazone in this study did not cause additional injury relative to the untreated plants, but in other research studies in the same field, sulfentrazone injury increased with saturated soil.

Sparten for weed control in Flax, Langdon 2007. John Lukach. 'Rahab94' flax was seeded May 9 at 40 lb/a. Pre-emergence treatments were applied May 11 and 0.34" rain was received May 14. Conditions on May 11 at 7pm were 50°F, 70%RH, east wind at 6 mph, and cloudy. The seed bed was conventional tillage on flax stubble so very low residue. Early post treatments were applied June 4 on two inch flax. Conditions at 11:30am were 64°F, 44%RH, north wind at 12 mph, cloudy and dry foliage. Weeds were 2 leaf common mallow 4/yd2, quarter sized kochia, 3/yd2, a heavy flush of newly emerged shepardspurse. The final post treatment was applied June 19 on bud stage flax about 12 inches tall. Conditions at 5pm were 70°F, 40%RH, west wind at 11 mph, sky clear and dry foliage. A tractor mounted CO2 sprayer with wind shield was used delivering 15 gpa pre-emerge and 10 gpa post emerge, 40 psi, DG8001.5 tips with four 20" spaced nozzles on 25ft plots. The experiment was over-sprayed with SelectMax at 5 oz/a on June 11. The experiment had a RCBD design with four replications.

Date	Treatment	Rate	28-May	11-Jun	---------- Aug 16 ----------				---------- June 25 ----------					
		oz/a	Inj	Inj	Shpu	Coma	Koch	Ht	Shpu	Coma	Koch	Ht	Yield	Twt
			%	%	%	%	%	cm	%	%	%	cm	bu/a	lb/bu
11-May	Sparten	6												
4-Jun	HarmonyGT+MCPAe+Assurell+COC	0.06+8+8+1%	0.0	2.5	99.0	91.3	99.0	54.5	99.0	97.8	99.0	11.0	11.0	51.3
11-May	Sparten	6												
4-Jun	Bronate Adv+Assurell+COC	11+8+1%	0.0	0.5	99.0	92.5	99.0	55.0	99.0	95.8	99.0	12.8	10.0	51.1
4-Jun	Bronate Adv+Assurell+COC	17+8+1%	0.0	2.3	93.5	80.0	98.3	51.3	95.8	80.0	99.0	10.5	9.2	50.9
11-May	Sparten	6												
4-Jun	Assurell+COC	8+1%	0.0	0.0	95.8	60.0	98.5	56.0	99.0	76.3	99.0	15.0	9.0	51.8
4-Jun	Bronate Adv+Assurell+COC	11+8+1%												
19-Jun	Bronate Advanced	11	0.0	1.3	85.0	57.5	98.8	49.3	96.8	71.3	99.0	7.5	8.8	50.2
11-May	Sparten	6												
4-Jun	CurtailM+Assurell+COC	21+8+1%	0.0	2.0	99.0	72.5	99.0	52.3	99.0	91.8	99.0	11.8	8.4	51.2
4-Jun	Sparten	6												
19-Jun	Bronate Adv+Assurell+COC	11+8+1%	0.0	2.0	83.8	88.8	99.0	49.8	97.8	97.8	99.0	11.0	7.8	50.4
4-Jun	Bronate Adv+Assurell+COC	11+8+1%	0.0	0.8	77.5	65.0	94.5	50.3	87.5	57.5	99.0	10.5	7.4	50.6
4-Jun	CurtailM+Assurell+COC	21+8+1%	0.0	2.0	42.5	60.0	12.5	45.5	72.5	60.0	54.5	10.5	4.7	50.5
4-Jun	Assurell	8	0.0	0.0	0.0	0.0	0.0	41.5	0.0	0.0	0.0	13.5	2.2	48.9
		LSD 5%	NS	1.3	12	11.5	6.3	5.8	10.9	17.2	23.6	2.3	3.2	1.2
		C.V. %	0	66.4	10.7	11.8	5.4	7.9	8.9	16.3	19.2	14	28.1	1.6

COC - Vigor

Yields reflect Shepardspurse control. Kochia that emerged after the two leaf flax treatments not vigorous, only a little taller than flax at harvest and about 3/yd2.

Broadleaf weed control in Flax, Langdon 2007. John Lukach. 'Rahab94' flax was seeded May 9 at 40 lb/a. Pre-emergence treatments were applied May 11 and 0.34" rain was received May 14. Conditions on May 11 at 8pm were 49°F, 71%RH, east wind at 8 mph, and cloudy. The seed bed was conventional tillage on wheat stubble with low residue. Early post treatments were applied June 4 on two inch flax. Conditions at 1pm were 66°F, 46%RH, north wind at 14 mph, cloudy and dry foliage. Weeds were 4 leaf wild mustard 10/ft2, 2 leaf wild buckwheat and common mallow 5/yd2, lambsquarter 1"tall 7/yd2, quarter sized spring emerged false chamomile, 4/yd2, and a moderate flush of newly emerged red root pigweed. The final post treatment was applied June 19 on bud stage flax about 12 inches tall. Conditions at 5pm were 70°F, 40%RH, west wind at 11 mph, sky clear and dry foliage. A tractor mounted CO2 sprayer with wind shield was used delivering 15 gpa pre-emerge and 10 gpa post emerge at 40 psi, DG8001.5 tips with four 20" spaced nozzles on 25ft plots. The experiment was over-sprayed with SelectMax at 5 oz/a on June 11. The experiment had a RCBD design with four replications.

Date	Treatment	Rate			11-Jun	25-Jun	Aug 16								June 11					
		oz/a	Yield	Twt	Inj	Inj	Ht	Wimu	Wibu	Colq	Rrpw	Fach	Coma	Prle	Wimu	Wibu	Colq	Rrpw	Fach	Coma
			bu/a	lb/bu	%	%	cm	%	%	%	%	%	%	%	%	%	%	%	%	%
May 11	Sparten	6																		
Jun 4	HarmonyGT+MCPAe+AssureII+COC	0.06+8+8+1%	18.5	53.0	1.8	0.0	58	99	94	99	99	99	97	10	99	97	99	98	96	99
May 11	Sparten	6																		
Jun 4	Bronate Adv+AssureII+COC	11+8+1%	17.5	52.8	0.5	0.0	60	99	97	99	98	99	88	98	99	97	99	99	97	94
May 11	CurtailM+AssureII+COC	21+8+1%	16.9	52.9	1.0	0.0	61	99	99	99	98	98	99	99	96	99	99	99	99	97
May 11	Sparten	6																		
Jun 4	CurtailM+AssureII+COC	21+8+1%	16.3	52.8	0.5	0.0	60	99	96	99	99	99	99	98	99	99	99	99	99	97
Jun 4	Bronate Adv+AssureII+COC	17+8+1%	16.0	52.8	2.3	0.0	59	99	98	99	99	98	97	98	99	99	99	99	99	96
Jun 4	Bronate Adv+Buctril+HarGT+AssureII+COC	9.6+9.6+0.06+8+1%	15.0	52.5	6.8	0.0	58	99	43	88	88	94	90	99	99	75	99	99	98	95
Jun 4	Sparten	6																		
Jun 19	Bronate Adv+AssureII+COC	11+8+1%	14.6	53.2	4.0	1.3	55	99	94	99	97	98	85	97	55	99	99	99	99	92
Jun 4	Bronate Adv+AssureII+COC	11+8+1%																		
Jun 19	Bronate Advanced	11	14.4	52.9	0.8	3.3	56	99	99	99	99	99	99	99	99	99	99	99	99	99
Jun 4	Bronate Adv+Buctril+HarGT+AssureII+COC	9.6+9.6+0.06+8+1%																		
Jun 19	Bronate Adv+Buctril+HarGT+AssureII+COC	9.6+9.6+0.06+8+1%	14.3	52.5	6.3	8.8	58	99	99	98	98	99	99	99	99	87	99	99	87	97
Jun 4	CurtailM+HarGT+AssureII+COC	21+0.06+8+1%	14.1	51.1	5.5	0.0	59	99	91	96	77	53	60	97	99	96	97	97	98	89
Jun 4	Bronate Adv+HarGT+AssureII+COC	11+0.06+8+1%	12.4	51.8	2.0	0.0	58	99	45	96	95	63	70	99	99	75	99	99	94	84
Jun 4	Bronate Adv+AssureII+COC	11+8+1%	11.5	51.2	0.3	0.0	59	99	93	98	55	45	50	96	99	80	99	87	84	60
May 11	Sparten	6																		
Jun 4	AssureII+COC	8+1%	9.8	51.6	0.0	0.0	59	60	83	99	99	99	70	5	50	99	99	99	99	91
Jun 19	Bronate Adv+Buctril+HarGT+AssureII+COC	9.6+9.6+0.06+8+1%	7.0	50.4	0.0	2.0	54	99	40	35	87	38	50	15	0	0	0	0	0	0
Jun 4	AssureII	8																		
Jun 19	MCPAe	4	3.8	50.3	0.0	0.0	55	53	0	30	35	0	0	3	0	0	0	0	0	0
	LSD 5%		22.0	1.9	77.1	85.0	5.1	3.6	8	8.5	9.8	11.7	17.9	4.6	5.2	13.2	0.7	3.9	8.7	9.5
	C.V. %		13.5	52.1	2.1	1.0	57.8	93.3	77.9	88.8	88.1	78.6	76.8	74.1	79.3	80	85.7	84.8	83.1	79.2

COC - Vigor

Early wild mustard control was necessary for good yields. The heavy canopy of mustard at the late June 19 spray date interfered with spray coverage on treatments with no previous herbicide. MCPAe, 4 oz/a, was applied to the check plots on June 19 to allow harvest.

Evaluation of Various Herbicide Treatments on Flax

Eric Eriksmoen, Hettinger, ND

'Carnduff' flax was seeded on April 30. Pre-emergence (PRE) treatments were applied on May 8 with 54° F, 76% RH, sunny sky and NW wind at 3 mph. Post emergence (POST) treatments were applied on May 24 to 8 node flax (3 ½") and to 1" kochia (kocz), 1" Russian thistle (ruth) and to 4 leaf wild oat (wiot) with 49° F, 54% RH, mostly clear sky and an E wind at 8 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. Kochia, Russian thistle and wild oat populations averaged 15, 6 and 2 plants per square foot, respectively. Plots were evaluated for weed control on June 9, June 26 and July 20. The trial was harvested on August 8.

	Treatment	Product rate	App. timing	6/9 kocz	6/26 kocz	July 20 kocz	July 20 ruth	July 20 wiot	Grain yield
		oz/A		% Control					bu/A
1	Untreated	--		0	0	0	0	0	9.7
2	Bronate Adv.+Assure II + COC*	11.4 + 8 + 1%	POST	91	89	78	72	86	13.0
3	Spartan + glyphosate /	6 + 16 /	PRE						
	Assure II + COC	8 + 1%	POST	97	93	84	79	98	16.1
4	Spartan + glyphosate /	6 + 16 /	PRE						
	Bronate Adv.+Assure II+COC	11.4 + 8 + 1%	POST	98	99	97	99	96	17.7
	C.V. %			4.4	5.1	9.9	14.5	12.9	15.6
	LSD 5%			5	6	10	14	14	3.5

* Crop Oil Concentrate adjuvant.

Summary

All herbicide treatments were initially quite effective at controlling kochia, however, the Bronate Advance + Assure II treatment alone (trt 2) did not provide control of regrowth and/or additional flushes. The Spartan + glyphosate / Assure II treatment (trt 3) provided very good control of kochia through June, however, this control started to break towards the end of the season. The pre-emergence application of Spartan + glyphosate followed by a post applied treatment of Bronate Advance + Assure II (trt 4) provided excellent season long control of kochia, Russian thistle and wild oat, and also provided for the highest grain yields.

Perennial weed control in established juneberries with fall-applied herbicides. Harlene Hatterman-Valenti and Collin Auwarter.

This trial is being conducted at the NDSU Horticulture Research Arboretum near Absaraka, ND to determine th effect of fall-applied herbicides to juneberries. The soil is a Spottswood sandy loam with 2.0% O.M. and 7.2 pH The fall treatments were applied on October 30, 2006. Plots were 1 row by 10 ft arranged in a randomized complete block design with 4 replicates. The rows were 8 ft apart and 3 ft between plants. The treatments were applied using a CO_2 backpack sprayer equipped with 8002 flat-fan nozzle with an output of 20 GPA and a pressure of 40 psi. The granular formulation of dichlobenil was weighed for the area treated and spread uniform with a small hand-held shaker.

Application Date:	10/30/06
Time of Day:	11:00 AM
Air Temp. (F):	38
Rel. Hum. (%):	48
Wind (mph):	7
Cloud Cover (%):	25

Table 1. Perennial weed control from fall-applied herbicides in established juneberries 28 and 52 WAT.

		------- (28WAT)-------			----- (52 WAT)------		
Treatment	Rate lb ai/A	Qugr	Cath	Dali	Qugr	Cath	Dali
		----------% Control ----------					
Untreated		0	0	0	0	0c	0
Sulfentrazone	0.5	80	0	20	25	0	38
Flumioxazin	0.75	93	0	12	13	0	25
Mesotrione	0.46	65	0	45	40	0	44
Simazine	2.5	85	0	12	0	0	36
Dichlobenil	6	82	85	95	92	60	94
Rimsulfuron	0.125	90	84	65	90	40	54
LSD 0.05		8	5	9	9	10	13

Sulfentrazone, flumioxazin, and mesotrione had little effect on the perennial weeds. Best season-long perennial weed control occurred with dichlobenil and rimsulfuron.

