Evaluation of Everest Herbicide on Established Alfalfa at Hettinger

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Treatments were applied at three different timings to a 10 year old stand of alfalfa (variety unknown) intermixed with tame grass. The first application was on April 20 to 2 inch tall alfalfa. The second application was on May 5 to 3 inch tall alfalfa and the third application was on May 24 to 6 inch tall alfalfa. Treatments were applied with a tractor mounted CO^2 propelled plot sprayer delivering 10 gpa at 30 psi to 5 foot wide by 20 foot long plots. The trial was a randomized complete block design with four replications. Plots were evaluated for crop injury on June 15.

	Treatment	Application Timing	Product Rate	Crop Injury
			oz/A	%
1	Untreated			0
2	Everest + NIS	April 20	0.3 + 0.25%	94
3	Everest + NIS	April 20	0.6+ 0.25%	96
4	Everest + NIS	May 5	0.3+ 0.25%	95
5	Everest + NIS	May 5	0.6+ 0.25%	96
6	Everest + NIS	May 24	0.3 + 0.25%	45
7	Everest + NIS	May 24	0.6 + 0.25%	48
8	Everest + Pursuit + NIS	May 24	0.3 + 2.0 + 0.25%	48
9	Pursuit + NIS	May 24	2.0 + 0.25%	0
C.V. %				8.4
LSD .05				7

Summary

Established alfalfa appears to be very sensitive to Everest Herbicide causing leaf necrosis. The May 24 applications of Everest appears to have less crop injury, however, this may be due to the shorter time period between application and evaluation. Additional evaluations were not taken. Alfalfa's sensitivity to Everest should be re-evaluated and considered for addition to the Everest label as a plant species controlled by this compound. This may be desirable for alfalfa ground being rotated back into wheat production.

Weed control in cabbage - Oakes. Greenland, Richard G. This experiment was at the Oakes Irrigation Research Site. It consisted of two separate studies.

The direct-seeded cabbage weed control study was on a Gardena loam and Embden loam with pH 6.9 and 2.3% soil organic matter. Treflan at 1 pt/acre was applied on April 21 to the entire study, then incorporated with two passes of a field cultivator. 'Bronco' cabbage was direct seeded on April 21 in 18" rows with an in-row spacing of 7". Plants were later thinned to a 14" in-row spacing. It was harvested on Sept. 7.

The transplanted cabbage weed control study was on an Embden loam with pH 6.9 and 2.8% soil organic matter that had been planted to field corn the previous year. The corn was flailed in the fall and the field was disked in the spring prior to establishing the study. Preplant incorporated herbicide treatments were incorporated with two passes of a field cultivator immediately after herbicide application. 'Bronco' cabbage was started from seed in the greenhouse and transplanted to the field on May 31 and June 1. It was planted in 18" rows with an in-row spacing of 12". It was harvested on Sept. 20 and 21.

Both studies were on land planted to corn the previous year. The corn was flailed and the fields disked in the fall. In the spring, the fields were chisel plowed, disked, and field cultivated. Appropriate fertilizer and insecticides were used when needed. A row of barley cover crop was planted between and parallel to the cabbage rows. Fusilade + NIS (12 oz/acre + 0.5%) was applied to the direct seeded study on June 8 and the transplanted study on June 24. The Fusilade was to kill the barley cover crop and any grass weeds.

Results

In previous years Authority and Valor were applied POST without any surfactant because of the fear of crop injury. In this year's study we compared Authority and Valor with and without a surfactant to see the effect of a surfactant on weed control and crop injury.

Direct-seeded cabbage: Adding a surfactant with Authority or Valor increased crop injury and did not increase weed control. The number of cabbage heads and cabbage yield was reduced when a surfactant was added. Highest cabbage yields were with the handweed check or with Authority alone or Authority followed by Stringer. In previous years yields were reduced with the Authority alone treatment because of lack of hairy nightshade control. Nightshade pressure was medium to low in this study.

Transplanted cabbage: Because of cold weather in May, the transplant study was planted later than normal and the health of the transplants was poor. Yields were much below average and yield response to treatments was variable, so no yield differences between treatments were statistically significant. Adding a surfactant with Authority or Valor did not effect the amount of cabbage injury but increased barley injury for some treatments. Adding surfactant increased control of lambsquarters, but not hairy nightshade or foxtail. A surfactant increased control of purslane for Authority, but not for Valor, because purslane control by Valor was good to excellent without a surfactant. Valor applied one week after transplanting decreased plant stand and harvested heads. Authority did not give good control of hairy nightshade. Valor gave good to excellent control of hairy nightshade and purslane, but was a little weak on lambsquarters.

Table 1. Cabbage weed control treatment application data at the Oakes Irrigation Research Site in 2005.

Application timing	Date	Time	Barley height	Cabbage height	Cabbage growth stage	Weed height	Weed growth stage
Direct-seeded study							
PRE	April 21	2:55 pm	0	0	0	0	0
Post1	May 26	9:20 am	5"	2"	2 lf	½ to1"	2 to 4 lf
Post2	June 6	4:35 pm	7"	5"	4 lf	1 to 2"	2 to 8 lf
Transplanted study							
PPI	May 31	9:40 am	0	0	0	0	0
PRE	May 31	12:00 pm	0	0	0	0	0
Post1	June 2	4:30 pm	0	2.5"	2 lf	0	0
Post2	June 9	11:00 am	2.5"	2.5"	3 lf	<½"	cot.
Post3	June 22	9:30 am	6"	4"	6 lf	½ to 3"	3 to 12 lf
Post4	June 27	3:00 pm	7"	5"	7 lf	1 to 3"	2 to 10 lf

Treatments were applied with a CO_2-pressurized backpack sprayer using AI 110-04 flat fan nozzles, 23 gpa, at 51 psi.

Table 2. Yield and crop injury data at Oakes Irrigation Research Site in 2005 in direct-seeded cabbage.

Herbicides	Rates	Application timing[1]	Number of heads	Yield	Head size	No head formed[2]	Crop injury (6/8) cabbage	Crop injury (6/8) barley
			1000s/A	tons/A	lbs/head		---------- % ----------	
Dacthal fb Stinger	10 lbs fb ⅓ pt	PRE fb Post2	20.2 cd[3]	29.7 bc	3.0	19 ac	28 bc	2 a
Dacthal fb Valor	10 lbs fb 2 oz	PRE fb Post2	18.5 de	29.4 bc	3.2	16 a	25 b	25 b
Dacthal fb Valor + NIS	10 lbs fb 2 oz + ¼%	PRE fb Post2	13.8 ef	22.7 d	3.3	35 c	45 cd	45 cd
Authority	2 oz	Post1	25.0 ac	39.2 a	3.3	18 ab	18 b	5 a
Authority+NIS	2 oz + ¼ %	Post1	21.1 bd	26.5 cd	2.6	21 ac	68 de	30 bc
Authority fb Stinger	2 oz fb ⅓ pt	Post1 fb Post2	27.2 a	41.2 a	3.0	13 a	18 b	3 a
Authority+NIS fb Stinger	2 oz + ¼% fb ⅓ pt	Post1 fb Post2	18.9 de	24.9 cd	2.7	34 bc	70 e	33 bc
Authority fb Valor	2 oz fb 2 oz	Post1 fb Post2	20.3 cd	33.9 b	3.3	10 a	25 b	25 b
Authority+NIS fb Valor+NIS	2 oz+¼% fb 2 oz+¼%	Post1 fb Post2	11.3 f	16.7 e	3.1	22 ac	83 e	63 d
Hand weeded check			26.1 ab	40.4 a	3.1	7 a	8 a	0 a
Probability			<.0001	<.0001	0.51	0.02	<.0001	<.0001
C.V. (%)			18	12	17	55	25	31

[1]See Table 1 for explanation of application timings.
[2]Percent of cabbage plants that did not form a head.
[3]Values in the same column followed by the same letter are not significantly different at the 0.05 level.
Applied Treflan @ 1 pt/acre PPI on April 21 and Fusilade @ 12 oz/acre + 0.5% NIS on June 8 to all plots.

Table 3. Weed ratings at the Oakes Irrigation Research Site in 2005 in direct-seeded cabbage.

Herbicides	Rates	Application timing[1]	June 8		July 28				
			Colq[2]	Hns	Rrpw	Colq	Hns	Purs	Ft
			---------- 0 to 10[3] ----------						
Dacthal fb Stinger	10 lbs fb ⅓ pt	Pre fb Post2	9.0 c[4]	7.0 b	8.1 d	6.8 b	6.2 e	9.6 ab	8.8 ab
Dacthal fb Valor	10 lbs fb 2 oz	Pre fb Post2	9.3 bc	8.0 b	9.5 ab	9.3 a	10.0 a	10.0 a	8.3 b
Dacthal fb Valor + NIS	10 lbs fb 2 oz + ¼%	Pre fb Post2	9.5 b	7.8 b	9.0 bc	9.5 a	10.0 a	10.0 a	8.3 b
Authority	2 oz	Post1	10.0 a	10.0 a	9.8 ab	9.5 a	8.5 bc	8.5 bd	7.8 bc
Authority + NIS	2 oz + ¼ %	Post1	10.0 a	10.0 a	8.5 cd	10.0 a	7.8 cd	7.5 d	6.5 cd
Authority fb Stinger	2 oz fb ⅓ pt	Post1 fb Post2	10.0 a	10.0 a	9.5 ab	9.3 a	8.8 b	8.8 bc	7.8 bc
Authority + NIS fb Stinger	2 oz + ¼% fb ⅓ pt	Post1 fb Post2	10.0 a	10.0 a	8.5 cd	9.8 a	7.5 d	7.8 cd	6.5 cd
Authority fb Valor	2 oz fb 2 oz	Post1 fb Post2	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	7.5 bd
Authority+NIS fb Valor+NIS	2 oz + ¼% fb 2 oz + ¼%	Post1 fb Post2	10.0 a	10.0 a	9.5 ab	10.0 a	9.8 a	9.0 ab	6.3 d
Hand weeded check			8.0 d	5.0 c	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a
Probability			<.0001	<.0001	0.0002	<.0001	<.0001	0.0002	0.0002
C. V. (%)			1	5	3	3	4	5	7

[1]See Table 1 for explanation of application timings.
[2]Colq is common lambsquarters; Hns is hairy nightshade; Rrpw is redroot pigweed; Purs is Purslane; Ft is green and yellow foxtail.
[3]Ratings: 0 is plot completely covered with vigorously growing weeds; 10 is no weeds in plot.
[4]Values in the same column followed by the same letter are not significantly different at the 0.05 level.

Table 4. Yield and injury data at the Oakes Irrigation Research Site in 2005 in transplanted cabbage.