:rennial weed control in established juneberries with spring-applied herbicides. Harlene Hatterman-Valenti and)llin Auwarter.

ıis trial is being conducted at the NDSU Horticulture Research Arboretum near Absaraka, ND to determine the fect of fall-applied herbicides to juneberries. The soil is a Spottswood sandy loam with 2.0% O.M. and 7.2 pH. ıe fall treatments were applied on May 7, 2007. Plots were 1 row by 10 ft arranged in a randomized complete ock design with 4 replicates. The rows were 8 ft apart and 3 ft between plants. The treatments were applied ing a CO_2 backpack sprayer equipped with 8002 flat fan nozzles with an output of 20 GPA and a pressure of 40 i. The granular formulation of dichlobenil was weighed for the area treated and spread uniformly with a small nd-held shaker.

)plication Date:	5/7/07
me of Day:	11:00 AM
r Temp. (F):	62
:l. Hum. (%):	48
ind (mph):	6
oud Cover (%):	30

ıble 1. Perennial weed control from spring-applied herbicides in established juneberries 3 and 21 WAT.

		------- (3 WAT)-------		----- (21 WAT)------	
Treatment	Rate	Qugr	Dali	Qugr	Deli
	lb ai/A	----------% Control ----------			
Untreated		0	0	0	0
Sulfentrazone	0.5	25	20	52	18
Flumioxazin	0.75	13	13	0	0
Mesotrione	0.46	40	45	22	50
Simazine	2.5	0	13	12	0
Dichlobenil	6	92	95	38	44
Rimsulfuron	0.125	90	65	48	38
LSD 0.05		8	9	17	11

ılfentrazone, flumioxazin, and mesotrione had little effect on quackgrass or dandelion. Dichlobenil and nsulfuron provided much better control of quackgrass and dandelion early in the season, but by 21 WAT none the herbicides provided satisfactory control of either perennial.

Lentil tolerance to linuron, diuron, and KIH-485. (Jenks, Willoughby, Mazurek). 'Pennell' lentil was seeded May 9 at 85 lb/A into 7.5-inch rows into standing stubble. Herbicide treatments were applied preemergence (PRE) on May 11. Individual plots were 10 x 30 ft and replicated three times.

The objective of this study was to determine lentil tolerance to experimental herbicides applied PRE. None of the treatments in this study are labeled for use, including Prowl applied PRE. Approximately 13 inches of rain fell in May and early June. Severe lentil injury was observed in June with most treatments. Lentil recovered significantly by mid-July in Prowl and Linuron treatments. The study was not harvested due to heavy late-season weed pressure. None of the treatments provided acceptable weed control.

			Lentil injury	
Treatment	Rate	Timing	Jun 21	Jul 9
			----------%----------	
Prowl H2O	2.6 pt	PRE	34	8
Linuron + Prowl H2O	1 lb + 2.6 pt	PRE	39	11
Linuron + Prowl H2O	1.5 lb + 2.6 pt	PRE	44	13
Linuron + Prowl H2O	2 lb + 2.6 pt	PRE	47	17
Diuron + Prowl H2O	1.5 lb + 2.6 pt	PRE	71	43
Diuron + Prowl H2O	2 lb + 2.6 pt	PRE	82	54
Diuron + Prowl H2O	2.5 lb + 2.6 pt	PRE	86	71
KIH-485 + Prowl H2O	0.15 lb ai + 2.6 pt	PRE	62	30
KIH-485 + Prowl H2O	0.225 lb ai + 2.6 pt	PRE	62	33
Prowl H2O	2.6 pt	PRE	32	5
Prowl H2O	2.6 pt	PRE	43	5
Linuron	1 lb	PRE	10	5
Diuron	2 lb	PRE	58	39
KIH-485	0.15 lb ai	PRE	27	17
Untreated Check			0	0
LSD (0.05)			12.8	22.9
CV			16.5	58.3

Broadleaf weed control in lentil, Williston 2006. Neil Riveland. WREC

'AC Richlea' lentil were planted notill on May 10 into land cropped to durum in 2005 using a planter with 7 inch row spacing at 60 lbs/a on May 10. All PE treatments were applied on May 16 to a dry soil surface with 70 F, 36% RH, 95% clear sky and 3-5 mph SSW wind with topsoil at 60 F. 2,4-DB treatments were applied on June 1 to 3-4 inch lentil and 0.5 TO 1 inch Russian thistle with 81 degree F, 20% RH, 70% clear Wind W 2-3 mph and dry plant and soil surfaces, 2with soil temperature at 75 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 0.12 inch on May 21 and 0.38 inch on May 24. First rain event after 2,4-DB treatments was 0.17 inches on June 4. 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. Weed density was light. Lentil were machine harvested on July 27.

Treatment*	Product	Timing	Rate Unit	Plant Density	% Crop Injury		Cntrl Ruth	Test Wght	Grain Yield
	Rate		-/a	plts/ft^2	June	July	%	lbs/b	lbs/a
Prowl H2O	2.6	PE	pts	7.8	5	0	68	59.1	590
Lorox+Prowl H2O	0.5+2.6	PE	lbs+pts	6.9	15	0.3	67	59.7	560
Karmex+Prowl H2O	1.6+2.6	PE	lbs+pts	7.4	12	3	67	59.9	442
KIH-485+Prowl H2O	0.15+2.6	PE	lbs+pts	7.9	5	0	68	59.3	596
Lorox	0.15	PE	lbs	7.6	3	2	37	59.4	504
Karmex	1.6	PE	lbs	7.4	7	0	72	59.9	546
KIH-485	0.15	PE	lbs	7.3	1	0	75	59.4	547
Prowl H2O+Sencor	2.6+0.167	PE	pts+lbs	7.8	8	3	67	59.5	542
Prowl H2O+Express	2.6+0.167	PE	pts+oz	7.6	8	3	73	59.6	525
Prowl H2O & 2,4-DB	2.6+0.7	PE/Post	pts/pts	8.6	13	7	83	59.9	557
Untreated	0		None	8.0	0	0	0	59.6	572
Spartan	3 oz	PE	fl oz.	7.8	10	2	63	59.4	555
EXP MEAN				7.7	7	2	62	593.5	545
C.V. %				9.3	90	18	35	0.9	11
LSD 5%				NS	NS	NS	36	NS	NS

*** Assure II was applied to all treatments on June 4 at a rate of 0.7 pt/a.**

Summary: Late drougth lower yield potiential of the crop. Prowl H2O tended to increase early crop injury when mixed with Karmex or Lorox. Lorox did not adequately control Russian thistle.

Broadleaf weed control in lentil, Williston 2007. Neil Riveland. WREC.

'Pennell' lentil was planted on May 3 into tilled durum stubble from 2006 using a JD 750 notill drill with 7 inch row spacing at 80 lbs/a. All PE treatments were applied on May 9 to a dry soil surface with 70 F, 50% RH, 100% clear sky and 4-8 mph south wind (196 degrees) with topsoil at 59 F. Post emergence treatments were applied on June 2 to 2-4 inch lentils and 0.5 TO 1 inch Russian thistle (Ruth), 0.5 to 3 inch wild mustard (Wimu) and less than 1 inch redroot pigweed (Rrpw) and common lambsquarters (Colq) with 70 degree F, 62% RH, 95% clear, Wind NW (325 degrees) at 0-3 mph and dry 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. First rain received after PE applications was 0.21 inch on May 13 and 0.70 inch on May 14. First rain event after post application was 0.11 inches on June 6. The experiment was a randomized complete block design with three replications. Plots were evaluated for crop injury and weed control on June 19 and July 30. . Weed density were: Ruth, 1-2/ft2, Wimu, 8-8/ft2 and Rrpw and Colq, 1-2 ft2. Lentils were machine harvested on August 1.

				— %Crop — Injury		Control				Test	Grain
Treatment*	Product	Timing	Rate			Ruth	Wimu	Rrpw	Colq	Weight	Yield
	Rate		-/a	June	July	%				lbs/a	lbs/a
Prowl H2O	2.6	PE	pts	17	10	47	88	88	87	57.9	1331
Lorox+Prowl H2O	0.5+2.6	PE	lbs+pts	30	32	73	88	92	96	59.0	1507
Karmex+Prowl H2O	0.15+2.6	PE	lbs+pts	73	42	80	96	96	98	56.9	1476
KIH-485+Prowl H2O	1.6+2.6	PE	lbs+pts	27	8	73	77	63	63	59.4	1718
Lorox	0.15	PE	lbs	5	3	70	62	0	0	588	1936
Karmex	1.6	PE	lsb	45	22	73	98	95	96	58.0	1855
KIH-485	0.15	PE	lbs	12	8	71	72	92	77	59.6	1716
Prowl H2O+Sencor	2.6+0.167	PE	pts+lbs	20	12	73	94	93	95	59.1	1462
Prowl H2O+Express	2.6+0.167	PE	pts+oz	12	3	48	67	87	87	58.6	1262
Prowl H2O & 2,4-DB	2.6+0.7	PE/Post	pts/pts	43	17	72	94	93	93	58.4	1448
Untreated	0	PE	None	0	0	0	0	0	0	59.5	865
Spartan	2 oz	PE	oz	17	5	95	0	95	96	57.7	739
Spartan	2.5	PE	oz	20	15	95	60	96	98	59.2	956
Spartan	3.0	PE	oz	13	8	83	53	97	97	60.4	1546
Upbeet+NIS	1.0+0.25%		oz+V/V	90	99	40	96	60	12	0	0
EXP MEAN				28	19	66	70	76	73	54.8	1321
C.V. %				32	69	27	20	21	24	1.3	19
LSD 5%				15	22	30	23	27	30	1.5	418

* Assure II was applied to all treatments on June 5 at a rate of 0.8 pt/a.
NIS = Activator 90 from Loveland

Summary: Only Lorox did not cause some early crop injury. Adding Prowl H2O to Lorox, Karmex and KIH-485 increased crop injury. Karmex alone and Sencor and Express with Prowl H2O provided the best weed control. Karmex and Lorox alone had the highest yields, dispite crop injury. Upbeet killed all lentils.

Influence of Tillage and Herbicides in Onion, Oakes. Sarah Gegner, Harlene Hatterman-Valenti, WaltAlbus, and Collin Auwarter.

A field experiment was conducted at the North Dakota State University Research Station near Oakes, North Dakota. The experiment was arranged as a strip-block with four replicates. Main plot consisted of two tillage systems: strip-tilled and conventional-tilled with four herbicide treatments as sub-plots. The strips were made fall 2006 into wheat stubble using a shank typeunit; the conventional treatment was roto-tilled once in the fall. Onion variety 'Teton' seed (TE) was planted April 20 in double rows at a rate of 625,000 seeds per hectare. Plots were 3.66 m wide and 5.18 m long with 1.2 m between each replicate.
Herbicides included DCPA (Dacthal), pendimethalin (Prowl H_2O), oxyfluorfen (Goaltender), and bromoxynil (Buctril). Application rates as well as tillage treatments are illustrated in Table 1. DCPA and pendimethalin were applied as a pre-emergence herbicide on April 30, whereas 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. The entire experiment received a post-emergence application of bromoxynil and oxyfluorfen on June 4, after the onions had reached the two-leaf growth stage and an application of dimethenamind (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.

Results
Herbicides did not injure onions during establishment (data not shown). 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. Noticeable exceptions occurred with onions grade between 3.5 and 4 in. diameters where the conventional-tillage and herbicide treatment numerically yielded high than the corresponding herbicide treatment in strip-tillage. The yield grade cwt/A for each tillage and herbicide treatments are illustrated in Table 1.

Table 1. Effect of tillage and herbicide on weed emergence/control (5 wk after pre-emergence applications and 3 wk after first micro-rate application) and onion grade/yield at Oakes, ND.

Herbicide	Rate	Weed count (#/ft^2)			Onion yield (cwt/A)		
		Colq	Rrpw	Hans	3 ½-4 in.	3-3 ½ in.	2 ¼-3 in.
Strip-tillage							
DCPA	10 lbs/A	0.3	0.8	6.8	32	135	148
Pendimethalin	1.5 pt/A	1.0	2.3	6.5	70	157	201
Oxyfluorfen	2 oz/A	0.0	0.0	0.0	54	169	180
Bromoxynil	4 oz/A	0.0	0.0	0.0	20	141	164
Conventional							
DCPA	10 lbs/A	0.3	3.3	4.3	91	159	147
Pendimethalin	1.5 pt/A	1.5	5.5	9.5	65	155	177
Oxyfluorfen	2 oz/A	0.0	0.0	0.3	73	169	191
Bromoxynil	4 oz/A	0.0	0.0	0.0	39	84	132
LSD 0.05		1.3	2.4	5.5	40	69	37

Weed control using herbicides applied as micro-rates in onion, Absaraka. James Loken, Harlene Hatterman-Valenti, and Collin Auwarter.

An experiment was conducted at the North Dakota State Research Arboretum near Absaraka, ND, to compare early-season weed control of bromoxynil, oxyfluorfen (water based formulation), metribuzin, and acifluorfen applied at micro-rates to a standard pre-emergence treatment of DCPA in onion (*Allium cepa* L.). The soil was a Spottswood sandy loam with 2.0% O.M., 7.2 pH, and potato 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 3. Plots were 6 ft wide by 20 ft long and arranged in a randomized complete block design with four replicates. The standard pre-emergence treatment of DCPA was applied on May 7. At time of weed cotyledon stage (May 18) herbicides were applied as micro-rates at 1/16, 1/8, and 1/4 of their lowest labeled rates every 7 days, with 2 or 3 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 21 (3-leaf stage) to control broadleaf weeds. Another standard application of bromoxynil and oxyfluorfen was made on July 6 (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.) seven days after each micro-rate treatment using weed counts and approximately two weeks after the first standard application using a visual evaluation. On October 2, 10 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. Samples were taken to check for % double-centered bulbs.

Herbicide application dates, timings, and environmental conditions for Absaraka, 2007.

Application Date:	5-7	5-18	5-25	6-5	6-21	7-6
Onion Stage:	PRE	PRE	E	1-1½ lf	3 lf	5-6 lf
Air Temp., (F):	61	75	50	62	73	76
Wind Velocity, (MPH):	5	7	5	5	5	7
Soil Temp., (F):	59	66	51	68	71	82
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 did not injure onion during establishment. Plant counts generally reinforced visual weed control ratings. Visual ratings indicated that excellent common lambsquarters and redroot pigweed control occurred early on with 2 or 3 applications of bromoxynil at 0.063 lb ae/A. However, due to bromoxynil's lack of control of common purslane, the greatest large and total yield occurred with 3 applications of oxyfluorfen at 0.013 lb ai/A. This treatment provided good early-season common lambsquarters and redroot pigweed control. Similar total yields were reported with the conventional check, but large grade yields of this treatment were considerably lower.

Effect of herbicide, rate, and number of applications on weed control, onion yield, and grade at Absaraka

Herbicide	Micro-rate (lb ai/A)	# of App.	[4]Population colq		[4]Population rrpw		[5]% Weed Control colq	[5]% Weed Control rrpw	[3]Yield (lbs/A)		
			[1]1WAT1	2WAT3	1WAT1	2WAT3	[2]9WAP	9WAP	2.25-3 in	3 in or >	Total
Bromoxynil	0.0156	2	1.25	1.25	3	0.25	75	66	11869	5026	21715
Bromoxynil	0.0313	2	1.25	0.25	4	0.25	86	81	11988	3385	20018
Bromoxynil	0.0625	2	0	0.25	0	0	99	99	10554	3297	17485
Bromoxynil	0.0156	3	1.75	1.25	0.5	2.5	59	69	6126	2015	12880
Bromoxynil	0.0313	3	0.5	0.75	5.5	0	79	85	11072	5225	21874
Bromoxynil	0.0625	3	0	0	0	0	100	100	10236	6021	20472
Oxyfluorfen	0.0031	2	2	1.25	1	0.5	63	38	18361	6333	28725
Oxyfluorfen	0.0063	2	0.75	1	0	1.25	69	44	14657	23483	40952
Oxyfluorfen	0.0125	2	0.25	1.25	0	0.25	95	84	8204	27769	36866
Oxyfluorfen	0.0031	3	1.5	1.75	0.75	1.75	55	44	14298	14975	31003
Oxyfluorfen	0.0063	3	0.5	1.25	0.25	0.25	85	96	12108	33352	47285
Oxyfluorfen	0.0125	3	0	0.75	0.5	0	97	100	7368	40108	48002
Metribuzin	0.0047	2	1.25	1.5	0.5	1.25	25	25	4413	199	9718
Metribuzin	0.0094	2	1.25	0.25	2.25	1.25	31	34	8587	3863	16680
Metribuzin	0.0188	2	1.75	1	1.25	0.5	38	50	13167	24853	39192
Metribuzin	0.0047	3	0.75	2	1.75	1.5	54	50	8403	931	11678
Metribuzin	0.0094	3	1.5	3	4.25	1.75	38	28	11670	3107	20632
Metribuzin	0.0188	3	3.25	1.75	1.75	2	48	56	12944	21667	36858
Acifluorfen	0.0156	2	1.5	1.5	1.25	0.75	41	38	8204	1115	14378
Acifluorfen	0.0313	2	2.25	3.5	2	1.5	34	34	7249	820	13884
Acifluorfen	0.0625	2	0.5	0.75	0.25	0.25	53	75	13621	14896	31130
Acifluorfen	0.0156	3	0.75	1	1	1.75	38	44	12641	2031	18974
Acifluorfen	0.0313	3	0.75	0.5	1.25	3.25	34	34	10076	1505	16281
Acifluorfen	0.0625	3	0	0.5	0.5	0.25	63	78	11749	24973	38204
Conventional Method Check			0.25	0	2.25	1.5	98	63	16131	31162	50320
DCPA - PRE	7.5	—									
Bromoxynil - 5 lf	0.25	—									
Oxyfluorfen - 5 lf	0.1	—									
Hand-Weeded Check		—	0	0	0	0	100	100	15214	11080	29481
LSD (0.05)			1.6	1.5	ns	1.8	30	26	6680	8853	10815

[1]1WAT1 denotes one week after first treatment.
[2]9WAP denotes nine weeks after planting.
[3]Cull yield not shown.
[4]Average populations taken from a 1 ft2 area.
[5]colq and rrpw denote common lambsquarters and redroot pigweed, respectively.
[6]ns denotes not significant

Weed control using herbicides applied as micro-rates in onion, Oakes. James Loken, Harlene Hatterman-Valenti, Collin Auwarter, and Walt Albus. An experiment was conducted at the Oakes Irrigation Research Site near Oakes, ND, to compare early-season weed control of bromoxynil, oxyfluorfen (water based formulation), metribuzin, and acifluorfen applied at micro-rates to a standard pre-emergence treatment of DCPA 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 220,000 seeds/A using a Monosem four row double-line planter on April 19. Plots were 6 ft wide by 17 ft long and arranged in a randomized complete block design with four replicates. The standard pre-emergence treatment of DCPA was applied one week after planting (April 24). At time of weed cotyledon stage (May 9) herbicides were applied as micro-rates at 1/16, 1/8, and 1/4 of their lowest labeled rates every 7 days, with 2 or 3 total applications. Herbicide micro-rates were applied with a CO_2 pressurized backpack sprayer. A standard application of bromoxynil, oxyfluorfen, and dimethenamid-P was applied on June 20 (3-leaf stage) to control broadleaf weeds. Another standard application of bromoxynil and oxyfluorfen was made on July 11 (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. 50 lb/A of 28% nitrogen was applied the previous fall. Liquid nitrogen (30 lb/A at 28%) was applied via streambar on June 5, June 20, July 28, and July 12. Treatments were evaluated for overall control of redroot pigweed (*Amaranthus retroflexus* L.) and common lambsquarters (*Chenopodium album* L.) seven days after each micro-rate treatment using weed counts and approximately two weeks after the first standard application using a visual evaluation. On September 4, 10 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. Samples were taken to check for % double-centered bulbs.

Herbicide application dates, timings, and environmental conditions for Oakes, 2007.

Application Date:	4-24	5-9	5-16	5-23	6-20	7-11
Onion Stage:	PRE	PRE	E	1-1½ lf	3 lf	5-6 lf
Air Temp., (F):	54	72	52	59	74	66
Wind Velocity, (MPH):	5	5	5	7	6	6
Soil Temp., (F):	53	65	63	66	78	79
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 of oxyfluorfen and bromoxynil caused slight injury to onion during establishment. This was due to cooler temperatures at application time. Onion maggots severely reduced yields. Plants counts reinforced visual weed control ratings. Visual ratings indicated that excellent common lambsquarters and redroot pigweed control occurred early on with 3 applications of bromoxynil at 0.063 lb ae/A and 3 applications of oxyfluorfen at 0.013 lb ai/A. The greatest total onion yields were also associated with the oxyfluorfen treatment. Early-season broadleaf weed control was necessary to achieve high yields with the micro-rate treatments.

Effect of herbicide, rate, and number of applications on weed control, onion yield, and grade at Oakes

Herbicide	Micro-rate (lb ai/A)	# of App.	[4]Population colq		[4]Population rrpw		[5]% Weed Control colq	[5]% Weed Control rrpw	[3]Yield (lbs/A)		
			[1]1WAT1	2WAT3	1WAT1	2WAT3	[2]9WAP	9WAP	2.25-3 in	3 in or >	Total
Bromoxynil	0.0156	2	2.75	2.5	0.75	1	25	50	827	179	2900
Bromoxynil	0.0313	2	0	0	1.75	0.5	71	74	2122	468	6173
Bromoxynil	0.0625	2	0.25	0	1.5	0.25	96	90	5036	1438	9986
Bromoxynil	0.0156	3	5.5	2.5	0.5	0.75	73	93	1151	755	5878
Bromoxynil	0.0313	3	1	0.25	2.25	0	93	88	1691	935	5453
Bromoxynil	0.0625	3	0	0.25	0	0	100	94	4029	575	8497
Oxyfluorfen	0.0031	2	6.75	7.75	2	2.5	19	50	611	0	3266
Oxyfluorfen	0.0063	2	0.25	0.75	.25	0	53	76	3849	935	8554
Oxyfluorfen	0.0125	2	0.75	0.25	1.5	0.25	79	100	6007	1942	12447
Oxyfluorfen	0.0031	3	4.5	2.5	2	1.25	38	73	5288	1546	9878
Oxyfluorfen	0.0063	3	1	1.5	0.5	0.25	50	91	4676	1978	10108
Oxyfluorfen	0.0125	3	2	1	0.25	0	63	96	7014	1978	13785
Metribuzin	0.0047	2	7	6.5	3	2	70	31	252	0	2532
Metribuzin	0.0094	2	7.5	2.25	2.25	2	38	44	0	0	1036
Metribuzin	0.0188	2	1.75	1.5	1.75	3	56	70	863	0	3561
Metribuzin	0.0047	3	2.25	2	3.75	2	35	48	252	144	1841
Metribuzin	0.0094	3	1	0.75	1.75	0.5	69	86	179	0	2654
Metribuzin	0.0188	3	1	0.25	2	0.25	78	88	575	0	1999
Acifluorfen	0.0156	2	2.25	2.75	2	1.5	31	41	144	0	2417
Acifluorfen	0.0313	2	7.25	7.75	0.75	1.5	24	21	1330	0	3288
Acifluorfen	0.0625	2	3.25	3.25	0.5	0.5	14	86	611	0	2532
Acifluorfen	0.0156	3	4.5	4.25	1.25	2	19	66	144	0	1172
Acifluorfen	0.0313	3	5	5	1.75	0.5	18	90	683	0	3863
Acifluorfen	0.0625	3	3.5	1.25	0	0	43	96	2734	1115	7389
Conventional Method Check			1.5	1	1.25	0.75	53	31	1079	144	4475
DCPA - PRE	7.5	—									
Bromoxynil - 5 lf	0.25	—									
Oxyfluorfen - 5 lf	0.1	—									
Hand-Weeded Check		—	0	0	0	0	100	100	6691	3093	16181
LSD (0.05)			ns	1.5	ns	1.8	32	22	3446	1927	5680

[1]1WAT1 denotes one week after first treatment.
[2]9WAP denotes nine weeks after planting.
[3]Cull yield not shown.
[4]Average populations taken from a 1 ft^2 area.
[5]colq and rrpw denote common lambsquarters and redroot pigweed, respectively.
[6]ns denotes not significant.

Simulated glyphosate drift to irrigated potato. Harlene Hatterman-Valenti and Collin Auwarter.

A study was conducted at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate simulated glyphosate drift applied to Russet Burbank potato. The study was conducted on loamy sand soil with 1.8 % organic matter and 7.7 pH. Onions were grown during 2006. 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 10, 2007. The objective of this study was to compare the injury from glyphosate applied at the tuber hooking (TH), tuber initiation (TI), early tuber bulking (EB), and late tuber bulking/early senescence stage (LB). 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 July 6, July 26, and August 23 on the TI, EB, and LB stages, and at 0.25 lb ae/A on June 20 for the TH stage with a CO2 pressurized sprayer equipped with 8002 flat fan nozzles with a spray volume of 20 GPA and a pressure of 40 psi. The amount of AMS added to the spray solution was reduced accordingly. Potatoes were machine harvested September 25 and graded a few weeks later. Application, environmental, crop, and yield data are listed below:

Date:	6/20/07	7/6/07	7/26/07	8/23/07
Treatment:	TH	TI	EB	LB
Air temperature (F):	75	81	70	64
Rel. hum. (%):	48	40	97	77
Wind (mph):	3	10	3	7
Soil moisture:	adequate	above normal	above normal	above normal
Cloud cover (%):	0	0	100	25

Potatoes treated with glyphosate at the TH stage had significantly lower yield of tubers >4 oz than the untreated, 51 cwt/A compared to 451 cwt/A. Potatoes treated with 0.25 lb/A glyphosate earlier in the growing season (TH or TI) had >70% cull tubers (<4 oz). Potatoes treated at the EB stage showed little total yield effects compared to the untreated, however potatoes treated at the EB stage yielded higher at the 0-4, 4-6, and 6-10 oz and yielded lower at the 10-12, 12-14, and >14 oz sizes. Potatoes treated with 0.25 and 0.125 lb/A glyphosate at the LB stage showed a significant yield loss compared to the untreated. Potatoes treated with 0.25 lb/A at the LB stage had a yield loss of 200 cwt/A and potatoes treated with 0.125 lb/A at the LB stage had a yield loss of 100 cwt/A compared to the untreated. Daughter tubers are being stored throughout the winter to determine if daughter tubers from plants treated with glyphosate show any affects compared to daughter tubers from plants not treated with glyphosate.