Herbicides	Rates	Application timing[1]	Crop injury		Plant stand		Number of heads	Yield	Head size	No head form[2]
			Barley	Cabbage	Jun 17	Aug 5				
			-------- % -------		1 to 10	----- 1000s/A -----		tons/A	lbs/head	%
Valor	2 oz	Post2	40 hij[3]	63 h	5.3 bcd	6.4 g	6.2 gh	15.2	4.9 a-d	12 a-d
Authority	2 oz	Post2	0 a	13 c-g	9.3 a	25.4 abc	20.7 a-d	15.8	1.5 fg	26 a-d
Authority	2 oz	Post3	0 a	5 abc	9.8 a	25.0 a-d	18.9 bcd	12.4	1.3 g	49 de
Authority + Valor	2 oz + 2 oz	Post2	35 g-i	60 h	5.5 bcd	5.3 g	5.4 gh	16.7	5.9 ab	10 abc
Authority + Valor	2 oz + 2 oz	Post3	0 a	13 c-g	9.5 a	21.8 de	17.4 cde	15.9	1.8 fg	39 b-e
Authority fb Valor	2 oz fb 2 oz	Post2 fb Post3	8 b	15 c-g	9.3 a	22.6 bcd	16.7 de	19.7	2.5 fg	32 a-d
Valor fb Authority	2 oz fb 2 oz	Post2 fb Post3	30 f-i	58 h	5.3 bcd	4.7 g	4.0 h	10.5	6.6 a	0 a
Treflan fb Valor	1 pt fb 2 oz	PPI fb Post2	60 jkl	58 h	5.8 bc	6.4 g	6.5 gh	15.9	4.8 bcd	13 abc
Treflan fb Authority	1 pt fb 2 oz	PPI fb Post2	20 cde	10 b-g	9.8 a	25.4 abc	22.5 ab	22.0	2.0 fg	22 a-d
Treflan fb Authority	1 pt fb 2 oz	PPI fb Post3	8 b	3 ab	10.0 a	26.3 a	24.3 a	21.1	1.7 fg	12 abc
Treflan fb Authority + Valor	1 pt fb 2 oz + 2 oz	PPI fb Post2	68 klm	58 h	6.3 b	3.8 g	5.8 gh	17.5	6.0 ab	0 a
Treflan fb Authority + Valor	1 pt fb 2 oz + 2 oz	PPI fb Post3	0 a	5 abc	10.0 a	25.0 a-d	22.5 ab	26.7	2.4 fg	21 a-d
Treflan fb Authority fb Valor	1 pt fb 2 oz fb 2 oz	PPI fb Post2 fb Post3	23 c-g	18 efg	9.0 a	22.0 cde	20.3 a-d	22.6	2.2 fg	18 a-d
Treflan fb Valor fb Authority	1 pt fb 2 oz fb 2 oz	PPI fb Post2 fb Post3	60 jkl	65 h	5.0 bcd	6.4 g	6.2 gh	14.6	4.8 bcd	13 abc
Authority fb Stinger	2 oz fb ⅓ pt	Post2 fb Post4	0 a	15 d-g	9.3 a	25.8 ab	22.1 abc	20.7	1.9 fg	20 a-d
Valor + NIS	2 oz + ¼%	Post2	68 klm	63 h	5.3 bcd	6.4 g	6.9 gh	13.8	4.2 cde	19 a-d
Authority + NIS	2 oz + ¼%	Post2	15 c-f	23 g	9.3 a	25.2 a-d	22.5 ab	20.6	1.8 fg	14 abc
Authority + NIS	2 oz + ¼%	Post3	0 a	3 ab	9.8 a	26.1 ab	22.1 abc	17.9	1.6 fg	33 a-d
Authority + Valor + NIS	2 oz + 2 oz + ¼%	Post2	70 klm	75 h	4.5 bcd	3.2 g	4.0 h	11.8	6.0 ab	6 ab
Authority + Valor + NIS	2 oz + 2 oz + ¼%	Post3	0 a	8 a-d	9.8 a	18.8 ef	13.1 ef	14.5	2.1 fg	73 ef
Authority + NIS fb Valor + NIS	2 oz + ¼% fb 2 oz + ¼%	Post2 fb Post3	13 bc	18 efg	9.5 a	19.0 ef	12.7 ef	17.6	2.8 efg	70 ef
Valor + NIS fb Authority + NIS	2 oz + ¼% fb 2 oz + ¼%	Post2 fb Post3	70 klm	65 h	5.0 bcd	5.1 g	5.8 gh	16.1	5.2 abc	7 abc
Treflan fb Valor + NIS	1 pt fb 2 oz + ¼%	PPI fb Post2	88 lm	78 h	4.3 cd	4.1 g	4.7 h	11.8	5.3 abc	13 abc
Treflan fb Authority + NIS	1 pt fb 2 oz + ¼%	PPI fb Post2	25 d-h	20 fg	9.8 a	25.2 a-d	24.0 a	21.2	1.8 fg	10 abc
Treflan fb Authority + NIS	1 pt fb 2 oz + ¼%	PPI fb Post3	0 a	8 a-d	9.5 a	24.8 a-d	22.5 ab	20.3	1.8 fg	15 a-d
Treflan fb Authority + Valor + NIS	1 pt fb 2 oz + 2 oz + ¼%	PPI fb Post2	85 lm	70 h	4.3 d	6.0 g	6.9 gh	16.3	4.9 a-d	8 abc
Treflan fb Authority + Valor + NIS	1 pt fb 2 oz + 2 oz + ¼%	PPI fb Post3	0 a	10 b-e	10.0 a	16.9 f	13.4 ef	19.4	2.9 efg	45 cde
Treflan fb Authority+NIS fb Valor+NIS	1 pt fb 2 oz+¼% fb 2 oz+¼%	PPI fb Post2 fb Post3	28 e-h	23 g	9.8 a	17.5 f	10.2 fg	16.0	3.1 def	84 f
Treflan fb Valor+NIS fb Authority+NIS	1 pt fb 2 oz+¼% fb 2 oz+¼%	PPI fb Post2 fb Post3	90 m	75 h	4.3 cd	5.8 g	6.5 gh	19.1	5.7 abc	3 a
Authority + NIS fb Stinger	2 oz + ¼% fb ⅓ pt	Post2 fb Post4	15 bcd	15 c-g	9.5 a	26.1 ab	21.1 a-d	16.5	1.5 fg	33 a-d
Treflan fb Dacthal fb Stinger	1 pt fb 8 lbs fb ⅓ pt	PPI fb Post1 fb Post4	8 b	5 abc	9.8 a	25.8 ab	23.6 ab	22.9	1.9 fg	13 abc
Treflan fb Goal 2XL	1 pt fb 2 pt	PPI fb PRE	50 ijk	13 b-f	9.8 a	25.8 ab	21.8 abc	21.9	2.0 fg	18 a-d
Hand weeded check			0 a	0 a	9.3 a	22.0 cde	21.1 a-d	28.6	2.7 efg	9 abc
Probability			<.0001	<.0001	<.0001	<.0001	<.0001	0.1	<.0001	<.0001
C.V. (%)			29	32	10	14	24	39	37	107

[1]See Table 1 for explanation of application timings.
[2]Percent of cabbage plants that did not form a head.
[3]Values in the same column followed by the same letter are not significantly different at the 0.05 level.
Applied Fusilade @ 12 oz/acre + 0.05 NIS to all plots on June 24.

Table 5. Lambsquarters, hairy nightshade, foxtail, and purslane ratings at the Oakes Irrigation Research Site in 2005 in transplanted cabbage.

Herbicide	Rates	Application timing[1]	Lambsquarters		Hairy nightshade		Foxtail		Purslane
			Jun 17	Aug 5	Jun 17	Aug 5	Jun 17	Aug 5	Aug 5
			0 to 10[2]						
Valor	2 oz	Post2	10.0 a	8.0 efg	10.0 a	10.0 a	10.0 a	7.0	10.0 a
Authority	2 oz	Post2	10.0 a	10.0 a	10.0 a	8.5 def	10.0 a	8.3	4.5 f
Authority	2 oz	Post3	8.3 e	7.3 g	8.3 d	7.0 g	8.3 e	9.0	4.3 f
Authority + Valor	2 oz + 2 oz	Post2	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	7.3	9.5 ab
Authority + Valor	2 oz + 2 oz	Post3	8.8 d	8.8 cde	8.5 cd	10.0 a	8.5 de	8.8	4.5 f
Authority fb Valor	2 oz fb 2 oz	Post2 fb Post3	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	8.8	7.3 de
Valor fb Authority	2 oz fb 2 oz	Post2 fb Post3	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	7.8	9.8 a
Treflan fb Valor	1 pt fb 2 oz	PPI fb Post2	10.0 a	8.8 cde	10.0 a	10.0 a	10.0 a	9.0	9.8 a
Treflan fb Authority	1 pt fb 2 oz	PPI fb Post2	10.0 a	9.8 ab	10.0 a	8.3 def	10.0 a	8.3	8.8 a-d
Treflan fb Authority	1 pt fb 2 oz	PPI fb Post3	10.0 a	9.0 bcd	9.0 bc	7.8 f	9.8 ab	9.0	7.8 b-e
Treflan fb Authority + Valor	1 pt fb 2 oz + 2 oz	PPI fb Post2	10.0 a	9.8 ab	10.0 a	9.8 ab	10.0 a	7.8	9.3 abc
Treflan fb Authority + Valor	1 pt fb 2 oz + 2 oz	PPI fb Post3	10.0 a	9.5 abc	8.5 cd	10.0 a	9.8 ab	9.8	9.8 a
Treflan fb Authority fb Valor	1 pt fb 2 oz fb 2 oz	PPI fb Post2 fb Post3	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	9.5	9.5 ab
Treflan fb Valor fb Authority	1 pt fb 2 oz fb 2 oz	PPI fb Post2 fb Post3	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	8.0	9.5 ab
Authority fb Stinger	2 oz fb ⅓ pt	Post2 fb Post4	10.0 a	10.0 a	10.0 a	9.5 abc	10.0 a	6.8	7.5 cde
Valor + NIS	2 oz + ¼%	Post2	10.0 a	8.8 cde	10.0 a	10.0 a	10.0 a	7.3	9.3 abc
Authority + NIS	2 oz + ¼%	Post2	10.0 a	10.0 a	10.0 a	8.8 cde	10.0 a	7.0	6.8 e
Authority + NIS	2 oz + ¼%	Post3	8.3 e	10.0 a	8.3 d	8.8 cde	8.3 e	8.0	8.8 a-d
Authority + Valor + NIS	2 oz + 2 oz + ¼%	Post2	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	6.3	9.8 a
Authority + Valor + NIS	2 oz + 2 oz + ¼%	Post3	8.3 e	10.0 a	8.5 cd	10.0 a	9.0 cd	8.8	8.5 a-e
Authority + NIS fb Valor + NIS	2 oz + ¼% fb 2 oz + ¼%	Post2 fb Post3	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	8.3	9.8 a
Valor + NIS fb Authority + NIS	2 oz + ¼% fb 2 oz + ¼%	Post2 fb Post3	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	6.3	9.5 ab
Treflan fb Valor + NIS	1 pt fb 2 oz + ¼%	PPI fb Post2	10.0 a	8.3 def	10.0 a	10.0 a	10.0 a	7.5	9.8 a
Treflan fb Authority + NIS	1 pt fb 2 oz + ¼%	PPI fb Post2	10.0 a	10.0 a	10.0 a	8.3 def	10.0 a	8.3	8.8 a-d
Treflan fb Authority + NIS	1 pt fb 2 oz + ¼%	PPI fb Post3	9.8 ab	10.0 a	8.5 cd	8.0 ef	9.3 bc	8.5	9.5 ab
Treflan fb Authority + Valor + NIS	1 pt fb 2 oz + 2 oz + ¼%	PPI fb Post2	10.0 a	9.8 ab	10.0 a	9.8 ab	10.0 a	8.3	10.0 a
Treflan fb Authority + Valor + NIS	1 pt fb 2 oz + 2 oz + ¼%	PPI fb Post3	9.5 bc	10.0 a	9.5 ab	10.0 a	9.5 abc	8.5	9.5 ab
Treflan fb Authority+NIS fb Valor+NIS	1 pt fb 2 oz+¼% fb 2 oz+¼%	PPI fb Post2 fb Post3	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	8.8	10.0 a
Treflan fb Valor+NIS fb Authority+NIS	1 pt fb 2 oz+¼% fb 2 oz+¼%	PPI fb Post2 fb Post3	10.0 a	10.0 a	10.0 a	9.8 ab	10.0 a	8.3	10.0 a
Authority + NIS fb Stinger	2 oz + ¼% fb ⅓ pt	Post2 fb Post4	10.0 a	10.0 a	10.0 a	9.8 ab	10.0 a	7.5	7.0 de
Treflan fb Dacthal fb Stinger	1 pt fb 8 lbs fb ⅓ pt	PPI fb Post1 fb Post4	10.0 a	7.5 fg	9.0 bc	9.0 bcd	9.5 abc	9.0	9.8 a
Treflan fb Goal 2XL	1 pt fb 2 pt	PPI fb PRE	10.0 a	7.3 g	10.0 a	9.5 abc	10.0 a	9.3	9.8 a
Hand weeded check			9.3 c	10.0 a	9.0 bc	10.0 a	9.5 abc	10.0	10.0 a
Probability			<.0001	<.0001	<.0001	<.0001	<.0001	0.5	<.0001
C.V. (%)			2	4	2	3	3	13	8

[1]See Table 1 for explanation of application timings.
[3]Ratings: 0 is plot completely covered with vigorously growing weeds; 10 is no weeds in plot.
[3]Values in the same column followed by the same letter are not significantly different at the 0.05 level.

Weed control in carrots - Oakes. Greenland, Richard G. Only a few herbicides are available for weed control in carrots. Treflan, Lorox, Poast and Fusilade are the most commonly used. In this study we evaluated several new herbicides and herbicide combinations for use in carrots. This study was on an Egeland loam (pH 7.5, 2.2% OM) at the Oakes Irrigation Research Site, in a field that was cropped to soybean the previous year. The field was chisel plowed and disked once, then it was field cultivated three times to smooth the seedbed and incorporate fertilizer and herbicides. 'Niagra' carrot was planted on May 4 at a rate of 790,000 seeds/acre in 18" rows with 3 lines per row. At the same time a barley cover crop was planted between and parallel to the carrot rows. The study was overhead sprinkler irrigated. Herbicides were applied with a CO_2-pressurized backpack sprayer using AI 110-04 flat fan nozzles, 23 gpa, at 51 psi. See Table 1 for application timings. Hairy nightshade was the predominant weed, with some lambsquarters also present. Weed and injury ratings were taken on June 15 and June 28. Carrots were harvested as processing carrots in mid September.

Results. Raptor did not injury carrots when applied PRE, but injured carrots when applied 4 to 6 weeks after planting. The injury increased as the rate increased. Hairy nightshade control was poor when Raptor was applied PRE and was good to excellent (depending on application rate) when applied POST. Upbeet injured carrots and did not control hairy nightshade. Authority and Valor injured carrots. Authority didn't control hairy nightshade. Valor reduced carrot stands, but the carrots that remained grow larger so yield was not reduced. Upbeet and Raptor applied POST reduced carrot yields. Raptor applied PRE did not reduce carrot yield. Lorox and Dacthal did not injure carrot or reduce carrot yield and gave good control of hairy nightshade. Lorox applied both PRE and POST, and the Lorox/Dacthal combinations gave the highest carrot numbers, yield, and root size. None of the new herbicides performed as well as these standards.

Table 1. Carrot weed control treatment application data at the Oakes Irrigation Research Site in 2005.

Application timing	Date	Time	Barley height	Carrot height	Carrot growth stage	Weed height	Weed growth stage
PRE	May 5	9:25 am	0	0	0	0	0
Post1	May 26	9:05 am	3"	1	cot.	¼ to ½"	cot to 2 lf
Post2	June 6	3:50 pm	7"	2"	2.5 lf	1 to 2"	2 to 6 lf
Post3	June 16	11:35 am	5" (dying)	5"	5 lf	2 to 6"	4 to 10 lf

Treflan (1.5 pt/A PPI on May 27) and Fusilade + NIS (12 oz/acre + 0.5% on June 17) were applied to the entire study.

Table 2. Percent carrot injury, and stand, lambsquarters, and hairy nightshade ratings in the Oakes Irrigation Research Site 2005 carrot weed control study.