Influence of adjuvants with Reglone for desiccation on dryland potatoes. Harlene Hatterman-Valenti and Collin Auwarter.

A study was conducted to evaluate adjuvants for use with Reglone. Red Norland seed pieces (2 oz) were planted May 29, 2007 at the NDSU research site near Prosper, ND. The trial was conducted on clay loam soil with 3.4% organic matter and 6.9 pH. Plots were 4 rows by 25 ft arranged in a randomized complete block design with 4 replicates. Potato seed pieces were planted in 36 inch rows and 12 inch plant spacing. A fungicide maintenance program was utilized throughout the growing season. The desiccant treatments were applied September 7, using a CO2 pressurized sprayer equipped with 8002 flat fan nozzles with a spray volume of 20 GPA and a pressure of 40 psi. Environmental conditions at the time of application included: 61°F air temp., 81% Rel. Hum., 7 mph wind velocity, and 10% cloud cover.

Effect of adjuvant on potato desiccation using Reglone.

	Rating date			9/11	9/11	9/14	9/14	9/21	9/21	10/1	10/1
	Rating data type:										
	Desiccation			Stem	Lvs	Stem	Lvs	Stem	Lvs	Stem	Lvs
	DAA			4	4	7	7	14	14	24	24
No.	Treatment Name	Rate	Unit								
1	Reglone	2	pt/a	33.8a	60.0b	40.0b	85.0b	91.3a	98.8a	98.8a	100.0a
2	Reglone	2	pt/a	32.5a	67.5ab	41.3b	92.5a	95.0a	100.0a	100.0a	100.0a
	Preference	0.25	%v/v								
	Interlock	2	fl oz/a								
3	Reglone	2	pt/a	40.0a	71.3ab	52.5a	91.3a	95.0a	100.0a	100.0a	100.0a
	AG 06011	6	fl oz/a								
4	Reglone	2	pt/a	30.0a	68.8ab	40.0b	85.0b	93.8a	100.0a	100.0a	100.0a
	AG 05006	0.5	% v/v								
	Interlock	2	fl oz/a								
5	Reglone	2	pt/a	35.0a	67.5ab	42.5b	88.8ab	95.0a	100.0a	100.0a	100.0a
	AG 07042	0.5	% v/v								
	Interlock	2	fl oz/a								
6	Reglone	2	pt/a	37.5a	75.0a	42.5b	91.3a	95.0a	100.0a	100.0a	100.0a
	AG 07042	0.5	% v/v								
	Interlock	2	fl oz/z								
7	Untreated			0.0b	0.0c	0.0c	0.0c	0.0b	0.0b	0.0b	0.0b

Means followed by same letter do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

The treatments were applied when the plants were beginning to senescence. All provided good results at both 14 and 24 DAA. Reglone with AG06011 showed slightly better desiccation early after application and provided greater stem necrosis at 7 DAA compared with others, but all were equivalent at 14 DAA.

Carfentrazone-ethyl (AIM) as a desiccant on dryland potatoes. Harlene Hatterman-Valenti and Collin Auwarter.

A study was conducted to evaluate adjuvants for use with Aim or a tank-mix of Aim and Reglone. Red Norland seed pieces (2 oz) were planted May 29, 2007 at the NDSU research site near Prosper, ND. The trial was conducted on clay loam soil with 3.4% organic matter and 6.9 pH. Plots were 4 rows by 25 ft arranged in a randomized complete block design with 4 replicates. Potato seed pieces were planted in 36 inch rows and 12 inch plant spacing. A fungicide maintenance program was utilized throughout the growing season. The desiccant treatments were applied September 7, using a CO2 pressurized sprayer equipped with 8002 flat fan nozzles with a spray volume of 20 GPA and a pressure of 40 psi.

Application Date:	9/7	9/14
Application Timing	'A'	'B'
Time of Day	8:00 AM	6:00 PM
Air Temp. °F	61	56
% Rel. Hum.	81	35
Wind Velocity (mph)	7	5
% Cloud Cover	10	0

Potato desiccation with carfentrazone-ethyl

	Rating date				9/11	9/11	9/14	9/14	9/21	9/21	10/1	10/1
	Rating data type: Desiccation				Stem	Lvs	Stem	Lvs	Stem	Lvs	Stem	Lvs
	DAA: 'A'-'B'				4	4	7	7	14-7	14-7	24-17	24-17
No.	Treatment Name	Rate	Unit	Appl Code								
1	AIM	3.2	fl oz/a	AB	15ab	28b	21b	40c	45c	94b	94b	100a
	N-Tense	1	qt/a									
2	AIM	2	fl oz/a	AB	10bc	31b	18b	58b	73b	99a	100a	100a
	Reglone	1	pt/a									
	MSO	1	qt/a									
3	AIM	2	fl oz/a	AB	20a	53a	34a	78a	79a	100a	100a	100a
	Reglone	1.5	pt/a									
	MSO	1	qt/a									
4	AIM	3.2	fl oz/a	AB	8c	18c	13b	29d	39d	90c	94b	100a
	MSO	1	qt/a									
5	Untreated				0d	0d	0c	0e	0e	0d	0c	0b

Means followed by same letter do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Treatments of Aim mixed with Reglone performed best. The treatment of Aim at 2 oz/A with Reglone at 1.5 pt/a showed greater stem and leaf desiccation at 4 and 7 days after application. At 24 DAA, the Aim without Reglone treatments showed complete death of the leaves but slightly less necrosis of the stems.

Table 1. Effect of glyphosate on potato yield and grade.

No.	Name	Rate	Time	<4oz		4-6oz		6-10oz		10-12oz		12-14oz		>14oz		Total		>4oz	
		lb ae/a		----------Cwt/A----------															
1	Glyphosate	0.25	TI	93	b	47.2	e	39.3	e	5.8	ef	0.6	f	0.7	c	186.5	e	93.6	d
2	Glyphosate	0.125	TI	135	a	91.1	ab	100.8	d	24.2	de	12.2	ef	9.3	c	373.1	cd	237.7	c
3	Glyphosate	0.0625	TI	90.2	bc	94.4	a	156.2	ab	44	cd	25.1	cde	30.5	bc	440.5	abc	350.3	b
4	Glyphosate	0.03125	TI	63.5	cde	77.3	a-d	168.6	ab	66.7	ab	38.7	abc	70.9	a	485.6	ab	422.1	ab
5	Glyphosate	0.25	EB	55.2	de	84.8	abc	175.3	ab	60	abc	41.5	abc	81.2	a	497.9	a	442.7	a
6	Glyphosate	0.125	EB	59.3	de	77.4	a-d	179.9	a	52.7	bc	42.1	abc	85.2	a	496.7	a	437.4	ab
7	Glyphosate	0.0625	EB	60.2	de	71.7	bcd	153.6	abc	46.8	bc	47.5	ab	86.6	a	466.4	ab	406.2	ab
8	Glyphosate	0.03125	EB	59.7	de	72.2	bcd	144	abc	56.7	bc	33.1	bcd	82.4	a	448.1	abc	388.4	ab
9	Glyphosate	0.25	LB	57.2	de	62.2	de	112	cd	22.9	ef	21	de	33.4	bc	308.8	d	251.5	c
10	Glyphosate	0.125	LB	53.2	de	78.3	a-d	136.1	bcd	44.5	c	31.7	bcd	59.7	ab	403.5	bc	350.4	b
11	Glyphosate	0.0625	LB	65.4	cd	83.8	a-d	149.4	abc	54.4	bc	42.1	abc	68.5	a	463.5	ab	398.1	ab
12	Glyphosate	0.03125	LB	55.3	de	73.4	a-d	146.1	abc	51	bc	44.9	ab	61.7	ab	432.5	abc	377.1	ab
13	Glyphosate	0.25	TI	37.1	e	23.1	f	21.6	e	3.4	f	2.4	f	0.7	c	88.2	f	51.2	d
14	Untreated			41.6	de	66.2	cde	165.8	ab	77.2	a	51.1	a	90.3	a	492.1	a	450.5	a

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Mean comparisons performed only when AOV Treatment P(F) is significantly at mean comparison OSL.

Weed control in safflower. Williston,2007. Neil Riveland

'MonDak'safflower was planted on April 28 into tilled soil previously cropped to hrs wheat (in 2006) using a planter having 7 inch row spacing, seeding at 30 lbs/a. All treatments were applied post-emergence on June 5 to 5-6 leaf safflower,1-2 Russian thistle and common lambsquarters and 0.5-2 inch wild mustard with a dry soil surface, 57 F temperature, 100% clear sky, wind from 107 degrees at 1-3 mph and 65% RH. We 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 0.11 inches on June 6. The experiment was a randomized complete block design with three replications. Plots were evaluated for crop injury on July 5 and for weed control on August 9. Only Russian thistle (Ruth) and green foxtail were rated. Population densities of Ruth were 0.5-2/ft2 and green foxtail 12-20/ft2. Safflower was machine harvested on September 7.

Treatment[a]	Product Rate	Crop Inj	Plt Ht	— Control —		Test Weight	Yield	Seed Oil
				Ruth	Grft			
	oz/a	%	in	%		lbs/b	lbs/a	%OD
Harmony GT+NIS	0.167+0.25%	0	25	72	0	40.0	648	35.0
Harmony GT+NIS	0.20+0.25%	8	23	75	0	41.1	638	33.3
Harmony GT+NIS	0.25+0.25%	7	26	78	0	41.4	835	35.7
Harmony GT+NIS	0.3+0.25%	10	23	90	0	40.3	631	34.1
Harmony GT+NIS	0.4+0.25%	18	24	95	0	41.1	800	34.3
Glean+NIS	0.25+0.25%	5	22	95	33	41.0	676	33.9
Ally+NIS	0.1+0.25%	15	25	96	0	41.7	748	34.5
Upbeet+NIS	0.5+0.25%	0	25	62	0	41.5	791	34.2
Upbeet+NIS	0.75+0.25%	7	23	82	0	40.3	610	34.2
Upbeet+NIS	1.0+0.25%	7	23	53	0	41.2	962	35.1
Upbeet+HarmGT+NIS	0.5+0.2+0.25%	10	24	88	0	40.4	696	33.7
Select+HarmGT+COC	6+0.2+1%	0	21	85	95	41.1	852	33.3
Assurell+HrmGT+COC	8+0.2+1%	3	23	93	99	41.5	887	34.3
Poast+HrmGT+COC	16+0.2+1%	0	23	95	95	42.1	1164	34.7
SelectMax+HrmGT+NIS	9+0.2+0.25%	10	27	96	90	42.1	1123	35.3
Poast+Upbeet+COC	16+1.0+1%	10	23	73	94	41.8	874	34.2
Weedy check	0	0	25	0	0	41.9	666	34.6
2,4-DB	12	53	24	90	0	42.7	722	35.5
EXP MEAN		9	24	79	28	41.3		34.4
C.V. %		56	11	6	14	1.6		3.1
LSD 5%		8	NS	7	7	NS		NS

[a] - NIS = Activator 90 from Loveland. COC = Hebimax from Loveland

Summary: Minor injury occurred with many of the sulfonylurea herbicides. 2,4-DB caused the most crop injury.

BROADLEAF WEED CONTROL IN SAFFLOWER

Broadleaf weed control in safflower. Williston 2006. Neil Riveland 'Finch' safflower was planted on May 15 into tilled soil previously cropped to durum wheat (in 2005) using a planter having 7 inch row spacing, seeding at 30 lbs/a. The KIH 485 treatment was applied PE on May 16 to a dry soil surface with 65 degree F temperature, 43% RH, wind south at 3-6 mph, and clear sky. All other treatments (post emergence) were applied on June 7 with 65 F temperature, RH at 60%, wind NE at 2-4 mph and a 95% clear sky to 4-6 leaf safflower, 2-4 lf green foxtail, and 1-2 inch Russian thistle. We 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 25 ft plots. First rain received after PE application was 0.12 inches on May 21 and after the post treatment application 0.26 was received on June 8 and 9. The experiment was a randomized complete block design with four replications. Plots were evaluated for crop injury on June 17 and July 18. Russian thistle (Ruth) density was low at 1-2/yd2 and was rated on September 6. Safflower was machine harvested on September 6.