Herbicides	Rates	Application timing[1]	Carrot injury		Stand		Lambsquarters		Hairy Nightshade	
			Jun 15	Jun 28	Jun 15	Jun 28	Jun 15	Jun 28	Jun 15	Jun 28
			--------- % --------		---------- 0 to 10[2] ----------					
Raptor fb Lorox	0.5 oz fb 1.5 lb	PRE fb Post3	0.0 a3	0.3 ab	7.3 a	9.3 a	9.3 abc	10.0 a	6.3 efg	8.3 b-e
Raptor fb Lorox	1.0 oz fb 1.5 lb	PRE fb Post3	0.5 ab	0.3 ab	7.5 a	8.8 ab	9.0 bcd	10.0 a	5.5 g	8.3 bcd
Raptor fb Lorox	2.0 oz fb 1.5 lb	PRE fb Post3	0.0 a	0.5 ab	7.5 a	9.0 ab	8.3 d	10.0 a	6.0 fg	8.8 a-d
Lorox fb Upbeet + NIS	1 lb fb ¼ oz + ¼%	PRE fb Post2	4.0 cd	1.8 c	7.3 a	8.8 ab	9.3 abc	9.0 cde	7.8 cd	5.0 h
Lorox fb Upbeet + NIS	1 lb fb ½ oz + ¼%	PRE fb Post2	4.3 cde	3.3 c-f	7.0 ab	8.0 abc	9.0 bcd	8.5 efg	8.0 cd	5.3 h
Lorox fb Upbeet + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2	4.8 cde	5.5 fg	7.0 ab	7.3 cde	8.8 cd	8.3 fg	8.3 bcd	6.0 gh
Lorox fb Raptor+NIS+28%N	1 lb fb ½ oz+¼%+2.5%	PRE fb Post2	3.8 cd	0.8 b	7.0 ab	8.8 ab	8.8 cd	8.0 g	8.5 abc	6.8 efg
Lorox fb Raptor+NIS+28%N	1 lb fb 1 oz+¼%+2.5%	PRE fb Post2	5.0 cde	3.5 d-g	6.5 bc	7.8 bcd	9.0 bc	8.3 fg	8.5 abc	9.0 abc
Lorox fb Raptor+NIS+28%N	1 lb fb 2 oz+¼%+2.5%	PRE fb Post2	6.0 e	6.0 g	6.3 c	6.8 de	9.5 abc	9.3 bcd	8.5 abc	10.0 a
Lorox fb Raptor+NIS+28%N	1 lb fb ½ oz+¼%+2.5%	PRE fb Post3	0.5 b	2.8 cde	7.0 ab	8.0 abc	9.3 abc	9.5 abc	7.5 cde	6.3 fgh
Lorox fb Raptor+NIS+28%N	1 lb fb 1 oz+¼%+2.5%	PRE fb Post3	0.5 b	5.0 fgh	7.0 ab	8.0 abc	9.0 bcd	8.8 def	6.3 efg	7.3 d-g
Lorox fb Raptor+NIS+28%N	1 lb fb 2 oz+¼%+2.5%	PRE fb Post3	0.3 ab	5.5 fg	7.3 a	7.5 cd	9.3 abc	9.0 cde	7.0 def	8.8 a-d
Lorox fb Authority + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2	3.8 cd	2.3 cd	6.5 bc	6.8 de	10.0 a	9.8 ab	8.5 abc	6.3 fgh
Lorox fb Valor + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2	5.3 de	3.0 c-f	6.0 c	6.3 e	10.0 a	10.0 a	10.0 a	10.0 a
Lorox fb Authority + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2 & 3	3.5 c	4.0 e-h	6.5 bc	6.8 de	10.0 a	10.0 a	9.8 ab	8.8 a-d
Lorox fb Valor + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2 & 3	5.5 de	5.3 fg	6.0 c	5.0 f	10.0 a	10.0 a	10.0 a	10.0 a
Lorox fb Dacthal	1 lb fb 8 lbs	PRE fb Post1	0.0 a	0.5 ab	7.0 ab	8.8 ab	10.0 a	10.0 a	8.3 cd	7.5 c-f
Dacthal fb Lorox	8 lbs fb 1.5 lb	Post1 fb Post3	0.0 a	0.0 a	7.8 a	9.3 a	9.8 ab	10.0 a	8.5 a-d	9.3 ab
Lorox fb Lorox	1 lb fb 1.5 lbs	PRE fb Post3	0.0 a	0.8 b	7.3 a	9.0 ab	9.0 bc	10.0 a	6.3 efg	7.8 b-e
Hand weeded check			0.0 a	0.0 a	7.5 a	9.0 ab	8.8 cd	9.8 ab	6.3 efg	9.0 abc
Probability			<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
C.V. (%)			24	32	8	10	3	3	7	7

[1]See Table 1 for explanation of application timings.
[2]Ratings are from 0 to 10: 0 = plot completely covered with vigorously growing weeds, 10 = no weeds in plot.
[3]Values in the same column followed by the same letter are not significantly different at the 0.05 level.

Table 3. Number of roots and yield of carrots in the Oakes Irrigation Research Site 2005 carrot weed control study.

Herbicides	Rates	Application timing[1]	Number of carrots (by carrot dia.)				Carrot yield (by carrot diameter)			
			>1.5"	1 to 1.5"	US #1	total	>1.5"	1 to 1.5"	US #1	total
			---------- 1000s/acre ----------				---------- tons/acre ----------			
Raptor fb Lorox	0.5 oz fb 1.5 lb	PRE fb Post3	69	250	336	428	13.8	24.1	38.7	46.9
Raptor fb Lorox	1.0 oz fb 1.5 lb	PRE fb Post3	64	182	260	351	12.3	18.1	31.1	40.4
Raptor fb Lorox	2.0 oz fb 1.5 lb	PRE fb Post3	77	185	284	380	15.2	19.2	35.2	44.3
Lorox fb Upbeet + NIS	1 lb fb ¼ oz + ¼%	PRE fb Post2	17	167	224	313	3.7	14.6	19.8	24.1
Lorox fb Upbeet + NIS	1 lb fb ½ oz + ¼%	PRE fb Post2	34	134	203	312	5.9	11.6	18.7	22.3
Lorox fb Upbeet + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2	33	148	213	309	5.5	11.8	18.5	21.4
Lorox fb Raptor+NIS+28%N	1 lb fb ½ oz+¼%+2.5%	PRE fb Post2	58	224	325	415	10.2	18.9	30.8	36.0
Lorox fb Raptor+NIS+28%N	1 lb fb 1 oz+¼%+2.5%	PRE fb Post2	62	173	252	341	10.9	14.4	25.9	31.5
Lorox fb Raptor+NIS+28%N	1 lb fb 2 oz+¼%+2.5%	PRE fb Post2	65	145	225	332	12.0	12.8	25.3	34.1
Lorox fb Raptor+NIS+28%N	1 lb fb ½ oz+¼%+2.5%	PRE fb Post3	35	198	298	375	5.8	15.7	24.0	28.4
Lorox fb Raptor+NIS+28%N	1 lb fb 1 oz+¼%+2.5%	PRE fb Post3	42	162	232	300	7.4	14.9	23.4	27.8
Lorox fb Raptor+NIS+28%N	1 lb fb 2 oz+¼%+2.5%	PRE fb Post3	41	121	174	327	7.3	10.6	18.2	28.1
Lorox fb Authority + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2	45	152	211	324	9.6	12.8	22.9	29.0
Lorox fb Valor + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2	90	96	197	264	23.3	11.8	35.5	44.7
Lorox fb Authority + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2 & 3	77	188	284	378	16.6	17.5	34.7	41.6
Lorox fb Valor + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2 & 3	14	121	236	290	26.5	12.3	38.9	46.2
Lorox fb Dacthal	1 lb fb 8 lbs	PRE fb Post1	76	143	249	327	16.2	13.9	31.2	41.5
Dacthal fb Lorox	8 lbs fb 1.5 lb	Post1 fb Post3	65	257	355	433	13.8	26.4	41.5	49.8
Lorox fb Lorox	1 lb fb 1.5 lbs	PRE fb Post3	63	206	293	380	13.0	19.8	33.8	43.7
Hand weeded check			09	134	260	327	24.6	14.6	40.0	48.0
Probability			0.004	<.0001	0.0003	0.02	<.0001	<.0001	<.0001	<.0001
LSD (0.05)			45	61	77	91	9.2	6.0	10.1	11.6
C.V. (%)			51	26	21	19	51	27	24	22

[1]See Table 1 for explanation of application timings.

Table 4. Carrot root characteristics for the Oakes Irrigation Research Site 2005 carrot weed control study.

Herbicides	Rates	Application timing[1]	Average root length	Average root size	Multiple root	US #1 yield	Uniformity	Overall score
			inches	oz/root	-------- % ---------		1 to 5	1 to 10
Raptor fb Lorox	0.5 oz fb 1.5 lb	PRE fb Post3	7.3	3.6	11	82	3.0	6.0
Raptor fb Lorox	1.0 oz fb 1.5 lb	PRE fb Post3	7.1	3.8	16	78	3.1	6.1
Raptor fb Lorox	2.0 oz fb 1.5 lb	PRE fb Post3	7.8	4.0	15	80	3.0	6.0
Lorox fb Upbeet + NIS	1 lb fb ¼ oz + ¼%	PRE fb Post2	6.8	2.7	11	81	2.8	5.9
Lorox fb Upbeet + NIS	1 lb fb ½ oz + ¼%	PRE fb Post2	6.8	2.7	4	81	2.6	5.6
Lorox fb Upbeet + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2	7.3	2.8	5	87	3.0	6.0
Lorox fb Raptor+NIS+28%N	1 lb fb ½ oz+¼%+2.5%	PRE fb Post2	6.7	3.0	9	85	3.1	6.1
Lorox fb Raptor+NIS+28%N	1 lb fb 1 oz+¼%+2.5%	PRE fb Post2	6.9	3.3	10	82	2.9	5.9
Lorox fb Raptor+NIS+28%N	1 lb fb 2 oz+¼%+2.5%	PRE fb Post2	7.4	3.5	19	74	3.1	6.1
Lorox fb Raptor+NIS+28%N	1 lb fb ½ oz+¼%+2.5%	PRE fb Post3	6.9	2.5	10	84	2.8	5.8
Lorox fb Raptor+NIS+28%N	1 lb fb 1 oz+¼%+2.5%	PRE fb Post3	6.8	3.3	7	85	2.9	5.9
Lorox fb Raptor+NIS+28%N	1 lb fb 2 oz+¼%+2.5%	PRE fb Post3	7.0	3.2	7	65	2.4	5.3
Lorox fb Authority + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2	7.2	3.4	12	80	2.9	5.9
Lorox fb Valor + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2	7.7	6.0	14	80	3.0	6.0
Lorox fb Authority + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2 & 3	7.3	4.0	11	84	3.0	6.0
Lorox fb Valor + NIS	1 lb fb 1 oz + ¼%	PRE fb Post2 & 3	7.5	5.5	12	84	3.0	6.0
Lorox fb Dacthal	1 lb fb 8 lbs	PRE fb Post1	7.5	4.3	20	76	2.9	5.9
Dacthal fb Lorox	8 lbs fb 1.5 lb	Post1 fb Post3	7.4	3.8	11	83	3.4	6.6
Lorox fb Lorox	1 lb fb 1.5 lbs	PRE fb Post3	7.5	3.9	19	77	3.1	6.1
Hand weeded check			8.0	5.1	10	84	3.1	6.1
Probability			0.15	<.0001	0.003	0.15	0.001	0.002
C.V. (%)			8	21	47	10	9	5
LSD (0.05)			ns	1.1	8	ns	0.4	0.4

[1]See Table 1 for explanation of application timings.

Dry bean desiccation with Aim. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Thompson, ND, to evaluate Aim treatments applied as a desiccant to navy bean. Rogers '331' navy bean was planted on May 30, 2005 and maintained by the cooperator until the time of treatment. Early desiccation treatments were applied September 7 at 12:45 pm with 73 F air, 86 F soil surface, 31% relative humidity, 50% clouds, 1 to 4 mph S wind, moist soil surface and subsoil and no dew present to naturally senescent dry bean. Dry bean senescence at application was quantified in the following manner: 60% green pods, 40% yellow pods, 0% leather pods, and 40% leaf drop. Late applied desiccation treatments were applied September 14 at 1:45 pm with 73 F air, 79 F soil surface, 30% relative humidity, 10% clouds, 3 to 5 mph NW wind, dry soil surface, damp subsoil and no dew present to naturally senescent dry bean quantified as: 40% green pods, 55% yellow pods, 5% leather pods, and 50% leaf drop. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 30 gpa at 40 psi through 11004 Turbo TeeJet flat-fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Aim was recently registered at a recommended rate of 2 oz/A as a crop desiccant for dry edible beans. Desiccants were applied at the beginning of crop senescence where leaf drop had not occurred and vines were green, which is earlier than grower practice. At 3 (data not shown) and 5 DAT, differences among Aim rates within adjuvant type were not visible. However, methylated seed oil (MSO) adjuvant enhanced Aim more than petroleum oil (PO). All treatments with Aim increased speed of desiccation more than Gramoxone Max. At 7 DAT, Aim treatments caused pod color change and leaf desiccation similar to treatments at 5 DAT, although all herbicide treatments enhanced dry bean desiccation. Lack of leaf desiccation in the lower canopy was a result of poor canopy penetration. Aim rates greater than 2 oz/A plus MSO were needed to achieve greater than 80% leaf desiccation. Dry bean desiccation was incomplete at 14 DAT. Stem desiccation was 5 to 15% at 5 to 7 DAT and 15 to 20% at 14 DAT (data not shown). (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Dry bean desiccation with Aim (Zollinger and Ries).

Treatment[1]	Rate	5 DAT				7 DAT				14 DAT			
		green[2]	yellow[3]	leather[4]	leaf[5]	green	yellow	leather	leaf	green	yellow	leather	leaf
	(product/A)	(%)				(%)				(%)			
Aim+PO	1oz	40	60	0	60	35	60	5	62	22	27	52	72
Aim+PO	1.5oz	38	58	0	65	33	60	5	63	17	28	55	75
Aim+PO	2oz	38	58	0	66	38	63	5	64	17	23	60	73
Aim+PO	2.5oz	37	57	0	63	27	70	5	68	15	33	50	73
Aim+PO	3.3oz	35	65	0	70	25	70	5	71	12	25	63	78
Aim+PO/ Aim+PO	1oz/ 1oz	37	63	0	61	33	62	5	63	17	33	53	71
Aim+MSO	1oz	37	63	0	65	33	57	10	67	15	30	55	85
Aim+MSO	1.5oz	35	65	0	71	27	63	10	71	17	28	53	75
Aim+MSO	2oz	35	65	0	73	23	65	10	74	10	35	55	75
Aim+MSO	2.5oz	32	68	0	75	20	71	10	76	12	40	55	80
Aim+MSO	3.3oz	32	68	0	77	20	65	15	79	10	30	60	83
Aim+MSO/ Aim+MSO	1oz/ 1oz	37	63	0	65	30	65	5	67	15	35	55	85
Gramoxone Max+ NIS	1pt	40	60	0	50	28	67	5	62	25	45	30	70
Untreated		50	50	0	35	45	55	0	37	30	55	15	55
LSD (0.05)		4	3	0	2	9	3	2	4	3	3	3	2

[1]PO = petroleum oil = Herbimax at 1 qt/A; MSO = methylated seed oil = Scoil at 1qt/A; NIS = nonionic surfactant = R-11.
[2]Green = % green colored pods.
[3]Yellow = % yellow colored pods.
[4]Leather = % brown/dry pods.
[5]Leaf = % dry leaf and leaf drop.

Evaluation of dry bean herbicide programs. Jenks, Markle, and Willoughby. 'Maverick' pinto beans were seeded May 23 at 120 lb/A into 30-inch rows. Herbicide treatments were applied preplant incorporated (PPI) and preemergence (PRE) on May 23 with a bicycle sprayer delivering 20 gpa at 30 psi through XR 80015 nozzles. Air and soil temperatures were 71 and 60 F, respectively, and relative humidity was 37%. Postemergence (POST) were applied on June 21 to 2 to 3-trifoliate dry beans with a bicycle sprayer delivering 10 GPA at 40 psi through XR 8001 nozzles. Air and soil temperatures were 81 and 73 F, respectively, and relative humidity was 59%. Individual plots were 10 by 30 ft and replicated three times. At the POST application, kochia was 2-3" tall and 5-15/ft^2. Redroot pigweed was 1-3" tall and 5-20/ft^2. Foxtail was 4-8" tall and 10-30/ft^2.

None of the treatments caused significant crop injury. Initially, all treatments provided good to excellent foxtail control. The tank mix of Rezult + Reflex provided slightly less foxtail control compared to other treatments. In fact, by mid-August it appeared that grass control was 10-30% less in treatments containing Reflex. Treatments containing Rezult provided good to excellent kochia control. Treatments without Rezult did not control kochia. All treatments provided excellent pigweed control with the exception of Rezult applied alone. Although not included in the table below, Rezult also provided good to excellent control of biennial wormwood.

Table. Evaluation of BAS 777 for weed control in Clearfield wheat.

		Dry bean			Green foxtail			Kochia			Redrt pigwd		
Treatment[a]	Rate	Jun 20	Jul 11	Jul 26	Jun 20	Jul 11	Jul 26	Jun 20	Jul 11	Jul 26	Jun 20	Jul 11	Jul 26
		- % injury -			% control								
PPI / POST													
Prowl H2O / Rezult + Raptor	3 pt / 3.2 pt + 2 fl oz	0	2	0	98	98	98	95	99	96	99	100	100
Pursuit / Rezult	2 oz / 3.2 pt	0	3	0	96	98	98	96	100	99	100	100	100
PRE / POST													
Pursuit / Rezult	2 oz / 3.2 pt	3	1	0	98	99	98	86	100	97	99	99	100
POST													
Rezult	3.2 pt	--	2	0	--	96	93	--	99	88	--	85	80
Raptor + Basagran + NIS + 28% N	4 oz + 6 oz + 0.25% + 1 qt	--	1	0	--	99	99	--	78	20	--	99	99
Reflex + NIS	12 fl oz + 0.25%	--	1	0	--	0	0	--	92	40	--	68	92
Raptor + Reflex + NIS	4 oz + 8 fl oz + 0.25%	--	2	0	--	89	92	--	73	33	--	100	100
Rezult + Raptor + Reflex	3.2 pt + 2 fl oz + 4 fl oz	--	1	0	--	94	93	--	100	96	--	96	96
Rezult + Reflex	3.2 pt + 8 fl oz	--	4	0	--	87	86	--	100	99	--	100	100
Untreated		0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		NS	NS		2	4	5	10	24	31	2	21	13
CV		327	140	0	1	3	4	7	16	26	1	15	9

[a]*Rezult treatments were applied with COC and 28% N at 1% v/v and 1 qt, respectively.*

Prickly lettuce control in dry pea. Jenks, Markle, and Willoughby. Dry peas were seeded May 4 near Beach, ND. Herbicide treatments were applied just before planting (Preplant) on May 4 with a bicycle sprayer delivering 10 gpa at 40 psi through XR 8001 nozzles. Air and soil temperatures were 65 and 51 F, respectively, and relative humidity was 27%. Postemergence (POST) treatments were applied on June 16 with a bicycle sprayer delivering 10 gpa at 40 psi through XR 8001 nozzles. Air and soil temperatures were 74 and 67 F, respectively, and relative humidity was 67%. Individual plots were 10 x 30 ft and replicated three times. *Glyphosate was applied preplant to all plots with the exception of the untreated plot.* Prickly lettuce, which is a winter annual, was in the rosette stage at the preplant application (about 2-4" diameter, 10-15 per sq ft). The June 16 evaluation was essentially an evaluation of glyphosate activity on emerged prickly lettuce. It was not clear how many prickly lettuce plants present at the July/Aug evaluations survived the preplant glyphosate application or emerged thereafter. We do know that at least some plants did survive the glyphosate application.

Sencor at 0.25 lb/A provided slightly better prickly lettuce control than at 0.125 lb. However, Sencor, Pursuit + Spartan, and Express applied preplant with glyphosate did not provide additional prickly lettuce control over that provided by glyphosate alone at any evaluation date. MCPA amine, Basagran alone, and Basagran + Raptor combinations provided 89-94% prickly lettuce control, with the exception of where Basagran + Raptor was applied at reduced rates. Basagran + Raptor (0.5 pt + 2 fl oz) provided only 75% prickly lettuce control or about 15-20% less control compared to the normal use rates. It is clear from this and other studies that growers should not use reduced rates when attempting to control prickly lettuce.

MCPA amine and 2,4-DB are not labeled for use in North Dakota on dry pea. Although MCPA amine provided 93% control, it also caused about 30% crop injury. Treatments containing Basagran caused 8-14% crop injury. 2,4-DB showed some activity on prickly lettuce, but provided only 78% control and caused about 9% injury. It is clear from this study that the glyphosate burndown is critical for reducing prickly lettuce competition to allow the crop to get a head start. Cold spring temperatures less than 50-55 F may reduce glyphosate effectiveness. Without an effective glyphosate burndown, the postemergence herbicides alone would not be as effective since prickly lettuce would be larger and more dense at the postemergence application. Basagran and Raptor are more effective on smaller prickly lettuce.

Table. Prickly lettuce control in dry pea.

			Prickly lettuce			Pea	Density
Treatment[a]	Rate	Timing	Jun 16	Jul 1	Aug 4	Jul 1	Jun 16
	(product/A)		% control			% injury	#/m row
Glyphosate	0.75 lb ae	Preplant	97	70	65	0	13.7
Sencor	0.125 lb	Preplant	91	67	61	0	12.2
Sencor	0.25 lb	Preplant	94	71	69	0	13.0
Pursuit + Spartan	2 fl oz + 2 oz	Preplant	93	67	63	0	13.2
Basagran + MSO	2 pt + 1%	POST	97	92	94	12	12.8
Basagran + Raptor[b]	1 pt + 4 fl oz	POST	93	89	89	8	12.8
Basagran + Raptor[b]	2 pt + 2 fl oz	POST	92	85	89	14	13.4
Sencor / Basagran + Raptor[b]	0.2 lb / 1 pt + 4 fl oz	Preplant / POST	95	87	91	11	12.9
Sencor / Basagran + Raptor[b]	0.2 lb / 0.5 pt + 2 fl oz	Preplant / POST	91	79	75	5	13.5
2,4-DB	0.7 pt	POST	95	80	78	9	13.2
MCPA amine	0.5 pt	POST	97	93	93	30	11.8
Express + NIS	0.1 oz + 0.125%	Preplant	95	71	66	0	12.2
Express + NIS	0.167 oz + 0.125%	Preplant	93	68	63	0	12.1
Untreated			0	0	0	0	10.1
LSD (0.05)			4	5	6	3	1.8
CV			3	4	5	29	8.8

[a]*Glyphosate plus AMS at 0.75 lb ae plus 2.5 gal/100 gal were applied preplant to all plots except the untreated.*
[b]*Basagran + Raptor was applied with MSO + 28% N (1% +1qt)*

Volunteer canola control in dry pea. Jenks, Markle, and Willoughby. 'Majoret' dry peas were seeded May 12 at 120 lb/A into 6-inch rows. Canola was then seeded over the top to simulate a volunteer canola (VC) situation. Herbicide treatments were applied preemergence (PRE) on May 19 with a bicycle sprayer delivering 20 gpa at 30 psi through XR 80015 nozzles. Air and soil temperatures were 83 and 72 F, respectively, and relative humidity was 29%. Postemergence treatments were applied to 3-leaf canola May 19 with a bicycle sprayer delivering 10 gpa at 40 psi through XR 8001 nozzles. Air and soil temperatures were 74 and 62 F, respectively, and relative humidity was 68%. Treatments to 6-leaf canola were applied June 23 with a bicycle sprayer delivering 10 gpa at 40 psi through XR 8001 nozzles. Air and soil temperatures were 78 and 74 F, respectively, relative humidity was 73%. Individual plots were 10 by 30 ft and replicated three times.

Spartan did not control VC. Sencor applied PRE provided only 80% control at the July evaluation, which is about 18% less than in the 2004 study. Sencor applied postemergence provided excellent (90%) VC control at the 3-leaf stage, but reduced to 62% when applied at the 6-leaf stage. MCPA amine provided poor VC control at either application stage. Basagran at 0.5 pt provided only fair (76%) VC control at the 3-leaf stage and poor control (48%) at the 6-leaf stage. Raptor provided excellent control at either application stage. These results are generally similar to the 2004 study with the exception of MCPA amine, which provided excellent VC control (95%) at the 3-leaf stage in 2004, but provided only poor control in 2005.

Table. Volunteer canola control in dry pea.

Treatment	Rate	Timing	Volunteer canola	
			Jun 30	Jul 14
			% control	
Spartan	4 oz	PRE	43	36
Sencor	0.375 lb	PRE	77	80
Sencor	0.25 lb	3-leaf	93	90
Sencor	0.25 lb	6-leaf	53	62
MCPA amine	8 fl oz	3-leaf	57	53
MCPA amine	8 fl oz	6-leaf	40	43
Basagran + COC	0.5 pt 2 pt	3-leaf	84	76
Basagran + COC	0.5 pt 2 pt	6-leaf	63	48
Raptor + NIS + 28% N	4 fl oz + 0.25% v/v + 2.5% v/v	3-leaf	93	97
Raptor + NIS + 28% N	4 fl oz + 0.25% v/v + 2.5% v/v	6-leaf	70	95
Untreated			0	0
LSD (0.05)			19	25
CV			23	30

Dry pea tolerance to Express and Affinity applied preemergence. Jenks, Markle, and Willoughby. Majoret' dry peas were seeded May 11 at 120 lb/A into 6-inch rows. Herbicide treatments were applied preemergence (PRE) on May 19 with a bicycle sprayer delivering 10 gpa at 40 psi through XR 8001 nozzles. Air and soil temperatures were 80 and 68 F, respectively, and relative humidity was 35%. Individual plots were 10 x 30 ft and replicated three times.

The objective of this study was to determine if Express or Affinity applied PRE would cause injury to dry pea. This use is not labeled as of November 2005. Express or Affinity could be tank-mixed with preplant or PRE glyphosate (burndown) to help control weeds such as wild buckwheat and volunteer RR canola.

There was no visible crop injury with any treatment. There were no differences in dry pea yield or test weight with any treatment. We had 1.24 inches of rain two days after application and almost 5 inches within about two weeks of application.

Table. Dry pea tolerance to Express and Affinity applied preemergence.