Treatment	Product Rate	— % Crop Injury —		Flower Date	Control Ruth	Test Weight	Yield
		6/17	7/18	Fr 6-1	%	lbs/bu	lbs/a
Harmony GT+NIS	0.167+0.25%	0	1	47	68	72.3	850.5
Harmony GT+NIS	0.20+0.25%	5	1	48	75	41.1	866.8
Harmony GT+NIS	0.25+0.25%	10	13	48	88	41.8	852.2
Harmony GT+NIS	0.3+0.25%	13	9	48	86	41.7	828.2
Harmony GT+NIS	0.4+0.25%	14	10	48	91	41.7	817.6
Glean+NIS	0.25+0.25%	14	4	48	79	41.9	880.9
Ally+NIS	0.1+0.25%	70	40	48	91	41.6	802.7
Upbeet+NIS	0.5+0.25%	9	4	49	50	42.2	874.3
Upbeet+NIS	0.75+0.25%	11	5	47	46	41.7	848.8
Upbeet+NIS	1.0+0.25%	13	4	48	31	41.7	856.6
Upbeet+HarmGT+NIS	0.5+0.2+0.25%	13	9	48	84	42.2	854.6
Select+HarmGT+COC	6+0.2+1%	10	3	48	89	42.1	837.5
Assurell+HrmGT+COC	8+0.2+1%	8	1	47	84	41.4	817.1
Poast+HrmGT+COC	16+0.2+1%	14	6	48	78	41.6	824.1
SelectMax+HrmGT+NIS	9+0.2+0.25%	0	0	47	83	42.0	857.8
Poast+Upbeet+COC	16+1.0+1%	15	6	48	15	41.6	857.3
Weedy check	0	0	0	47	0	41.5	859.2
Weedfree Check	0	0	0	47	0	41.9	888.1
KIH-485	4.8	4	1	47	94	41.8	836.8
HIGH MEAN		70	40	49	94	42.3	888.1
LOW MEAN		0	0	47	0	41.1	802.7
EXP MEAN		12	6	48	65	41.8	848.0
C.V. %		54	86	2	21	1.1	6.4
LSD 5%		9	7	1	19	NS	NS
LSD 1%		12	10	NS	26	NS	NS
# OF REPS		4	4	4	4	2	4
F-TRT		24	12	2	21	0.8	0.7

Everest on safflower. Williston, 2007. Neil Riveland

Four safflower varieties were planted on May 8th into land fallowed in 2006 using a cone seeder having 6 inch ro spacing, seeding at 350,000 PLS/a. Each plot was 8 rows wide (four feet) and 16 feet long. All treatments were applied perpendicular to seeding, across each block or range. Each block was a treatment and there were six treatments and three replications. Preemergence treatments were applied on May 10 to a dry soil surface with 4 F temperature, 75% clear sky, wind from 10 degrees at 5-7 mph and RH 75%. Post-emergence treatments were applied June 5 to 2-4 leaf safflower. We used one 15 foot boom 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 each 16 foot range of varieties. First rain received after application was 0.91 inches on May 13 and 14. No other herbicides were applied for weed control since there was no early plan to harvest the plots. The experiment was a split-plot (Everest treatments as whole plots and varieties as split plots)in a randomized complete block design with three replications. Plots were evaluated for crop injury on June 3 (PE treatments only) June 16 and July 2. Safflower was machine harvested on September 17. Soil pH was 6.2 and organic matter content was 1.7%. There was no visible injury from any PE treatment on safflower varieties when rated on June 3.

Treatment/Timing/Rate [a]	Variety	Crop Injury [b] June 16	Crop Injury [b] July 2	Plant Height		Test Weight	Yield
		%		cms	inches	lbs/b	lbs/a
Untreated Check	Finch	0.0	0.0	46.0	18.1	42.6	864.0
Untreated Check	MT 2003	0.0	0.0	44.3	17.4	40.5	715.0
Untreated Check	MonDak	0.0	0.0	49.0	19.3	41.6	923.5
Untreated Check	Cardinal	0.0	0.0	51.0	20.1	44.0	1022.0
Everest PE .408 oz	Finch	15.0	16.7	48.0	18.9	42.0	829.2
Everest PE .408 oz	MT 2003	11.7	15.0	43.7	17.2	40.5	713.8
Everest PE .408 oz	MonDak	10.0	11.7	47.0	18.5	41.1	892.8
Everest PE .408 oz	Cardinal	11.7	8.3	50.7	19.9	43.9	879.2
Everest PE .816 oz	Finch	18.3	16.7	48.0	18.9	43.2	990.6
Everest PE .816 oz	MT 2003	11.7	10.0	44.7	17.6	41.3	846.9
Everest PE .816 oz	MonDak	10.0	11.7	45.3	17.8	41.8	921.4
Everest PE .816 oz	Cardinal	10.0	8.3	54.0	21.3	44.2	1086.3
Everest PE .306 oz/Post.306 oz	Finch	23.3	20.0	43.0	16.9	43.0	860.8
Everest PE .306 oz/Post .306 oz	MT 2003	23.3	20.0	41.0	16.1	40.9	797.3
Everest PE .306 oz/Post .306 oz	MonDak	15.0	18.3	44.0	17.3	42.0	923.8
Everest PE .306 oz/Post .306 oz	Cardinal	13.3	13.3	52.3	20.6	44.4	988.8
Everest PE .408 oz/Post .408 oz	Finch	31.7	33.3	44.0	17.3	42.9	771.2
Everest PE .408 oz/Post .408 oz	MT 2003	25.0	20.0	40.0	15.8	40.7	731.6
Everest PE .408 oz/Post .408 oz	MonDak	20.0	18.3	45.0	17.7	41.2	823.6
Everest PE .408 oz/Post .408 oz	Cardinal	20.0	18.3	53.7	21.1	43.7	794.6
Everest Post .612 oz	Finch	40.0	33.3	45.3	17.8	44.0	1006.5
Everest Post .612 oz	MT 2003	33.3	23.3	41.7	16.4	41.3	812.2
Everest Post .612 oz	MonDak	28.3	23.3	45.7	18.0	42.2	924.3
Everest Post .612 oz	Cardinal	25.0	16.7	52.3	20.6	44.6	1079.2
HIGH MEAN		40.0	33.3	54.0	21.3	44.6	1086.3
LOW MEAN		.0	.0	40.0	15.8	40.5	713.8
EXP MEAN		16.5	14.9	46.7	18.4	42.4	883.3
C.V. %		34.8	40.0	5.9	5.9	1.3	13.0
LSD 5%		9.4	9.8	4.5	1.8	1.2	188.2
LSD 1%		12.6	13.0	6.0	2.4	1.6	251.2
# OF REPS		3	3	3	3	2	3
F-TRT		10.9	7.3	6.4	6.4	11.0	2.6

[a] – All PE treatments included Quad 7, a basic blend adjuvant from AGSCO, at 0.25%v/v. All post treatments included Quad 7 a basic blend adjuvant from AGSCO, at 1% v/v.
[b] – Visual crop injury ratings based on stunting and delay in plant development.

AVERAGE PERFORMANCE OF FOUR SAFFLOWER VARIETIES AT SIX EVEREST APPLICATION RATES

Treatment/Timing/Rate	Crop Injury 6/16	Crop Injury 7/2	Plant Height		Test Weight	Yield
	%		cms	inches	lbs/b	lbs/a
Untreated Check	0.0	0.0	47.6	18.7	42.1	881.1
Everest PE .408 oz	12.1	12.9	47.3	18.6	41.8	828.7
Everest PE .816 oz	12.5	11.7	48.0	18.8	42.6	961.3
Everest PE .306 oz/Post .306 oz	18.8	17.9	45.1	17.7	42.5	892.6
Everest PE .408 oz/Post .408 oz	24.2	22.5	45.7	17.9	42.1	780.2
Everest Post .612 oz	31.7	24.2	46.3	18.2	43.0	955.5
LSD(5%	8.7	9.7	NA	NA	NA	NA
LSD(1%	12.4	13.8	NA	NA	NA	NA

PERFOMANCE OF FOUR SAFFLOWER VARIETIES AVERAGED OVER SIX EVEREST TREATMENTS

Variety	Crop Injury 6/16	Crop Injury 7/2	Plant	Height	Test Weight	Yield
	%		cms	inches	lbs/b	lbs/a
Finch	21.4	20.0	45.7	18.0	43.0	887.0
MT 2003	17.5	14.7	42.6	16.7	40.9	769.4
MonDak	13.9	13.9	46.0	18.1	41.6	901.5
Cardinal	13.3	10.8	52.3	20.6	44.1	975.0
LSD(5%	2.8	2.5	1.8	0.70	0.36	49.02
LSD(1%	3.7	3.3	2.4	0.93	0.50	65.73

PERFORMANCE OF FOUR SAFFLOWER VARIETIES AT SIX EVEREST APPLICATION RATES

Treatment/Timing/Rate	Variety	Crop Injury 6/16	Crop Injury 7/2	Plant Height		Test Weight	Yield
		%		cms	inches	lbs/b	lbs/a
Untreated Check	Finch	0.0	0.0	46.0	18.1	42.6	863.9
Everest PE .408 oz	Finch	15.0	16.7	48.0	18.9	42.0	829.2
Everest PE .816 oz	Finch	18.3	16.7	48.0	18.9	43.1	990.5
Everest PE .306 oz/Post .306 oz	Finch	23.3	20.0	43.0	16.9	43.0	860.7
Everest PE .408 oz/Post .408 oz	Finch	31.7	33.3	44.0	17.3	42.9	771.1
Everest Post .612 oz	Finch	40.0	33.3	45.3	17.8	43.9	1006.4
Untreated Check	MT 2003	0.0	0.0	44.3	17.4	40.5	714.9
Everest PE .408 oz	MT 2003	11.7	15.0	43.7	17.1	40.4	713.7
Everest PE .816 oz	MT 2003	11.7	10.0	44.7	17.5	41.3	846.9
Everest PE .306 oz/Post .306 oz	MT 2003	23.3	20.0	41.0	16.1	40.9	797.3
Everest PE .408 oz/Post .408 oz	MT 2003	25.0	20.0	40.0	15.7	40.7	731.6
Everest Post .612 oz	MT 2003	33.3	23.3	41.7	16.4	41.3	812.2
Untreated Check	MonDak	0.0	0.0	49.0	19.3	41.6	923.4
Everest PE .408 oz	MonDak	10.0	11.7	47.0	18.5	41.0	892.7
Everest PE .816 oz	MonDak	10.0	11.7	45.3	17.8	41.8	921.4
Everest PE .306 oz/Post .306 oz	MonDak	15.0	18.3	44.0	17.3	41.9	923.8
Everest PE .408 oz/Post .408 oz	MonDak	20.0	18.3	45.0	17.7	41.1	823.6
Everest Post .612 oz	MonDak	28.3	23.3	45.7	17.9	42.2	924.3
Untreated Check	Cardinal	0.0	0.0	51.0	20.1	43.9	1022.0
Everest PE .408 oz	Cardinal	11.7	8.3	50.7	19.9	43.9	879.1
Everest PE .816 oz	Cardinal	10.0	8.3	54.0	21.2	44.1	1086.3
Everest PE .306 oz/Post .306 oz	Cardinal	13.3	13.3	52.3	20.6	44.3	988.7
Everest PE .408 oz/Post .408 oz	Cardinal	20.0	18.3	53.7	21.1	43.7	794.5
Everest Post .612 oz	Cardinal	25.0	16.7	52.3	20.6	44.5	1079.1
LSD 5%		NA	6.1	NA	NA	NA	NA
LSD 1%		NA	NA	NA	NA	NA	NA

Spartan on safflower. Williston 2007. Neil Riveland

'MonDak'safflower was planted on May 3 into tilled soil previously cropped to hrs wheat (in 2006) using a planter having 7 inch row spacing, seeding at 30 lbs/a. All treatments were applied preemergence on May 9 to a dry soil surface
with 65 F temperature, 100% clear sky, wind from 195 degrees at 5-7 mph and RH 56%. We 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 0.91 inches on May 13 and 14. Poast was applied on June 5 at 24 oz/a with a COC to control all grassy weeds. The experiment was a randomized complete block design with three replications. Plots were evaluated for crop injury on June 19 and for weed control on August 9. Russian thistle (Ruth), common lambsquarters (Colq) and redroot pigweed (Rrpw) densities were 0.5-2/ft2. Safflower was machine harvested on
September 7. Soil pH was 5.4 and organic matter content was 1.9%.

Treatment	Product Rate	Crop Inj	Plt Ht	Control			Test Weight	Yield	Seed Oil
				Ruth	Colq	Rrpw			
	oz/a	%	In.	%			lbs/b	lbs/a	%OD
Weedy check	0	0	21	0	0	0	39.7	570	33.0
Weedfree Check	0	0	23	100	100	100	40.5	764	34.7
KIH-485	2.4	3	24	55	80	47	40.7	761	34.2
KIH-485	4.8	0	22	68	78	45	40.3	697	33.3
Spartan	1.5	0	24	67	92	72	41.0	799	33.9
Spartan	2.25	1	24	95	98	99	41.1	744	34.4
Spartan	3	8	23	95	98	97	39.6	607	33.4
Spartan	3.75	18	23	99	99	99	40.7	744	33.9
Prowl H2O	41.6	0	22	75	95	92	39.2	566	32.3
Prowl + Spartan	41.6+3	7	22	99	98	97	39.8	637	33.1
EXP MEAN		4	23	75	84	77	40.3	688	33.6
C.V. %		119	7	21	16	39	1.9	43	2.6
LSD 5%		8	NS	23	20	60	NS	149	NS

SUMMARY: KIH-485 did not control Russian thistle adequately. Spartan at 3.75 oz/a caused the most crop injury but that injury had no effect on safflower Agronomic performance.