			Pea density	Dry pea			
Treatment[a]	Rate	Timing	Jun 24	Jun 24	Jul 15	Yield	Test wt.
			#/m row	—— % injury ——		lb/A	lb/bu
Express + NIS	0.083 oz + 0.25% v/v	PRE	11.5	0	0	3160	64.3
Express + NIS	0.125 oz + 0.25% v/v	PRE	11.6	0	0	2820	64.8
Express + NIS	0.167 oz + 0.25% v/v	PRE	13.4	0	0	2770	64.2
Affinity + NIS	0.15 oz + 0.25% v/v	PRE	11.0	0	0	2660	65.0
Affinity + NIS	0.3 oz + 0.25% v/v	PRE	13.2	0	0	2840	64.8
Prowl H2O	0.75 lb ae + 3 pt	PRE	11.8	0	0	2730	64.6
LSD (0.05)			NS	NS	NS	NS	NS
CV			15.0	0	0	9	1.1

[a]*Glyphosate and Prowl H2O (0.75 lb ae and 3 pt) were applied alone or tank-mixed with each treatment Express or Affinity treatment to control weeds.*

Evaluation of Chemical Weed Control and Application Timing on Field Pea at Hettinger

Eric Eriksmoen

Fall treatments (Fall) were applied on October 12, 2004. Pre-plant treatments (PP) were applied on April 7, 2005. 'CDC Mozart' yellow field pea was seeded on April 18. Pre-emergence treatments (PRE) were applied on April 20. Pea emergence was on May 10. Post-emergence (POST) treatments were applied to 5 node peas (3 ½"), ¼" kochia and to 1 leaf wild buckwheat on May 24 with 63°F, 45% RH cloudy sky and 8 mph N wind. Kochia and wild buckwheat populations were 12 and 0.25 plants / ft^2, respectively. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi to 5 foot wide by 20 foot long plots. The experiment was a randomized complete block design with four replications. The trial was sprayed with 9 oz/A Assure II on May 19 to control grassy weeds. Soil pH was 6.6 and soil organic matter was 3.1%. Plots were evaluated for crop stand on May 23, for crop injury on May 25 and on June 10, and for weed control on May 25, June 10 and on July 22. The trial was harvested on July 29.

Summary

Crop stands were very uniform across the trial and Fall, pre-plant and pre-emergence treatments did not appear to cause problems with seed germination or seedling emergence. Crop injury caused by herbicide treatments were inconsistent and very minor when observed. Spartan herbicide applied alone at a low rate in the Fall (trt 2) did not provide adequate season long weed control, however, Fall applied Spartan at the 4 oz/A rate (trt 3) significantly improved weed control and seed yield. Low rates of Fall applied Spartan followed with a spring treatment (trts 7 – 10) provided excellent season long kochia and wild buckwheat control. Spartan treatments applied either pre-plant (trts 6, 11 and 12) or pre-emergence (trts 13 and 14) also provided excellent season long kochia and buckwheat control, regardless of the rate applied. Pursuit herbicide treatments (trts 4 and 23) and Extreme herbicide (which is a pre-mixture of Pursuit and glyphyosate) treatment 16, were very effective at controlling wild buckwheat but did not provide adequate control of kochia. The addition of Spartan to these herbicides (trts 5 and 8) picked up kochia control, providing for an excellent herbicide combination. Harmony GT (trt 17), Express (trt 18) and Roundup (trt 19) applied pre-emergence, and Rezult (trt 21) applied post emergence did not provide adequate kochia or wild buckwheat control and seed yields were similar to the untreated check. The pre-emerge Prowl H_2O treatment (trt 20) provided excellent kochia control but was relatively weak on wild buckwheat. The post emergence Raptor + Basagran treatment (trt 22) provided adequate wild buckwheat control but tended to be weaker on kochia. The kochia population in this study is believed to be ALS resistant (resistant to Pursuit, Raptor, Express and Harmony GT herbicides).

In general, Spartan herbicide applied in the Fall, pre-plant or pre-emergence was very effective in controlling kochia and wild buckwheat in this study. Higher rates of Spartan and the addition of Pursuit in Fall applications tended to enhance weed control. Harmony GT and Express herbicides applied pre-emergence did not cause crop injury and did not provide adequate weed control.

Evaluation of Chemical Weed Control and Application Timing on Field Pea at Hettinger

	Treatment	Application Timing	Product Rate	Crop Stand	May 25 Inj.	May 25 kocz	May 25 wibw	June 10 Inj.	June 10 kocz	June 10 wibw	July 22 kocz	July 22 wibw	Seed Yield
		*	oz/ac	#/ft^2	% Control								Bu/ac
1	Untreated			4	0	0	0	0	0	0	0	0	16.2
2	Spartan	Fall	2	5	0	92	95	0	89	50	82	42	16.7
3	Spartan	Fall	4	4	0	91	95	0	96	94	91	82	20.3
4	Pursuit	Fall	2	4	0	81	82	0	80	99	59	96	23.0
5	Pursuit / Spartan	Fall / PP	2 / 2	4	0	94	92	0	99	97	97	95	21.8
6	Roundup / Spartan	Fall / PP	16 / 2	3	0	94	94	0	98	95	91	88	22.3
7	Spartan / Roundup	Fall / PRE	2 / 16	4	0	92	92	0	90	90	90	86	25.5
8	Spartan / Extreme	Fall / PRE	2 / 24	4	0	95	94	0	93	94	92	97	27.6
9	Spartan / Spartan + Roundup	Fall / PRE	2 / 2 + 16	3	0	96	95	0	99	97	98	97	22.2
10	Spartan / Prowl H_2O	Fall / PP	2 / 32	4	1	92	94	0	94	96	92	97	22.3
11	Spartan + Roundup	PP	2 + 16	3	0	92	95	0	96	96	89	94	22.1
12	Spartan + Roundup	PP	6 + 16	3	0	95	95	0	99	94	99	97	20.4
13	Spartan + Roundup	PRE	2 + 16	4	0	90	95	0	96	99	90	91	21.8
14	Spartan + Roundup	PRE	6 + 16	4	0	95	95	0	99	99	99	97	22.5
15	Spartan + Prowl H_2O	PP	2 + 32	4	0	94	91	0	91	90	90	92	20.2
16	Extreme	PP	24	3	0	69	90	0	78	98	50	90	22.3
17	Harmony GT + Roundup	PRE	1/6 + 16	3	0	0	0	0	30	28	22	0	16.2
18	Express + Roundup	PRE	1/10 + 16	4	0	0	0	0	0	0	12	0	15.4
19	Roundup	PRE	16	3	0	0	0	0	12	0	9	0	18.8
20	Prowl H_2O + Roundup	PRE	32 + 16	5	0	90	95	0	86	52	94	45	22.0
21	Rezult	POST	51	3	--	--	--	0	78	5	55	0	16.5
22	Raptor + Basagran	POST	2 + 16	4	--	--	--	0	88	85	81	86	24.0
23	Pursuit	POST	2	4	--	--	--	0	85	79	75	89	22.1
24	Spartan / Basagran	PP / POST	2 + 16	4	0	92	94	0	97	92	98	90	24.4
Trial Mean				4	0	64	66	0	78	72	73	69	21.1
C.V. %				29.8	566	9.1	7.1	980	7.9	7.2	10.5	10.2	9.7
LSD .05				NS	NS	8	7	NS	9	7	11	10	2.9
LSD .01				NS	NS	11	9	NS	12	10	14	13	3.8

* Application Timing: Fall = 10/12/04, PP (pre-plant) = 4/7/05, PRE (pre-emergence) = 4/20/05, POST (post emergence) = 5/24/05

Weed control in conventional-till field pea, Carrington, 2005. Gregory J. Endres and Blaine G. Schatz. (Carrington Research Extension Center, North Dakota State University, Carrington, ND 58421) 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 experiment was conducted on a conventionally-tilled, Heimdahl loam soil with 7.9 pH and 3.1% organic matter at the NDSU Carrington Research Extension Center. Herbicide treatments were applied to 10- by 25-ft plots with a pressurized hand-held plot sprayer at 17 gal/A and 35 psi through 8002 flat-fan nozzles. PPI treatments were applied to a dry soil surface on April 23 with 44 F, 30% RH, clear sky, and 7 mph wind. Treatments were immediately incorporated twice with a cultivator+harrow tilling at a 3-inch depth. On April 25, inoculated 'Integra' field pea was seeded in 7-inch rows at a rate of 300,000 pure live seeds/A. PRE treatments were applied to a dry soil surface on April 26 with 37 F, 66% RH, 20% clear sky, and 17 mph wind. Rainfall totaled 1.12 inches 12 d following PRE application. The early-POST (EPOST) treatment was applied on May 23 with 72 F, 39% RH, 5% clear sky, and 7 mph wind to 2-inch tall field pea, 1- to 2-leaf green and yellow foxtail, 0.5-inch tall common lambsquarters, and 0.5-inch tall redroot pigweed. POST treatments were applied on June 6 with 70 F, 53% RH, 90% clear sky, and 4 mph wind to 7-inch tall field pea, 3- to 4-leaf green and yellow foxtail, 1- to 3-inch tall common lambsquarters, 0.5- to 1-inch tall redroot pigweed, and 1- to 3-inch tall wild buckwheat. Average plant density in untreated plots was measured on June 6: field pea = 9 plants/ft^2, foxtail = 11 plants/ft^2, common lambsquarters = 1 plants/ft^2, pigweed = 6 plants/ft^2 and wild buckwheat = <1 plant/ft^2. The trial was harvested with a plot combine on August 3.

Weed densities in the trial generally were light. Visual evaluation of soil-applied products on June 3 (before application of POST treatments) indicated excellent control of broadleaf weeds with imazethapyr (Table 1). Foxtail control was excellent with imazethapyr with ethalfluralin or pendamethalin tank mixures. Ethafluralin+imazethapyr and soil- followed by POST-applied treatments generally provided excellent weed control (Table 2). POST treatments provided good to excellent control of foxtail and common lambsquarters. Imazamox tank miztures with bentazon provided 96 to 99% redroot pigweed control. Crop response generally was low (Table 3). Seed yield greater than 50 bu/A was achieved with ethalfluralin+imazethapyr, imazethapyr&pendamethalin followed by bentazon+sethoxydim, and sequential application of bentazon+sethoxydim.

Table 1. Weed control with soil-applied herbicides in conventional-till field pea , Carrington, 2005.

Treatment[1]	Application timing[2]	Rate	6/3			
			Foxtail spp.[3]	Common lambsquarters	Redroot pigweed	Wild buckwheat
		lb ai/A	----------% control ----------			
Untreated check	x	x	0	0	0	0
Pendamethalin	PPI	1.5	87	72	96	81
Imazethapyr	PPI	0.031	77	99	99	89
Imazethapyr&pendamethalin	PPI	0.031&0.5	93	99	98	94
Ethafluralin+imazethapyr	PPI	0.75+0.031	96	99	99	99
Imazethapyr	PRE	0.031	75	98	98	99
LSD (0.05)			6	3	3	18

[1]Pendimethalin=Prowl H_20, BASF; Imazethapyr&pendamethalin=Pursuit Plus, BASF.

[2]PPI=April 23; PRE=April 25; EPOST=May 23; and POST=June 6.

[3]Foxtail spp.=Yellow and green.

Table 2. Weed control with soil- and POST-applied herbicides in cinventional-till field pea, Carrington, 2005.

			7/2				8/4			
Treatment[1]	Application timing[2]	Rate	Fox-tail spp.[3]	Common lambs-quarters	Pig-weed spp.	Wild buck-wheat	Fox-tail spp.	Common lambs-quarters	Pig-weed spp.	Wild buck-wheat
		lb ai/A	% control							
Untreated	x	x	0	0	0	0	0	0	0	0
Pendamethalin/Bentazon+ sethoxydim+imazamox	PPI/POST	1.5/1+0.2+0.016	98	97	99	88	98	97	99	82
Imazethapyr/Bentazon+sethoxydim	PPI/POST	0.031/1+0.2	96	94	95	73	96	92	97	91
Imazethapyr&pendamethalin/ Bentazon+sethoxydim	PPI/POST	0.031&0.5/1+0.2	98	97	97	86	97	96	99	92
Ethalfluralin+imazethapyr	PPI	0.75+0.031	98	96	99	99	95	91	99	99
Imazethapyr/Bentazon+sethoxydim	PRE/POST	0.031/1+0.2	96	89	97	95	92	91	97	92
Bentazon+sethoxydim	POST	1+0.2	96	93	62	75	96	80	47	80
Imazamox+bentazon+NIS+UAN	POST	0.031+0.188+0.25% v/v+32 fl oz	92	91	99	67	94	94	99	77
Imazamox+bentazon+sethoxydim	POST	0.016+0.5+0.1	88	96	98	60	91	88	96	78
Bentazon+sethoxydim/Bentazon+ sethoxydim	EPOST/ POST	0.5+0.1/0.5+0.1	94	85	70	65	95	94	70	68
LSD (0.05)			5	12	12	20	2	14	22	18

[1]Pendimethalin=Prowl H20, BASF; Bentazon+sethoxydim includes MSO (Destiny, a methylated seed oil from Agriliance, St. Paul, MN) at 1% v/v and UAN (urea ammonium nitrate) at 32 fl oz/A; Imazethapyr&pendamethalin=Pursuit Plus, BASF; NIS=Preference, a nonionic surfactant from Agriliance.

[2]PPI=April 23; PRE=April 25; EPOST=May 23; and POST=June 6.

[3]Foxtail spp.=Yellow and green.

Table 3. Field pea response to herbicide treatments, Carrington, 2005.