Weed control in Clearfield sunflower. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Valley City, ND, to weed efficacy from sunflower herbicides applied at multiple application timings. Croplan 'CL520' corn was planted on June 10, 2007. PRE treatments were applied on June 11 at 10:00 am with 86 F air, 72 F soil at a four inch depth, 61% relative humidity, 25% cloud cover, 6 to 10 mph SE wind, damp soil surface, and wet subsoil. Soil characteristics were 50.5% sand, 34.3 silt, 15.2% clay, loam texture, 5.3% OM, and pH 5.5. POST treatments were applied on July 3 at 2:00 with 80 F air, 85 F soil surface, 69% relative humidity, 10% cloud cover, 3 to 8 mph NE wind, dry soil surface, damp subsoil, excellent crop vigor, and no dew present to V4 to V10 (3 to 8 inch) sunflower. Weed species present with POST only applications only were: 3 to 8 inch (1 to 2/yd2) yellow foxtial; 3 to 10 inch (1/yd2) wild oat; 1 to 3 inch (2 to 5/yd2) easternblack nightshade; and 2 to 4 (1/yd2) and marshelder. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-fan nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles with a backpack-type plot sprayer for POST treatments. The experiment had randomized complete block design with three replicates per treatment.

On June 18, sunflower was emerging. On June 16, over 3 inches of rain fell in three hours causing movement of no-till corn stalks into low areas of the field. Some parts of the study was under water for 1-2 days. Some injury was observed as stunting, some yellow flash. On July 3, corn cobs completely covered treatments 107-113. The statistical program filled in missing values. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Weed control in Clearfield sunflower (Zollinger and Ries).

		22 DAT - PRE					14 DAT - POST					28 DAT - POST				
Treatment[1]	Rate	Snfl[2]	Yeft	Wioa	Ebns	Mael	Snfl	Yeft	Wioa	Ebns	Mael	Snfl	Yeft	Wioa	Ebns	Mael
	(product/A)	% injury	------- % control -------				% injury	------- % control -------				% injury	------- % control -------			
PRE																
KIH-485	2.8oz	0	99	50	90	50	0	99	50	90	50	0	99	55	99	55
KIH-485	3.5oz	5	99	53	92	60	0	99	53	92	60	0	99	55	99	55
KIH-485	4.2oz	10	99	95	95	85	0	99	95	95	85	0	99	95	95	85
KIH-485	7oz	20	99	99	99	99	20	99	99	99	99	20	99	99	99	99
KIH-485+Spartan	2.8oz+3fl oz	2	99	99	99	99	2	99	99	99	99	2	99	99	99	99
KIH-485+Spartan	3.5oz+3fl oz	0	95	90	99	99	0	95	90	99	99	0	95	90	99	99
KIH-485+Spartan	2.8oz+4fl oz	7	99	95	99	99	7	99	95	99	99	7	99	95	99	99
KIH-485+Spartan	3.5oz+3fl oz	8	99	99	99	99	8	99	99	99	99	8	99	99	99	99
PREPOST																
Prowl H_2O/ Beyond+NIS+28%	3pt/ 4fl oz+0.25% v/v+2.5% v/v	0	72	0	20	20	0	99	99	99	99	0	99	99	99	99
Spartan/ Beyond+NIS+28%	3fl oz/ 4fl oz+0.25% v/v+2.5% v/v	0	48	20	90	50	0	99	99	99	99	0	99	99	99	99
Prowl H_2O+Spartan/ Beyond+NIS+28%	1.5pt+1.5fl oz/ 4fl oz+0.25% v/v+2.5% v/v	0	75	28	95	63	0	99	99	99	99	0	99	99	99	99
POST																
Beyond+NIS+28%	4fl oz+0.25% v/v+2.5% v/v						0	99	99	99	99	0	99	99	99	99
Beyond+PO+28%	4fl oz+1% v/v+2.5% v/v						0	99	99	99	99	0	99	99	99	99
LSD (0.05)		7	4	5	3	10	3	NS	4	3	8	3	NS	5	3	9

[1]KIH-485 = pyroxasulfone from Kumiai America; NIS = nonionic surfactant = R-11; PO = petroleum oil concentrate = Herbimax.
[2]Snfl = sunflower.

Weed control in Clearfield sunflower, Carrington, 2007. (Greg Endres). The experimental design was a randomized complete block with three replicates. The dryland, conventional-till trial was established on a Heimdal loam soil with 3.2% organic matter and 6.9 pH. Mycogen '8N386CL' oil sunflower were planted in 30-inch rows on May 21. Herbicide treatments were applied with a CO_2-hand-boom plot sprayer delivering 11.5 gal/A at 30 psi through 8001 flat fan nozzles to the center 6.7 ft of 10 by 30 ft plots. Pre-emergence (PRE) treatments were applied on May 21 with 75 F, 62% RH, 100% cloudy sky on a dry soil surface. Rainfall totaling 1.6 inches occurred the day following application of PRE treatments. Post-emergence (POST) treatments were applied on June 28 with 54 F, 82% RH, 100% cloudy sky, and 3 mph wind to V8- to V10-stage sunflower, 2- to 4-inch tall (tillering) green and yellow foxtail, tillering volunteer wheat, 0.5- to 5-inch tall common lambsquarters, 3- to 6-inch diameter common purslane, 2- to 6-inch tall lanceleaf sage, 1- to 4-inch tall hairy nightshade, 0.5- to 8-inch tall (blooming) wild mustard, 1- to 2-inch tall biennial wormwood, 3- to 5-inch tall redroot pigweed, 0.5- to 4-inch tall prostrate pigweed, and 3- to 4-inch tall wild buckwheat. Sunflower density on June 29 was 26,000 plants/A and weed density generally was low, ranging from 1- to 7-plants/ft^2 for all species. The trial was harvested with a plot combine on November 19.

Common lambsquarters control was excellent (94-98%) with PRE Spartan followed by Beyond (Table 1). Biennial wormwood control was excellent with PRE Spartan at 3 fl oz/A followed by Beyond. Redroot pigweed and wild mustard control generally was excellent with all treatments, ranging from 85 to 98%. Control of other broadleaf and grassy weeds was generally fair with all treatments, ranging from 53 to 80%. Plant chlorosis occurred with Beyond when visually evaluated on July 14 (Table 2). Crop injury was not detected on July 26, and days required to reach crop flowering and physiological maturity were similar among treatments (data not shown). Sunflower yield improved with herbicide treatments compared to the untreated check. Test weight and oil were generally similar among treatments.

Table 1. Weed control in Clearfield sunflower, Carrington, 2007.

Herbicide			Weed control[1]																	
			7/14											7/27							
Treatment[2]	Application[3]	Rate	fota	wht	colq	copu	llsa	hans	wimu	biww	rrpw	prpw	wibw	fota	colq	copu	llsa	hans	rrpw	prpw	wibw
		fl oz product/A	%											%							
Prowl H^{2}O/ Beyond + NIS	PRE/POST	48/4 + 0.25% v/v	68	77	72	83	75	83	95	66	91	91	66	70	78	74	72	77	90	75	63
Spartan/Beyond + NIS	PRE/POST	3/4 + 0.25% v/v	73	77	96	72	78	85	95	99	98	78	70	70	94	73	75	77	96	82	71
Prowl H^{2}O + Spartan/Beyond + NIS	PRE/POST	24 + 1.5/4 + 0.25% v/v	77	80	98	85	75	83	95	73	96	73	65	70	95	72	72	77	93	72	53
Beyond + NIS	POST	4 + 0.25% v/v	72	79	70	65	77	78	95	59	90	67	68	69	68	72	75	75	85	73	56
Beyond + MSO	POST	4 + 1% v/v	74	80	72	68	76	78	95	70	90	72	69	70	70	72	73	75	90	72	65
untreated check			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C.V. (%)			3.9	5	5.8	10.3	2.3	3.7	0.0	15.2	5.2	13.7	4.5	0.8	12.1	3.9	3.7	3.3	6.7	10.7	15.3
LSD (0.05)			4	5	7	12	3	5	0	19	7	16	5	1	15	4	4	4	9	12	14

[1]fota=green and yellow foxtail; wht=volunteer wheat; colq=common lambsquarters; copu=common purslane; llsa=lanceleaf sage; hans=hairy nightshade; wimu=wild mustard; biww=biennial wormwood; rrpw=redroot pigweed; prpw=prostrate pigweed; and wibw=wild buckwheat.

[2]NIS=Preference, a nonionic surfactant from Winfield; MSO=Destiny, a methylated seed oil from WinField. Urea ammonium nitrate include in all herbicide tank mixtures at 2.5% v/v.

[3]PRE=May 21; POST=June 28.

Table 2. Clearfield sunflower response to herbicides, Carrington, 2007.

Herbicide			Sunflower			
			Injury	Seed	Test	
Treatment[1]	Application[2]	Rate	Chlorosis	yield	weight	Oil
		fl oz product/A	0-9[3]	bu/A	lb/A	%
Prowl H^{2}O/Beyond + NIS	PRE/POST	48/4 + 0.25% v/v	2	1121	29.1	39.5
Spartan/Beyond + NIS	PRE/POST	3/4 + 0.25% v/v	1	1009	29.4	38.7
Prowl H^{2}O + Spartan/Beyond + NIS	PRE/POST	24 + 1.5/4 + 0.25% v/v	1	1280	28.8	39.6
Beyond + NIS	POST	4 + 0.25% v/v	2	1116	27.7	37.8
Beyond + MSO	POST	4 + 1% v/v	2	963	29.0	38.0
untreated check			0	573	28.1	38.1
C.V. (%)			27.4	18.3	2.1	2.4
LSD (0.05)			1	341	1.1	NS

[1]NIS=Preference, a nonionic surfactant from Winfield; MSO=Destiny, a methylated seed oil from WinField. Urea ammonium nitrate include in all herbicide tank mixtures at 2.5% v/v.

[2]PRE=May 21; POST=June 28.

[3]0=none; 9=yellow.

Weed control in ExpressSun Trait sunflower, Carrington, 2007. Greg Endres. The experimental design was a randomized complete block with three replicates. The dryland trial was established on a Heimdal loam soil with 3.2% organic matter and 6.9 pH. Herbicide treatments were applied with a CO_2-hand-boom plot sprayer delivering 11.5 gal/A at 30 psi through 8001 flat fan nozzles to the center 6.7 ft of 10 by 30 ft plots. Preplant (PP) treatments were applied on May 24 with 44 F, 80% RH, clear sky, no wind, and on moist soil. Rainfall totaling 1.2 inches occurred within two days after application of PP treatments. Pioneer '63N81' oil sunflower was direct-seeded in 30-inch rows on June 4. The sunflower plant population was thinned to about 20,000 plants/A on June 27. Weed density on June 27 was very low (<2 plants/ft^2) except wheat averaged 11 plants/ft^2. Post-emergence (POST) treatments were applied on June 28 with 55 F, 76% RH, 100% cloudy sky, and 4 mph wind to V4-stage sunflower, 6-leaf (jointing) wheat, 0.5- to 3-inch tall common lambsquarters, 0.5- to 1-inch tall prostrate and redroot pigweed, 0.5- to 6-inch tall wild mustard, 0.5- to 5-inch tall lanceleaf sage, and vining wild buckwheat. The trial was over-sprayed on July 9 with Assure II at 8 fl oz/A + COC at 24 fl oz/A to completely control the wheat. The trial was harvested with a plot combine on November 19.

Wheat control was slightly improved with Assure II not tank-mixed with Express (Table). Common lambsquarters, pigweed and wild mustard control was excellent when visually evaluated in August, ranging from 93 to 99% control. Control of other broadleaf weeds was fair to poor, with generally no difference in control between the two herbicide treatments. No crop injury was noted when visually evaluated on July 13 and July 20. Days required to reach crop flowering and physiological maturity were similar among treatments (data not shown). Sunflower yield was highest with Prowl followed by Express + Assure II.

Table.

			Weed control[1]																	
Herbicide			7/9	7/20							8/17						Sunflower		
Treatment[2]	Application[3]	Rate	wht	colq	pwsp	copu	hans	wimu	llsa	wibw	colq	pwsp	hans	wimu	llsa	wibw	Yield	TW	Oil
		fl oz product/A	%														bu/A	lb/bu	%
Prowl/Express + Assure II + COC	PP/POST	32/0.25 oz + 8 + 24	65	98	68	73	52	78	65	65	99	93	72	96	76	72	1886	31.4	44.4
Spartan/Express + Assure II + COC	PP/POST	4.5/0.25 oz + 8 + 24	68	99	89	72	67	78	69	68	98	99	77	94	76	73	1440	31.3	43.0
untreated check			70	0	0	0	0	0	0	0	0	0	0	0	0	0	1189	30.9	43.6
C.V. (%)			1.0	0.9	12.5	7.7	28.6	12.7	1.5	3.8	2.0	4.7	4.2	1.7	2.6	10.3	10.5	0.7	1.5
LSD (0.05)			2	1	15	8	40	15	2	4	13	7	7	2	3	11	360	NS	NS

[1]colq=common lambsquarters; pwsp=redroot and prostrate pigweed; copu=common purslane; hans=hairy nightshade; llsa=lanceleaf sage; and wibw=wild buckwheat.