Treatment[1]	Application timing[2]	Rate	Crop injury 6/6	7/2	8/3	Seed yield	Test weight
		lb ai/A	-------- % -------			bu/A	lb/bu
Untreated	x	x	0	0	0	49.6	63.0
Pendamethalin/Bentazon+sethoxydim+imazamox	PPI/POST	1.5/1+0.2+0.016	0	10	5	45.6	64.2
Imazethapyr/Bentazon+sethoxydim	PPI/POST	0.031/1+0.2	0	5	2	48.2	63.2
Imazethapyr&pendamethalin/Bentazon+sethoxydim	PPI/POST	0.031&0.5/1+0.2	0	3	4	53.3	63.1
Ethalfluralin+imazethapyr	PPI	0.75+0.031	0	0	2	56.8	63.1
Imazethapyr/Bentazon+sethoxydim	PRE/POST	0.031/1+0.2	0	0	3	45.6	62.4
Bentazon+sethoxydim	POST	1+0.2	x	3	5	48.1	63.2
Imazamox+bentazon+NIS+UAN	POST	0.031+0.188+0.25% v/v+32 fl oz	x	7	0	39.9	63.8
Imazamox+bentazon+sethoxydim	POST	0.016+0.5+0.1	x	6	3	38.4	63.3
Bentazon+sethoxydim/Bentazon+sethoxydim	EPOST/POST	0.5+0.1/0.5+0.1	x	2	0	54.1	62.8
LSD (0.05)			NS	NS	NS	7.3	0.8

[1]Pendimethalin=Prowl H20, BASF; Bentazon+sethoxydim includes MSO (Destiny, a methylated seed oil from Agriliance, St. Paul, MN) at 1% v/v and UAN (urea ammonium nitrate) at 32 fl oz/A; Imazethapyr&pendamethalin=Pursuit Plus, BASF; MSO=; Pendimethalin=ProwlH20, BASF; NIS=Preference, a nonionic surfactant from Agriliance.

[2]PPI=April 23; PRE=April 25; EPOST=May 23; and POST=June 6.

Weed Control in Conventional Till Field Pea. Kirk Howatt, Ronald Roach, and Janet Harrington. Pre-plant incorporated (PPI) and pre-emergence (PRE) treatments were applied May 5. PPI treatments were incorporated with a field cultivator set to a working depth of 3 inches. 'Integra' field pea was seeded May 5. Post treatments were applied to 6- to 9-inch field pea, six-leaf yellow foxtail, and 6-inch wild mustard and redroot pigweed on June 21 with 92°F, 33% RH, 80% cloud cover, wind velocity at 1 mph at 225° and moist soil with a temperature of 70° F. All treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

				7/05			7/19	
Treatment[a]	Rate	Stg	Field pea	Yeft	Rrpw	Wimu	Yeft	Rrpw
				%				
Pend/bent&seth+immx +PO+UAN	20/16+3.2+0.25 +1%+0.25G	PPI /POST	19	97	99	98	96	98
Imep/bent&seth +PO+UAN	0.5/16+3.2 +1%+0.25G	PPI /POST	10	98	99	99	97	99
Pend&imep/bent&seth +PO+UAN	8.5/16+3.2 +1%+0.25G	PPI /POST	13	98	99	99	97	99
Ethalfluralin+imep	12+0.5	PPI	2	97	99	94	97	99
Imep/bent&seth+PO +UAN	0.5/16+3.2+1% +0.25G	PRE /POST	2	98	99	99	98	99
Bent&seth+PO+UAN	16+3.2+1%+0.25G	POST	15	94	42	97	94	32
Immx+bent(4SL)+NIS +UAN	0.5+3+1 FL +0.25G	POST	10	88	90	96	93	93
Immx+bent&seth +PO+UAN	0.25+8+1.6 +1%+0.25G	POST	12	82	90	99	84	93
Bent&seth+PO+UAN	8+1.6+1%+0.25G	POST	12	90	89	96	92	89
Untreated	0		14	0	0	0	0	0
CV			80	6	6	4	4	4
LSD (P=0.05)			13	8	7	5	5	5

[a] Bentazon&sethoxydim was the co-pack product Result from BASF corp.

Early season field pea injury was influenced by excessive soil moisture content. Stand loss occurred because of saturated soil but was consistent across treatments. None of the treatments expressed injury different from untreated plants. Yellow foxtail control generally was greater when the treatment included a PPI or PRE component compared with only POST treatments. The total PRE treatment ethafluralin and imazethapyr provided 97% control of yellow foxtail on July 19, but POST application of imazamox and/or sethoxydim gave 84 to 94% control. All treatments with a soil applied herbicide component provided significantly better control of redroot pigweed than treatments containing only POST herbicides. Among POST treatments, bentazon&sethoxydim at 16 and 3.2 oz ai/A gave less than 50% control of pigweed while bentazon&sethoxydim at 8 and 1.6 oz/A provided 89% control. This anomaly could not be explained and was not consistent with previous experiences of reduced bentazon rates on larger weeds. The higher bentazon rate produced more rapid tissue necrosis, but since bentazon is not readily translocated downward, prolonged plant response was not expected to enable accumulation of bentazon at axillary meristems. All herbicide treatments provided 94% or better control of wild mustard on July 5. Field pea was not harvested because of late season flooding.

Weed control in direct-seeded field pea. Gregory J. Endres and Blaine G. Schatz. (Carrington Research Extension Center, North Dakota State University, Carrington, ND 58421) 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 experiment was conducted on a Heimdahl loam soil with 6.7 pH and 2.9% organic matter at the NDSU Carrington Research Extension Center. Herbicide treatments were applied to 5- by 25-ft plots with a pressurized hand-held plot sprayer at 17 gal/A and 30 psi through 8002 flat-fan nozzles. Fall sulfentrazone treatments were applied October 25, 2004 to a moist soil surface with 47 F, 71% RH, 15% clear sky, and 11 mph wind. On April 28, 2005, inoculated 'Integra' 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 to a dry soil surface on April 30 with 31 F, 64% RH, 30% clear sky, and 10 mph wind. Rainfall totaled 1.22 inches 8 d following PRE application. The trial area was treated on May 6 with a PRE burn-down application of glyphosate at 0.75 lb ae/A plus ammonium sulfate at 1% v/v. The early POST (EPOST) treatment was applied on May 23 with 73 F, 35% RH, 100% cloudy sky, and 6 mph wind to 2-inch tall field pea, 1- to 2-leaf green and yellow foxtail, 0.5-inch tall common lambsquarters, 0.5-inch tall prostrate and redroot pigweed, and 0.5-inch tall wild buckwheat. POST treatments were applied on June 6 with 75 F, 46% RH, clear sky, and 9 mph wind to 5- to 7-inch tall field pea, 2- to 4-leaf green and yellow foxtail, 1- to 3-inch tall common lambsquarters, 0.5- to 1-inch tall prostrate and redroot pigweed, and 1- to 2-inch tall wild buckwheat. Average plant density in untreated plots was measured on June 6: field pea = 11 plants/ft^2, foxtail = 35 plants/ft^2, common lambsquarters = 3 plants/ft^2, pigweed = 11 plants/ft^2 and wild buckwheat = 1 plant/ft^2. The trial was harvested with a plot combine on August 4.

Generally, fall- and PRE-applied treatments provided good to excellent broadleaf weed control when evaluated on June 3, except carfentrazone and thifensulfuron + tribenuron (Table 1). Fall- or PRE-applied sulfentrazone at 0.188 lb/A provided similar broadleaf weed control. Broadleaf weed control was reduced with fall-applied sulfentrazone at 0.094 lb/A followed by PRE application at 0.094 lb/A compared to fall- or PRE-applied sulfentrazone at 0.188 lb/A. Imazethapyr+pendimethalin provided 88% foxtail control and excellent broadleaf weed control (96 to 99%). Crop injury (reduced plant biomass) ranging from 17 to 18% occurred with spring-applied sulfentrazone at 0.188 lb/A (Table 2). Also, substantial crop injury occurred with imazamox at 0.031 lb/A + bentazon following pendimethalin. Severe pea injury and yield loss occurred with fomesafen. Weed control on August 4 ranged from 88 to 99% with fall-applied sulfentrazone at 0.188 lb/A followed by bentazon at 0.5 lb/A + sethoxydim at 0.1 lb/A, sulfentrazone + imazethapyr, imazethapyr + pendimethalin, and pendimethalin followed by imazamox at 0.031 lb/A + bentazon (Table 3). Sequentially-applied bentazon at 0.5 lb/A + sethoxydim at 0.1 lb/A provided 98% control of common lambsquarters compared to 75% control with bentazon at 1.0 lb/A + sethoxydim at 0.2 lb/A. Pea seed yield ranged from 68.9 to 70.7 bu/A with sulfentrazone followed by bentazon + sethoxydim, and imazethapyr + pendimethalin compared to the untreated check at 49.2 bu/A (Table 2).

Table 1. Weed control with soil-applied herbicides in no-till field pea , Carrington, 2005.

Treatment[1]	Application timing[2]	Rate	6/3 Foxtail spp.[3]	Common lambsquarters	Pigweed spp.[3]	Wild buckwheat
		lb ai/A	----------% control ----------			
Untreated	x	x	0	0	0	0
Sulfentrazone	Fall	0.188	66	99	99	93
Sulfentrazone/Sulfentrazone	Fall/PRE	0.094/0.094	58	91	94	75
Sulfentrazone	PRE	0.188	73	99	99	94
Sulfentrazone+imazethapyr	PRE	0.188+0.031	76	99	99	94
Sulfentrazone+metribuzin	PRE	0.094+0.25	63	98	98	80
Imazethapyr+pendimethalin	PRE	0.031+1.5	88	99	99	96
Imazethapyr	PRE	0.031	74	99	99	96
Imazethapyr	PRE	0.031	73	99	99	99
Pendimethalin	PRE	1.5	76	85	93	86
Pendimethalin	PRE	1.5	86	88	96	99
Carfentrazone	PRE	0.008	0	0	0	0
Thifensulfuron+tribenuron+NIS	PRE	0.0075+0.0019+0.25%	0	0	0	0
LSD (0.05)			7	6	4	15

[1]Pendimethalin=ProwlH_20, BASF; NIS=Preference, a nonionic surfactant from Agriliance. The trial was treated on May 6 with a PRE burn-down application of glyphosate at 0.75 lb ae/A plus ammonium sulfate at 1% v/v.

[2]Fall=October 25, 2004; PRE=April 30, 2005.

[3]Foxtail spp.=Yellow and green; Pigweed spp.=Redroot and prostrate.

Table 2. Field pea response to herbicide treatments, Carrington, 2005.

Treatment[1]	Application timing[2]	Rate	Crop injury 6/3	Crop injury 7/2	Crop injury 8/4	Seed yield	Test weight
		lb ai/A		%		bu/A	lb/bu
Untreated	x	x	0	0	0	49.2	63.2
Sulfentrazone/Bentazon+ sethoxydim+MSO+UAN	Fall/POST	0.188/0.5+ 0.1+1%+2pt	0	0	0	70.6	63.3
Sulfentrazone/Sulfentrazone/ Bentazon+sethoxydim+MSO+ UAN	Fall/PRE/ POST	0.094/0.094/ 0.5+ 0.1+1%+ 2pt	0	8	6	68.9	63.5
Sulfentrazone/Bentazon+ sethoxydim+MSO+UAN	PRE/POST	0.188/0.5+ 0.1+1%+2pt	18	12	0	69.3	63.4
Sulfentrazone+imazethapyr	PRE	0.188+0.031	17	7	0	62.5	63.5
Sulfentrazone+metribuzin/ Bentazon+sethoxydim+MSO+ UAN	PRE/POST	0.094+0.25/ 0.5+0.1+1%+ 2pt	0	0	0	61.4	63.0
Imazethapyr+pendimethalin	PRE	0.031+1.5	0	0	0	70.7	63.3
Imazethapyr/Bentazon+ sethoxydim+MSO+UAN	PRE/POST	0.031/1.0+ 0.2+1%+2pt	0	0	0	58.3	63.0
Imazethapyr/Bentazon+ sethoxydim+MSO+UAN	PRE/POST	0.031/0.5+ 0.1+1%+2pt	0	0	0	61.0	63.1
Pendimethalin/Imazamox+ bentazon+MSO+UAN	PRE/POST	1.5/0.031+0.188+1% +2pt	0	21	17	52.6	63.7
Pendimethalin/Imazamox+ bentazon+MSO+UAN	PRE/POST	1.5/0.016+0.188+1% +2pt	0	0	0	51.3	62.7
Carfentrazone/Bentazon+ sethoxydim+MSO+UAN	PRE/POST	0.008/1.0+ 0.2+1%+2pt	0	0	3	51.8	63.5
Thifensulfuron+tribenuron+NIS/ Bentazon+ sethoxydim+MSO+ UAN	PRE/POST	0.0075+0.0019+ 0.25%/1.0+ 0.2+1%+2pt	0	0	2	55.9	62.5
Imazamox+bentazon+NIS+UAN	POST	0.031+0.188+1% +2pt	x	0	0	62.5	63.6
Imazamox+bentazon+MSO+ UAN	POST	0.016+0.188+1% +2pt	x	0	0	50.0	63.8
Imazamox+bentazon+ sethoxydim+MSO+UAN	POST	0.031+1.0+ 02+1%+2pt	x	0	2	46.6	63.5
Bentazon+sethoxydim+MSO+ UAN	POST	1.0+0.2+1%+ 2pt	x	0	2	57.4	62.9
Bentazon+sethoxydim+MSO+ UAN/Bentazon+sethoxydim+ MSO+ UAN	EPOST/ POST	0.5+0.1+1%+2pt/ 0.5+0.1+1%+2pt	x	0	2	61.6	63.1
Fomesafen+imazamox+ bentazon+MSO+UAN	POST	0.095+0.016+ 0.188+1%+2pt	x	95	83	8.4	64.1
Fomesafen+imazamox+ bentazon+MSO+UAN	POST	0.143+0.016+ 0.188+1%+2pt	x	95	90	6.9	64.3
LSD (0.05)			5	5	6	10.1	NS

[1]MSO=Destiny, a methylated seed oil from Agriliance, St. Paul, MN; Pendimethalin=ProwlH_20, BASF; UAN=urea ammonium nitrate; NIS=Preference, a nonionic surfactant from Agriliance. The trial was treated on May 6 with a PRE burn-down application of glyphosate at 0.75 lb ae/A plus ammonium sulfate at 1% v/v.