[2]COC=Destiny, a methylated seed oil from WinField.

[3]PP=May 24; POST=June 28.

Express-Sun sunflower . Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Valley City, ND, to evaluate weed efficacy and crop tolerance in Express-Sun sunflower. Pioneer '63N81' sunflower was on May 23, 2007. PRE treatments were applied on May 24 at 9:15 am with 45 F air, 51 F soil at a four inch depth, 49% relative humidity, 100% cloud cover, 8 to 12 mph W wind, wet soil surface, and wet subsoil. Soil characteristics were 50.5% sand, 34.3 silt, 15.2% clay, loam texture, 5.3% OM, and pH 5.5. POST treatments were applied on July 3 at 2:30 with 80 F air, 85 F soil surface, 72% relative humidity, 10% cloud cover, 3 to 8 mph NE wind, dry soil surface, damp subsoil, excellent crop vigor, and no dew present to V4 to V14 (4 to18 inch) sunflower. Weed species present with POST only applications only were: 3 to 8 inch (1 to 2/yd2) yellow foxtial; 3 to 10 inch (1/yd2) wild oat; 1 to 3 inch (2 to 5/yd2) easternblack nightshade; and 2 to 4 (1/yd2) and marshelder. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a bicycle-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-fan nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles with a backpack-type plot sprayer for POST treatments. The experiment had randomized complete block design with three replicates per treatment.

On June 18, sunflower was cotyledon to 2-leaf. On June 16, over 3 inches if came in three hours. The rain caused corn stalks from a large section of the field so travel with the rain into the low area of the study which comprised most of rep 1. The study was under water for 2-3 days. At 14 and 28 DAT, there was no sunflower injury (data not shown). (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Express-Sun sunflower (Zollinger and Ries).

Treatment[1]	Rate	14 and 28 DAT - POST			
		Yeft	Wioa	Ebns	Mael
	(product/A)	% control			
PRE/POST					
Prowl H_2O/Express SG+Assure II+Herbimax	2pt/0.25oz+8fl oz+1.5% v/v	99	99	72	73
Prowl H_2O/Express SG+Assure II+Herbimax	2pt/0.5oz+8fl oz+1.5% v/v	99	99	99	99
Spartan/Express SG+Assure II+Herbimax	4.5fl oz/0.25oz+8fl oz+1.5% v/v	99	99	99	99
Spartan/Express SG+Assure II+Herbimax	4.5fl oz/0.5oz+8fl oz+1.5% v/v	99	99	99	99
POST					
Express SG+Assure II+Herbimax	0.25oz+8fl oz+1.5% v/v	77	88	77	86
Express SG+Assure II+Scoil	0.25oz+8fl oz+1.5% v/v	92	93	88	88
Express SG+Assure II+Dyne-Amic	0.25oz+8fl oz+6fl oz	94	95	93	92
Express SG+Assure II+Herbimax	0.5oz+8fl oz+1.5% v/v	99	99	99	99
Express SG+Assure II+Scoil	0.5oz+8fl oz+1.5% v/v	99	99	99	99
Express SG+Assure II+Dyne-Amic	0.5oz+8fl oz+6fl oz	99	99	99	99
Express SG+Scoil	0.25oz+1.5% v/v	99	99	99	99
Express SG+Scoil	0.5oz+1.5% v/v	99	99	99	99
Express SG+Dyne-Amic	0.5oz+6fl oz	99	99	99	99
Express SG+Assure II+Asana XL+Scoil	0.5oz+8fl oz+5.5fl oz+1.5% v/v	99	99	99	99
Express SG+Select+Herbimax	0.25oz+4fl oz+1.5% v/v	99	99	99	99
Express SG+Select+Scoil	0.25oz+4fl oz+1.5% v/v	99	99	99	99
Express SG+Select+Herbimax	0.5oz+4fl oz+1.5% v/v	99	99	99	99
Express SG+Select+Scoil	0.5oz+4fl oz+1.5% v/v	99	99	99	99
Express SG+Select+Scoil	0.5oz+6fl oz+1.5% v/v	99	99	99	99
LSD (0.05)		2	2	2	2

[1]Herbimax = petroleum oil concentrate; Scoil = methylated seed oil; Dyne-Amic = methylated seed oil + organosilicone surfactant.

Effect of herbicides applied preharvest in sunflower. Howatt, Roach, and Harrington. Sunflowers were seeded on a farm near Fargo. Treatments were applied to sunflower at 28% seed moisture on September 19 with 61°F, 20% cloud cover, and wind velocity 3 mph at 0°. Treatments were applied with a tractor mounted sprayer delivering 17 gpa at 46 psi through TT 11002 nozzles for treatment 1 and 8.5 gpa at 36 psi through 11001 nozzles, for treatments 2 through 7, to a 20-ft wide area the length of 20 by 30 ft plots. The experiment was a randomized, complete block design with four replicates. Visible desiccation of the plant, stalk, and head was estimated. Moisture content of the stalk, receptacle, and seed was determined. And yield of sunflower achenes (seed) was calculated.

Table. Sunflower desiccation.

Treatment	Rate	plant	stalk	head	plant	stalk	head	Stalk moisture	Receptacle moisture	Seed Yield	Seed Moisture
		9/21	9/21	9/21	9/24	9/24	9/24	9/24	9/24	9/24	9/24
		%	%	%	%	%	%	%	%	lb/A	%
Paraquat+NIS	6+0.25%	79	52	37	89	80	81	68	56	2988	10
BAS800+MSO+AMS	0.36+1%+2%	52	47	50	81	74	81	75	68	3289	12
BAS800+MSO+AMS	0.71+1%+2%	52	55	55	84	81	81	73	64	2829	12
BAS800D+MSO+AMS	0.71+1%+2%	35	35	40	71	65	66	76	72	2697	12
Glyphosate +MSO+AMS	12+1%+2%	55	55	50	79	72	66	68	64	2753	11
BAS800+Glyt+MSO+AMS	0.36+12+1%+2%	32	35	42	72	67	59	78	73	3226	13
BAS800+Glyt+MSO+AMS	0.71+12+1%+2%	30	30	42	76	69	65	74	68	3222	11
Untreated	0	30	30	17	42	30	29	75	70	3466	16
LSD (P=0.05)		7	7	10	8	10	10	9	11	650	2
CV		10	11	16	7	10	11	7	9	12	11

Sunflower desiccation aid continued

Treatment	Rate	plant 9/28	stalk 9/28	head 9/28	Stalks Moisture 9/28	Receptacle Moisture 9/28	Seed Yield 9/28	Seed Moisture 9/28	plant 10/4	stalk 10/4	head 10/4	Stalks Moisture 10/4	Receptacle moisture 10/4	Seed Yield 10/4	Seed Moisture 10/4
		%	%	%	%	%	lb/A	%	%	%	%	%	%	lb/A	%
Paraquat+NIS	6+0.25%	95	91	91	66	46	2689	11	99	97	99	37	20	2267	6
BAS800+MSO+AMS	0.36+1%+2%	95	92	95	72	56	2916	12	98	96	99	50	26	2370	6
BAS800+MSO+AMS	0.71+1%+2%	97	96	98	67	54	2431	11	99	98	99	39	21	2199	6
BAS800D+MSO+AMS	0.71+1%+2%	91	86	87	73	65	2685	12	98	96	98	52	32	2118	7
Glyphosate+MSO+AMS	12+1%+2%	93	90	92	65	54	2709	11	98	96	99	43	16	2108	6
BAS800+Glyt+MSO+AMS	0.36+12+1%+2%	93	89	86	76	63	2977	12	99	97	99	52	22	2277	7
BAS800+Glyt+MSO+AMS	0.71+12+1%+2%	94	92	92	73	64	2756	12	99	98	99	51	25	2304	7
Untreated	0	69	47	50	74	58	2776	12	88	79	87	56	42	2284	7
LSD (P=0.05)		6	6	7	8	14	686	1	2	3	2	13	10	362	1
CV		4	5	5	6	13	14	5	2	2	1	19	27	11	8

Paraquat initially caused more visible desiccation of sunflower tissue than other treatments. Desiccation caused initially by BAS800 was inhibited when this herbicide was mixed with glyphosate. Seed moisture was lower for all treatments than the untreated 9/24. With exceptional drying conditions, there was no difference in seed moisture 9/28 or later. Receptacle moistures, which have been implicated as causing the most problems in the harvest process, did not reach the harvestable moisture target of 40% until 10/4. At this time, all plots receiving herbicide were 16 to 32% receptacle moisture while the untreated was 42% moisture. Treatment did not affect sunflower yield.

Sunflower desiccation timing. Howatt, Roach, and Harrington. Sunflowers were seeded on a farm near Fargo. 50% (45% actual) moisture treatments were applied September 4 with 84 F, 46% relative humidity, 5% cloud cover, wind velocity of 6 mph at 0° and dry soil at 76 F. 40% (40% actual) moisture treatments were on September 9 with 66 F, 60% relative humidity, 5% cloud cover, wind velocity 6 mph at 270°, and dry soil at 62 F. 30% (28% actual) moisture treatments were applied September 19 with 60 F, 50% relative humidity, 100% cloud cover, wind velocity 3 mph at 0°, and dry soil at 56 F. All treatments were applied with a tractor mounted sprayer, delivering 17 gpa at 46 psi through TT 11002 nozzles for treatment 1 and 8.5 gpa at 36 psi through TT 11001 nozzles for treatments 2 through 4 to a 20-ft wide area the length of 20 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Evaluations were at 7-day intervals after application. Moisture content of the stalk, receptacle, and seed was determined. And yield of sunflower achenes (seed) was calculated.

Application at 45% moisture content of seed.

Treatment		Stalks Moisture 9/11	Receptacle Moisture 9/11	Seed Yield 9/11	Seed Moisture 9/11	Stalk Moisture 9/18	Receptacle Moisture 9/18	Seed Yield 9/18	Seed Moisture 9/18	Stalks Moisture 9/25	Receptacle Moisture 9/25	Seed Yield 9/25	Seed Moisture 9/25	Stalks Moisture 10/2	Receptacle Moisture 10/2	Seed Yield 10/2	Seed Moisture 10/2
		%	%	lb/A	%	%	%	lb/A	%	%	%	lb/A	%	%	%	lb/A	%
Paraquat+NIS	6+0.25%	79	81	3090	28	69	65	2700	17	43	23	2280	9	19	12	1690	6
BAS800+MSO+AMS	0.71+1%+2%	82	85	4100	31	79	74	2670	20	66	35	2370	11	38	15	2030	7
Glyphosate+NIS+AMS	12+0.25%+2%	83	82	3570	29	79	65	3020	21	60	27	2360	9	25	12	2170	6
BAS800+Glyt+MSO+AMS	0.36+12+1%+2%	81	82	3710	29	77	59	2800	20	57	21	2120	9	27	12	2240	6
Untreated	0	79	74	3570	41	81	83	3560	28	76	71	2560	14	70	56	1770	9
LSD (P=0.05)		4	6	750	6	2	9	860	5	9	19	550	3	10	7	450	1
CV		3	5	13	12	2	8	19	15	10	35	15	18	17	22	15	13

Application at 40% moisture content of seed.

Treatment	Rate	Stalk Moisture 9/14	Receptacle Moisture 9/14	Seed Yield 9/14	Seed Moisture 9/14	Stalks Moisture 9/21	Receptacle Moisture 9/21	Seed Yield 9/21	Seed Moisture 9/21	Stalk Moisture 9/28	Receptacle Moisture 9/28	Seed Yield 9/28	Seed Moisture 9/28	Stalk Moisture 10/5	Receptacle Moisture 10/5	Seed Yield 10/5	Seed Moisture 10/5
	oz ai/A	%	%	lb/A	%	%	%	lb/A	%	%	%	lb/A	%	%	%	lb/A	%
Paraquat+NIS	6+0.25%	78	82	3040	30	68	67	2110	21	46	22	1960	11	17	10	1980	5
BAS800+MSO+AMS	0.71+1%+2%	83	84	3650	27	79	79	3320	24	62	44	2180	12	47	14	2060	6
Glyphosate+NIS+AMS	12+0.25%+2%	81	83	3330	29	76	72	2350	25	60	34	2080	11	27	14	1970	6
BAS800+Glyt+MSO+AMS	0.36+12+1%+2%	81	82	3230	25	76	68	2710	21	54	24	2410	10	24	17	2030	5
Untreated	0	82	85	4080	36	79	83	3030	28	72	65	2420	13	58	40	2230	6
LSD (P=0.05)		3	2	550	6	5	7	640	5	19	16	340	2	14	20	500	1
CV		2	2	10	14	4	6	15	14	21	27	10	14	26	71	16	12

Application at 28% moisture content of seed.