[2]Fall=October 25, 2004; PRE=April 30, 2005; EPOST=May 23; POST=June 6.

Table 3. Weed control with soil- and POST-applied herbicides in no-till field pea, Carrington, 2005.

Treatment[1]	Application timing[2]	Rate	7/2 Fox-tail spp.[3]	7/2 Common lambs-quarters	7/2 Pig-weed spp.[3]	7/2 Wild buck-wheat	8/4 Fox-tail spp.	8/4 Common lambs-quarters	8/4 Pig-weed spp.	8/4 Wild buck-wheat
		lb ai/A	% control							
Untreated	x	x	0	0	0	0	0	0	0	0
Sulfentrazone/Bentazon+ sethoxydim+MSO+UAN	Fall/POST	0.188/0.5+ 0.1+1%+2pt	80	98	96	86	89	98	98	91
Sulfentrazone/Sulfentrazone/ Bentazon+sethoxydim+MSO+ UAN	Fall/PRE/ POST	0.094/0.094/ 0.5+ 0.1+1%+ 2pt	82	99	80	74	93	99	88	70
Sulfentrazone/Bentazon+ sethoxydim+MSO+UAN	PRE/POST	0.188/0.5+ 0.1+1%+2pt	76	99	98	92	84	99	99	90
Sulfentrazone+imazethapyr	PRE	0.188+0.031	80	99	99	89	91	99	99	99
Sulfentrazone+metribuzin/ Bentazon+sethoxydim+MSO+ UAN	PRE/POST	0.094+0.25/ 0.5+0.1+1%+ 2pt	70	97	96	69	86	99	98	80
Imazethapyr+pendimethalin	PRE	0.031+1.5	96	96	99	91	99	99	99	99
Imazethapyr/Bentazon+ sethoxydim+MSO+UAN	PRE/POST	0.031/1.0+ 0.2+1%+2pt	72	90	99	77	83	90	99	89
Imazethapyr/Bentazon+ sethoxydim+MSO+UAN	PRE/POST	0.031/0.5+ 0.1+1%+2pt	73	93	98	83	82	97	99	99
Pendimethalin/Imazamox+ bentazon+MSO+UAN	PRE/POST	1.5/0.031+0.188+1% +2pt	98	99	99	78	98	99	99	88
Pendimethalin/Imazamox+ bentazon+MSO+UAN	PRE/POST	1.5/0.016+0.188+1% +2pt	97	95	99	69	98	96	99	70
Carfentrazone/Bentazon+ sethoxydim+MSO+UAN	PRE/POST	0.008/1.0+ 0.2+1%+2pt	67	57	58	63	77	67	73	70
Thifensulfuron+tribenuron+ NIS/Bentazon+ sethoxydim+MSO+UAN	PRE/POST	0.0075+0.0019+ 0.25%/1.0+ 0.2+1%+2pt	67	71	70	61	74	70	72	67
Imazamox+bentazon+NIS +UAN	POST	0.031+0.188+1% +2pt	78	75	99	62	84	73	99	73
Imazamox+bentazon+MSO +UAN	POST	0.016+0.188+1% +2pt	81	81	98	63	86	86	96	75
Imazamox+bentazon+ sethoxydim+MSO+UAN	POST	0.031+1.0+ 02+1%+2pt	70	94	99	65	78	97	99	78
Bentazon+sethoxydim+MSO+ UAN	POST	1.0+0.2+1%+ 2pt	71	77	68	69	82	75	68	73
Bentazon+sethoxydim+MSO+ UAN/Bentazon+sethoxydim+ MSO+ UAN	EPOST/ POST	0.5+0.1+1%+2pt/ 0.5+0.1+1%+2pt	72	96	73	47	80	98	72	57
Fomesafen+imazamox+ bentazon+MSO+UAN	POST	0.095+0.016+ 0.188+1%+2pt	65	88	98	64	0	65	65	65
Fomesafen+imazamox+ bentazon+MSO+UAN	POST	0.143+0.016+ 0.188+1%+2pt	66	89	95	81	13	65	65	65
LSD (0.05)			8	11	9	18	13	6	6	15

[1]MSO=Destiny, a methylated seed oil from Agriliance, St. Paul, MN; Pendimethalin=ProwlH_20, BASF; UAN=urea ammonium nitrate; NIS=Preference, a nonionic surfactant from Agriliance. The trial was treated on May 6 with a PRE burn-down application of glyphosate at 0.75 lb ae/A plus ammonium sulfate at 1% v/v.

[2]Fall=October 25, 2004; PRE=April 30, 2005; EPOST=May 23; POST=June 6.

[3]Foxtail spp.=Yellow and green; Pigweed spp.=Redroot and prostrate.

Evaluation of Potential Desiccants on Field Pea at Hettinger

Eric Eriksmoen

Non-replicated strips of 'CDC Mozart' yellow field peas were treated with 4 different chemicals on July 19. Peas were at physiologic maturity and had a seed moisture content of 34%. Treatments were applied with a tractor mounted CO^2 propelled plot sprayer delivering 20 gpa at 40 psi to 5 foot wide by 20 foot long plots. Seed was harvest from each strip and evaluated for moisture content on July 29.

	Treatment	Product Rate	Seed Moisture
		oz/A	%
1	Untreated		16.1
2	Roundup Ultra Max + AMS	17 + 1%	15.6
3	Gramoxone Max + NIS	16 + 0.25%	14.9
4	ET + NIS	1 + 0.25%	16.4
5	Aim + NIS	1 + 0.25%	16.1

Summary

Roundup Ultra Max, ET and Aim herbicides do not appear to be good crop desiccants. ET and Aim herbicides should be investigated as potential pre-harvest burndown products.

Mesotrione Use in Flax. Kirk Howatt, Ronald Roach, and Janet Harrington. 'ND009' Flax was seeded May 3 and PRE treatments were applied with air temperature at 48° F, 10% RH, 8 to 9 mph wind at 315°, and dry soil at 35° F. Post treatments were applied to 4- to 6-inch flax, 1- to 2-inch hairy nightshade, and four- to six-leaf yellow foxtail on June 17 with air temperature at 79° F, 36% RH, 5% cloud cover, 12 mph wind at 135°, and dry soil at 77° F. All 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 plots. The experiment was a randomized complete block design with four replicates. PRE and post treatments were established in separate study areas because of excessive rainfall. Soil type for PRE treatments was silty clay with 7.5 pH and OM of 5%. Study coordinates were N 46.93307, W 096.85848. Soil type for POST treatments was loam with 6.4 pH and OM of 3.6%. Study coordinates were N 47.00213, W 097.12300.

Treatment	Rate	Stg	6/22 Flax	7/01 Flax	7/01 Rrpw	7/01 Hans	7/01 Yeft
	oz ai/A				%		
Sulfentrazone	4	PRE	0	-	-	-	-
Mesotrione	1.5	PRE	0	-	-	-	-
Mesotrione	3	PRE	0	-	-	-	-
Mesotrione+NIS	1.5+0.25%	Post	37	60	97	98	59
Mesotrione+brox+NIS	1.5+4+0.25%	Post	66	74	96	97	76
Mesotrione+PO	1.5+1%	Post	47	70	98	98	62
Mesotrione+brox+PO	1.5+4+1%	Post	67	87	98	97	72
Mesotrione+PO+UAN	1.5+1%+2.5%	Post	59	76	98	98	83
Mesotrione+brox+PO+UAN	1.5+4+1%+2.5%	Post	77	92	98	98	91
Brox&MCPA5+thif-sg	6+0.06	Post	9	32	96	97	0
Untreated	0	Post	0	0	0	0	0
CV			12	11	1	1	9
LSD (P=0.05)			6	10	2	1	7

PRE application of sulfentrazone or mesotrione did not cause symptom expression different than the untreated flax. Moist soil conditions caused flax stress before the post treatments were applied. Moisture stress may have influenced flax response to herbicides because injury ratings were greater than recorded in past year's experiments. Mesotrione applied with PO caused more injury than mesotrione with NIS by 10 to 13 percentage points but did not improve yellow foxtail control. Mesotrione provided at least 96% control of redroot pigweed and hairy nightshade. The addition of UAN increased yellow foxtail control to 83% and mesotrione plus bromoxynil with PO and UAN provided 91% control of yellow foxtail, but flax also expressed more injury at 92% on July 1. Minimum injury with post mesotrione on this date was 60%.

Evaluation of Everest Herbicide on Flax at Hettinger

Eric Eriksmoen

Pre-plant (PP) treatments were applied on April 20. 'Verne' flax was seeded on May 3. Pre-emergence (PRE) treatments were applied on May 10. Post emergence (POST) treatments were applied on June 3 to 2 inch tall flax. Treatments were applied with a tractor mounted CO^2 propelled plot sprayer delivering 10 gpa at 30 psi to 5 foot wide by 20 foot long plots. The trial was a randomized complete block design with four replications. The trial was sprayed with 24 oz/acre Roundup Ultra Max on May 10 to control weeds. Soil pH was 6.6 and soil organic matter was 3.1%. Plots were evaluated for crop injury on June 2, June 9, June 17 and on July 22. The trial was not harvested.

	Treatment	Application Timing	Product Rate	Crop Injury			
				June 2	June 9	June 17	July 22
		*	oz/A	%	%	%	%
1	Untreated			0	0	0	0
2	Everest	PP	0.3	68	58	60	35
3	Everest	PP	0.6	82	78	70	38
4	Everest	PRE	0.3	35	32	35	4
5	Everest	PRE	0.6	28	26	34	5
6	Everest + NIS	POST	0.3 + 0.25%	--	50	60	68
7	Everest + NIS	POST	0.6 + 0.25%	--	60	65	85
C.V. %				25.3	31.5	41.9	39.6
LSD .05				17	20	29	20

* Application Timing: Pre-plant (PP) = April 20, Pre-emergence (PRE) = May 10, Post emergence (POST) = June 3.

Summary

Everest Herbicide appears to be detrimental to flax. Relatively high levels of crop injury were observed on pre-plant and post emergence applications, and lower but unacceptable levels with the pre-emergence treatments. On the pre-plant treatments, Everest may have leached into the seed/root zone prior to seeding and then taken up by the germinating seedling (root uptake). On the post emergence application, Everest was applied directly to the crop vegetation (foliar uptake). On the pre-emergence treatments, root uptake also occurred but at a slower rate due to a lack of springtime precipitation.

Grass control with V10137. Kirk Howatt, Ronald Roach, and Janet Harrington. 'ND009' Flax was seeded May 3. Treatments were applied to 2- to 3-inch flax and two- to four-leaf yellow foxtail on June 3 with air temperature of 69° F, 74% RH, 100% cloud cover, 6 to 8 mph wind at 180°, and damp soil at 61°F. 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 plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/22 Flax	6/22 Yeft	7/01 Yeft	7/15 Yeft
	oz ai/A		%		
V10137+NIS	1.125+0.25%	0	42	94	96
V10137+NIS	0.75+0.25%	0	55	91	93
V10137+brox&MCPA5+NIS	1.125+7.2+0.25%	0	69	91	91
V10137+brox&MCPA5+NIS	0.75+7.2+0.25%	0	76	93	95
V10137+brox&MCPA5	1.125+7.2	0	61	90	92
Untreated	0	0	0	0	0
CV		0	8	4	5
LSD (P=0.05)		0	6	4	6

V10137 did not cause visible injury to flax. The addition of brox&MCPA5 did not result in injury expression. More importantly, V10137 control of yellow foxtail was similar in July whether adjuvant was included or not included. V10137 control of yellow foxtail was greater in June if the EC herbicide brox&MCPA5 or NIS was included. Greater efficacy indicated more rapid expression of symptoms but overall control was not influenced by treatment components.

Volunteer canola control in flax. Jenks, Markle, and Willoughby. 'Neche' flax was seeded May 17 at 60 lb/A into 6-inch rows. Canola was then seeded over the top to simulate a volunteer canola (VC) situation. Herbicide treatments were applied preemergence (PRE) on May 19 with a bicycle sprayer delivering 20 gpa at 30 psi through XR 80015 nozzles. Air and soil temperatures were 83 and 72 F, respectively, and relative humidity was 29%. Postemergence treatments were applied to 3-leaf canola May 19 with a bicycle sprayer delivering 10 gpa at 40 psi through XR 8001 nozzles. Air and soil temperatures were 74 and 62 F, respectively, and relative humidity was 68%. Treatments to 6-leaf canola were applied June 23 with a bicycle sprayer delivering 10 gpa at 40 psi through XR 8001 nozzles. Air and soil temperatures were 80 and 75 F, respectively, relative humidity was 74%. Individual plots were 10 by 30 ft and replicated three times.

Spartan provided poor to fair VC control. Bronate Advanced provided excellent control when applied at the 3-leaf stage, but about 20% less control at the 6-leaf stage. MCPA ester provided 66-82% VC control, which is much less than in 2004 (85-95%). Harmony GT applied at 0.25 oz without an adjuvant provided poor VC control. These results are generally similar to 2004, with the exception of MCPA ester as noted above.

Table. Volunteer canola control in flax.