Treatment	Rate	Stalk Moisture	Receptacle Moisture	Seed Yield	Seed Moisture	Stalks Moisture	Receptacle Moisture	Seed Yield	Seed Moisture	Stalk Moisture	Receptacle Moisture	Seed Yield	Seed Moisture	Seed Yield
		9/26	9/26	9/26	9/26	10/03	10/03	10/03	10/03	10/10	10/10	10/10	10/10	10/18
	oz ai/A	%	%	lb/A	%	%	%	lb/A	%	%	%	lb/A	%	lb/A
Paraquat+NIS	6+0.25%	73	64	2553	13	53	26	2227	7	39	17	2233	9	1789
BAS800+MSO+AMS	0.71+1%+2%	74	65	2925	13	60	33	2292	8	51	19	2347	9	1670
Glyphosate+NIS+AMS	12+0.25%+2%	73	69	2420	14	60	30	2192	7	47	21	1888	9	1601
BAS800+Glyt+MSO+AMS	0.36+12+1%+2%	74	71	2469	14	61	39	2322	8	54	24	2243	9	1628
Untreated	0	73	66	2852	13	61	46	2182	8	50	27	2430	10	1751
LSD (P=0.05)		6	13	620	4	12	20	490	1	9	10	340	1	540
CV		5	12	15	19	13	37	14	13	12	30	10	7	21

Moisture components were not determined for 10/18 because rain events had rehydrated much of the desiccated tissue. Commercial harvest likely would have been scheduled according to receptacle moisture because seed desiccation progressed more similarly across treatments within timing. Receptacles reached harvestable moisture of 40% more than 7 days earlier with herbicide treatment compared to the control when applied at 40 to 50% seed moisture. There was less separation in desiccation rate between treatments receiving herbicide and the control when applied at 28% seed moisture, but the advantage would have been a few to several days earlier harvest. Seed yield was not substantially affected by herbicide treatment when seed moisture was 45% or less, but paraquat tended to result in less yield than other treatments when applied at 40% moisture or more.

Bluegrass response to propoxycarbazone timing, location 1. Kirk Howatt, Ronald Roach, and Janet Harrington. The experiment was established on a lawn area of Kentucky bluegrass near Fargo, ND. Treatments were applied May 30 with 59 F, 81% RH, 100% cloud-cover, 4 mph wind at 360°, and wet soil at 68 F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7-ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Quality scale is 1 to 10 with 10 being best.

Treatment	Rate	Grow	6/19 poa	6/19 quality	6/29 poa	6/29 quality
	oz ai/A	Stg	%		%	
Prcz+Basic Blend	0.25+1%	May	1	6	0	6
Prcz+Basic Blend	0.5+1%	May	1	6	0	6
Prcz+Basic Blend	1+1%	May	1	6	0	6
Prcz+Basic Blend	2+%	May	3	6	0	6
Prcz+Basic Blend	4+1%	May	10	6	0	6
Prcz+Basic Blend	0.25+1%	June	.[a]	.	0	6
Prcz+Basic Blend	0.5+1%	June	.	.	0	6
Prcz+Basic Blend	1+1%	June	.	.	0	6
Prcz+Basic Blend	2+1%	June	.	.	0	6
Prcz+Basic Blend	4+1%	June	.	.	0	6
Untreated			0	6	0	6
CV			58	2	0	0
LSD (P=0.05)			1	0.2	0	0

[a] Treatments were not applied until after this evaluation.

Injury was observed following the May application. Very minor chlorosis and stunting occurred with a maximum of 10% injury at 4 oz/A, which is at least 8 times the proposed maximum use rate. Propoxycarbazone did not affect the quality of turfgrass. Injury was not apparent 6/29 or later evaluations that are not shown for may or June application across all rates.

Bluegrass response to Propoxycarbazone timing, location 2. Kirk Howatt, Ronald Roach, and Janet Harrington. The experiment was established on a lawn area of Kentucky bluegrass on the NDSU station. Treatments were applied May 30 with 65 F, 71% RH, 100% cloud-cover, 2.5 mph wind at 360°, and wet soil at 70 F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with three replicates. Quality scale is 1 to 10 with 10 being best.

Treatment	Rate	Grow	6/19 poa	6/19 quality	6/29 poa	6/29 quality
	oz ai/A	Stg	%		%	
Propoxycarbazone+Basic Blend	0.25+1%	May	0	5	0	4
Propoxycarbazone+Basic Blend	0.5+1%	May	0	5	0	4
Propoxycarbazone+Basic Blend	1+1%	May	0	5	0	4
Propoxycarbazone+Basic Blend	2+1%	May	0	5	10	4
Propoxycarbazone+Basic Blend	4+1%	May	7	5	17	4
Propoxycarbazone+Basic Blend	0.25+1%	June	.[a]	.	0	4
Propoxycarbazone+Basic Blend	0.5+1%	June	.	.	0	4
Propoxycarbazone+Basic Blend	1+1%	June	.	.	0	4
Propoxycarbazone+Basic Blend	2+1%	June	.	.	0	4
Propoxycarbazone+Basic Blend	4+1%	June	.	.	0	4
Untreated	0		0	5	0	4
CV			144	3	72	0
LSD (P=0.05)			1	0.3	3	0

[a] Treatments were not applied until after this evaluation.

Propoxycarbazone at 4 oz/A, which is at least 8 times the proposed use rate, caused 7% injury as chlorosis on 6/19. Rates less than 4 oz/A were not discernible from the control. Injury on 6/29 with 2 and 4 oz/A propoxycarbazone applied in May caused 10 and 17% injury, respectively, but quality was not affected. This injury was absent on 7/9 (data not shown). Application of propoxycarbazone in June did not cause visible injury. Quality estimate of the turfgrass was not influenced by herbicide treatment.

Application volume with propoxycarbazone in bluegrass, location 1. Kirk Howatt, Ronald Roach, and Janet Harrington. The experiment was established in a lawn area of grass near Fargo, ND. Treatments were applied May 30 with 60 F, 81% RH, 100% cloud-cover, 4 mph wind at 360°, and wet soil at 68 F. Treatments were applied with a backpack sprayer delivering 8.5, 40 and 80 gpa at 40 psi through 11001 TT nozzles to a 7 ft wide plot area the length of 10 by 30 ft. The experiment was a randomized complete block design with four replicates. Quality scale is 1 to 10 with 10 being best.

Treatment	Rate	Spray volume	6/19 poa	6/19 quality	6/29 poa	6/29 quality
	oz ai/A	gpa	%		%	
Propoxycarbazone+Basic Blend	0.25+1%	8.5	0	6	0	6
Propoxycarbazone+Basic Blend	0.5+1%	8.5	0	6	0	6
Propoxycarbazone+Basic Blend	1+1%	8.5	0	6	0	6
Propoxycarbazone+Basic Blend	0.25+1%	40	0	6	0	6
Propoxycarbazone+Basic Blend	0.5+1%	40	0	6	0	6
Propoxycarbazone+Basic Blend	1+1%	40	0	6	0	6
Propoxycarbazone+Basic Blend	0.25+1%	80	0	6	0	6
Propoxycarbazone+Basic Blend	0.5+1%	80	0	6	0	6
Propoxycarbazone+Basic Blend	1+1%	80	0	6	0	6
Untreated	0		0	6	0	6
CV			0	0	0	0
LSD (P=0.05)			0	0	0	0

Treatments did not cause visible injury. Quality was not affected by herbicide treatment.

Application volume with propoxycarbazone in bluegrass, location 2. Kirk Howatt, Ronald Roach, and Janet Harrington. The experiment was established in a lawn area of established grass on the NDSU station. Treatments were applied on July 2 with 76 F, 69% RH, 10% cloud-cover, 2 mph wind, and damp soil at 74 F. Treatments were applied with a backpack sprayer delivering 8.5, 40, and 80 gpa at 35 psi through 11001 TT or 8004V5 nozzles to a 7 f wide area the length of 10 by 30 ft plots. Quackgrass (AGRRE) was 3 to 4 inches tall and smooth brome (BROIN) wa 3 to 6 inches tall. The experiment was a randomized complete block design with 4 replicates, except for the smooth brome at 3 replicates (missing rep 1).

Treatment	Rate	Spray volume	7/16 poa	7/16 AGRRE	7/16 BROIN	8/01 poa	8/01 AGRRE	8/01 BROIN
	oz ai/A	gpa			%			
Propoxycarbazone+Basic Blend	0.25+1%	8.5	0	81	58	0	84	0
Propoxycarbazone+Basic Blend	0.5+1%	8.5	0	87	75	1	92	17
Propoxycarbazone+Basic Blend	1+1%	8.5	3	91	78	8	97	37
Propoxycarbazone+Basic Blend	0.25+1%	40	0	82	70	1	82	0
Propoxycarbazone+Basic Blend	0.5+1%	40	4	87	75	2	91	20
Propoxycarbazone+Basic Blend	1+1%	40	2	89	80	8	95	33
Propoxycarbazone+Basic Blend	0.25+1%	80	0	83	72	1	76	0
Propoxycarbazone+Basic Blend	0.5+1%	80	4	85	73	2	89	13
Propoxycarbazone+Basic Blend	1+1%	80	7	85	80	9	95	27
Untreated	0		0	0	0	0	0	0
CV			55	2	5	59	5	52
LSD (P=0.05)			1	3	6	3	6	13

Bluegrass injury tended to increase with increasing rate, but injury did not exceed 9%. Injury was expressed as stunted plants and slight chlorosis with 1 oz/A. Application volume did not affect injury rating. On 7/16, quackgrass control increased with increasing rate to as much as 91% control. The best control was achieved with 1 oz/A applied in 8.5 gpa. Increasing the volume to 80 gpa, which would be more likely for commercial turf applicators, reduced control to 85%. Propoxycarbazone at 0.5 oz/A 89 to 92% control of quackgrass on 8/1. Propoxycarbazone activity to smooth brome was much less that to quackgrass. Control of smooth brome on 7/16 did not exceed 80%. But control dissipated, and by 8/1, maximum control was 37%. Even though control of vegetation was poor, smooth brome treated with propoxycarbazone did not produce seed, while untreated plants did produce an inflorescence.

Bluegrass response to propoxycarbazone tank-mixes, location 1. Kirk Howatt, Ronald Roach, and Janet Harrington. The experiment was established on a lawn area of grass near Fargo, ND. The treatments were applied on May 30 with 60 F, 81% RH, 100% cloud-cover, 4 mph wind at 360°, and wet soil at 68 F. The treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Quality scale is 1 to 10 with 10 being best.

Treatment	Rate	6/19 poa	6/19 quality	6/29 poa	6/29 quality
	oz ai/A				
Prcz+Basic Blend	0.5+1%	0	6	0	6
Prcz+2,4-D ester+Basic Blend	0.5+8+1%	0	6	0	6
Prcz+2,4-D amine+Basic Blend	0.5+8+1%	0	6	0	6
Prcz+2,4-D amine+carf+Basic Blend	0.5+8+0.25+1%	0	6	0	6
Prcz+2,4-D ester+MCPA+dica+BB	0.5+4+4+1+1%	0	6	0	6
Prcz+clpy&triclopyr+MCPP+BB	0.5+12+4+1%	1	6	0	6
Untreated	0	0	6	0	6
CV		176	0	0	0
LSD (P=0.05)		0.6	0	0	0

A minor difference in color of bluegrass was detected 6/19. This injury did not affect the quality of the turf. According to this study, propoxycarbazone could be tank-mixed with several herbicide formulation types and combinations for improved broadleaf weed control without risk of increased injury to bluegrass.

Bluegrass response to Propoxycarbazone tank-mixes, location 2. Kirk Howatt, Ronald Roach, and Janet Harrington. The experiment was established an area of lawn grass on the NDSU station. The treatments were applied May 30 with 65 F, 71% RH, 100% cloud-cover, 2.5 mph wind at 360°, and wet soil at 70 F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 40 psi through 11001 TT nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with three replicates except for the 6/29 evaluation of poa which was only 2 replicates because of water damage. Quality scale is 1 to 10 with 10 being best.

Treatment	Rate	6/19 poa	6/19 quality	6/29 poa	6/29 quality
	oz ai/A				
Propoxycarbazone+Basic Blend	0.5+1%	0	5	0	4
Prcz+2,4-D ester+Basic Blend	0.5+8+1%	0	5	0	4
Prcz+2,4-D amine+Basic Blend	0.5+8+1%	0	5	0	4
Prcz+2,4-D amine+carf+Basic Blend	0.5+8+0.25+1%	0	5	0	4
Prcz+2,4-D ester+MCPA+dica+BB	0.5+4+4+1+1%	0	5	0	4
Prcz+clpy&triclopyr+MCPP+BB	0.5+12+4+1%	0	5	12	4
Untreated	0	0	5	0	4
CV		0	0	75	0
LSD (P=0.05)		0	0	3	0

Treatments did not cause observable injury on 6/19. By 6/29, injury was expressed when propoxycarbazone was mixed with clopyralid, triclopyr, and MCPP but not with any other combination. This effect may have been accentuated by excessive soil moisture that persisted in the study area and resulted in exclusion of the third replicate. This injury may be caused by other components rather than propoxycarbazone since none of the other treatments expressed injury even with the wet soil. Overall turf quality was not affected.