			Volunteer canola	
Treatment	Rate	Timing	Jun 30	Jul 14
			% control	
Spartan	4 oz	PRE	74	63
Bronate Advanced	0.8 pt	3-leaf	100	100
Bronate Advanced	0.8 pt	6-leaf	85	81
MCPA ester	0.5 pt	3-leaf	70	66
MCPA ester	0.5 pt	6-leaf	55	82
Harmony GT	0.25 oz	3-leaf	81	48
Harmony GT	0.25 oz	6-leaf	70	55
Untreated			0	0
LSD (0.05)			5	8
CV			5	7

Flax Weed Control (Gregoire, 2005) Flax was sprayed at 7:00 p.m. June 6th and 6:30 pm, June 16th near Webster, North Dakota. The temperature during application June 6th was 72°, relative humidity near 42% and clear skies. The flax was 2-3" tall. Wild mustard, redroot pigweed, kochia and other broadleaf weeds were in the 4 leaf stage. Conditions June 16th were 70°, relative humidity 55%. The flax was 8-10" tall. Weeds were 6-8 leaf. Treatments were applied with a CO_2 pressurized back pack sprayer using 8.5 gpa at 40 psi and 8001 nozzles. Treatments were arranged in RCBD and replicated 3 times. Treatments were evaluated July 27th for weed control. Visual Flax injury was slight for either application time.

Treatment Name	Application Timing	Oz/Product Per Acre	General Broadleaf	Redroot Pigweed	Yield	Comments Species Weed Escapes
			----------percent control--------			
1 Select	2 inches	5 oz/A	67	100	23.5	Wild Buckwheat
Bronate Advanced	2 inches	11.4 oz/A				Kochia
poil		1 % v/v				
2 Select	8 inches	5 oz/a	90	33	17.0	Redroot Pigweed
Bronate Advanced	8 inches	11.4 oz/A				
poil		1 % v/v				
3 Select	8 inches	5 oz/A	90	100	19.6	
Bronate Advanced	8 inches	11.4 oz/A				
poil		1 % v/v				
Harmony GT		0.08 oz/A				
4 Select@6	2 inches	5 oz/A	88	83	21.0	Redroot Pigweed
Bronate Advanced/						
Bronate Advanced	2/8 inches	5.7 oz/A				
poil@6		1 % v/v				
5 Select	8 inches	5 oz/A	93	77	20.6	Redroot Pigweed
poil		1% v/v				
Curtail M	8 inches	24 oz/A				
Buctril	8 inches	16 oz/A				
6 Select	8 inches	5 oz/A	84	100	15.6	Kochia
poil		1% v/v				Wild Buckwheat
Curtail M	8 inches	24 oz/A				
Harmony GT	8 inches	0.08 oz/A				
7 Buctril	8 inches	16 oz/A	40	0	18.2	Wild Buckwheat
Curtail M	8 inches	24 oz/A				Redroot Pigweed
Select	8 inches	5 oz/A				Kochia
Poil		1% v/v				
8 Buctril	2 inches	20 oz/A	85	52	17.0	Redroot Pigweed
MCPA LVE	2 inches	4 oz/A				
Select	2 inches	5 oz/A				
poil		1% v/v				
9 Buctril	8 inches	20 oz/A	53	0	17.9	Redroot Pigweed
MCPA LVE	8 inches	4 oz/A				Wild Buckwheat
Select	8 inches	5 oz/A				
poil		1% v/v				
LSD (P=.05)			33	49	6.9	
CV			24	47	20	

Bromoxynil treatments applied to 2" tall flax were significantly better for Redroot Pigweed control than 6" applications. Harmony GT combinations had 100% Redroot Pigweed control but when applied with Curtail M had significantly lower yield than Bronate Advanced applied to 2" tall flax. Buctril applied to 6" tall flax in combination with either Curtail M or MCPA resulted in poor weed control.

Broadleaf Control in Flax – Langdon 2005 (Lukach)

Nekoma Flax was planted May 16. Sparten was applied May 19 and hard rain, 0.96" on May 21 caused crusting and reduced stand. Treatments were applied to 3 inch flax on June 17 between 1 and 2pm. Conditions were 76F, 52RH, 13mph SE wind with clear sky but soggy soil. A general application of Select 5oz/a+NIS was made on June 25. Applications to 10 inch flax were made on July 2 between 4 and 5pm. Conditions were 82F, 62RH, 8mph S wind with cloudy sky. It had rained the night before and again that night. Application was made with a tractor mounted CO2 sprayer, with wind shield on, using 8001 tips to apply 8.5 gal/a solution at 40 psi.

Broadleaf weed control in flax, Langdon			21-Jun		13-Jul		Brown								Height		
Treatment	Rate	Stage	inju	Chlor	Chlor	Bloom	Bolls	Rrpw	Wimu	Wibw	Kocz	Coma	Prle	Colq	7/13	9/14	Yield
			%												- cm -		bu/a
Sparten/Bronate Advanced	2 / 12	PE/3	0	0	0	8	90	72	78	73	100	80	98	100	47	58	18
Sparten/Bronate Advanced	4 / 12	PE/3	0	0	0	7	96	92	85	94	100	100	100	100	44	61	25
Sparten	4	PE	0	0	0	17	99	80	43	77	100	95	100	83	52	57	7
Sparten	8	PE	0	2	0	20	99	95	25	93	100	100	100	100	53	63	6
Bronate Advanced	9.6	3 "	2	0	0	12	98	50	88	77	98	93	95	86	50	59	15
Bronate Advanced	11.4	3 "	1	0	0	12	99	80	81	86	100	95	100	93	51	58	22
Bronate Advanced	17.1	3 "	2	1	0	10	95	83	93	100	100	93	100	100	50	60	20
BroAd+HarmonyGT	9.6 + ½	3 "	13	18	0	2	85	81	67	73	100	95	73	67	44	60	18
BroAd+HarmonyGT	9.6 + 1/5	3 "	7	5	0	1	82	85	92	85	100	95	100	73	39	58	23
BroAd+HarmonyGT	9.6 + 1/10	3 "	2	10	0	7	95	90	95	90	98	80	95	87	50	58	22
BroAd+HarmonyGT	9.6 + 1/20	3 "	4	4	0	2	93	82	92	83	95	93	98	98	48	62	20
BroAd+Buctril+HarGT+PO+Select	9.6+9.6+1/20+1qt+4	3 "	4	11	0	4	63	92	88	96	98	99	98	80	37	57	22
BroAd+Buctril+HarGT	9.6+9.6+ 1/20	3 "	4	3	0	2	83	92	92	80	90	98	100	88	38	62	21
CurtailM	16	3 "	4	2	0	10	80	37	96	90	98	95	98	98	48	61	20
CurtailM	28	3 "	20	1	0	5	62	37	92	97	100	100	98	97	43	60	16
CurtailM	21.3	3 "	7	2	0	4	90	70	80	88	85	90	98	98	46	59	20
CurM+ HarGT	16 + 1/20	3 "	2	13	0	2	95	83	92	85	100	97	100	97	40	62	22
CurM+ HarGT	16 + 1/10	3 "	7	2	0	6	91	87	75	67	80	93	90	95	45	59	22
CurM+ HarGT	21.3 + 1/20	3 "	7	2	0	4	82	92	82	90	88	90	100	98	44	63	22
CurM+ HarGT	21.3 + 1/10	3 "	25	4	0	1	52	92	85	78	95	100	93	88	38	61	21
CurM+ HarGT+ PO+Select	16 +1/10+1qt/a+4	3 "	23	8	0	4	85	63	78	76	93	95	85	67	44	61	19
CurM+ HarGT+ PO+Select	21.3+1/10+1qt/a+4	3 "	50	11	0	2	57	81	92	90	100	90	100	83	39	60	14
CurM+ HarGT+ PO+Select	21.3+1/20+1qt/a+4	3 "	8	8	0	2	70	67	86	90	95	85	100	97	44	63	22
Clarity+MCPAe	2 + 8	3 "	3	3	0	1	63	78	78	47	100	73	85	100	35	57	22
BroAd+HarmonyGT	9.6 + ½	10 "	0	3	3	0	57	99	100	93	98	100	94	98	39	59	23
BroAd+HarmonyGT	9.6 + 1/5	10 "	0	2	4	0	93	100	98	95	95	88	93	90	42	56	22
BroAd+HarmonyGT	9.6 + 1/10	10 "	0	1	5	0	90	98	96	92	96	100	95	87	41	56	21
BroAd+HarmonyGT	9.6 + 1/20	10 "	0	1	0	0	92	99	95	92	93	90	100	92	37	59	21
Bronate Advanced	9.6	10 "	0	0	0	8	99	47	98	93	100	93	98	98	49	56	17
BroAd+Buctril+HarGT+PO+Select	9.6+9.6+1/20+1qt+4	10 "	5	11	0	1	83	82	90	88	100	95	100	80	39	62	21
BroAd+Buctril+HarGT	9.6+9.6+ 1/20	10 "	0	2	0	3	91	80	83	78	100	98	100	83	49	61	17
CurM+ HarGT	21.3 + 1/20	10 "	0	5	0	0	70	100	98	78	95	98	98	99	45	57	19
CurM+ HarGT+ PO+Select	16 + 1/20 +1qt/a+4	10 "	3	3	0	0	75	100	100	78	75	85	98	100	42	57	21
BroAd / BroAd	9.6 / 9.6	3/10	3	1	0	8	87	82	96	96	100	95	98	99	44	60	21
BroAd+Buctril+HarGT+PO+Select	9.6+9.6+1/20+1qt+4	3/10	40	4	0	0	5	99	98	97	100	100	100	98	22	64	22
Untreated	0		0	0	0	17	99	0	0	0	0	0	0	0	54	62	2
	C.V. %		111	132	439	92	17	18	14	17	8	10	9	15	10	6	25
	LSD 5%		14	8	NS	8	22	23	19	22	16	18	17	21	7	NS	8
	# OF REPS		3	3	3	3	3	3	3	3	2	2	2	3	3	3	3

WILLISTON RESEARCH EXTENSION CENTER - 2005

Flax response to thifensulfuron, Williston 2005. 'Carter' flax was planted on recrop (land cropped to durum wheat in 2004) in 6 inch rows at 40 lbs/a on May 26. The early treatments were applied on June 24 to 3-4 inch flax and 1-2 inch tall populations of Russian thistle, common lambsquarters and redroot pigweed with 52 degrees F, 68% RH, 85% clear sky and 2-4 mph WNW wind and moist plants and dry topsoil at 50 F. Later 6 inch treatments were applied on July 1 to 8-12 inch flax and to 3-5 inch weed species named above, with 60 F, 70% RH, 95% clear sky and 2-4 mph SSW wind and dry plants and dry topsoil at 59 F. We used a small plot sprayer with wind cones, mounted on a G-Allis Chalmers tractor to apply the treatments, delivering 8.6 gals/a at 30 psi through 8001vs flat fan nozzles to a 6.67 ft wide area the length of 10 by 25 ft plots. First rain received after the early application was 0.57 inches on June 25. First rain received after the later application was 0.55 inches on July 7 The experiment was a randomized complete block design with four replications. Select at 8 oz/a product was applied to the whole plot area to control grassy weeds. Plots were evaluated for crop injury on July 13 by visually rating plant stunting and also for broadleaf weed control on that date. Flax was machine harvested for yield on September 16.

Treatment a	Rate oz/a	Stage in.	Crop Inj* Stunt 7/13 -- %	Branch 8/17 ---	----Weed Cntrl--- Rrpw -------%--------	Colq	Ruth	Test Weight lbs/bu	Seed Yield bus/a
Brox&MCPA5+Thif-sg	6+0.22	3	16	50	99	99	99	51.8	5.5
Brox&MCPA5+Thif-sg	6+0.11	3	13	75	99	99	99	53.3	5.1
Brox&MCPA5+Thif-sg	6+0.06	3	8	10	99	99	99	53.3	5.4
Brox&MCPA5+Thif-sg	6+0.03	3	9	25	96	99	99	53.1	5.7
Brox&MCPA5	6	3	5	0	79	99	99	54.2	6.8
Brox&MCPA5+Thif-sg	6+0.22	6	35	50	95	99	99	51.7	3.4
Brox&MCPA5+Thif-sg	6+0.11	6	21	20	90	99	98	51.3	3.9
Brox&MCPA5+Thif-sg	6+0.06	6	18	15	87	99	97	51.2	4.7
Brox&MCPA5+Thif-sg	6+0.03	6	15	30	88	99	95	50.8	3.3
Brox&MCPA5	6	6	8	30	73	99	91	53.7	5.0
Untreated	0	0	0	0	0	0	0	54.2	6.5
EXP MEAN			13	28	82	90	89	52.6	5.0
C.V. %			39		7	0	3	1.3	45.5
LSD 5%			7		8	NS	4	1.6	NS

* - Crop injury as measured by Stunting or plant height reduction.
Crop injury as measured by reduced stem branching.

Summary: Flax injury occurred as plant height and stem branching reduction. Flax yields were low because of late planting date but applying thifensulfuron at the 8-12 inch growth stage of flax resulted in an even greater yield reductions of 40-50% compared to the untreated check.

Lentil tolerance to preemergence herbicides. Jenks, Markle, and Willoughby. 'Pennell' lentils were seeded May 2 at 60 lb/A into 7.5-inch rows. Herbicide treatments were applied preemergence (PRE) on May 6 with a bicycle sprayer delivering 10 gpa at 40 psi through XR 8001 nozzles. Air and soil temperatures were 64 and 53 F, respectively, and relative humidity was 19%. Individual plots were 10 x 30 ft and replicated three times.

The objective of this study was to evaluate lentil tolerance to preemergence herbicides. Sencor is the only herbicide tested in this study that is approved as of November 2005. None of the herbicides caused a reduction in lentil density approximately 6 weeks after treatment (WAT) compared to the untreated check. However, all herbicides caused slight to moderate visible injury at the June evaluation. Spartan and 2,4-DB applied PRE caused what would probably be considered unacceptable crop injury compared to other treatments at the July evaluation.

Table. Lentil tolerance to preemergence herbicides.

			Lentil		Density	Yield	Test Wt
Treatment[a]	Rate	Timing	Jun 17	Jul 7	Jun 23	Sep 9	Sep 9
			—— % injury ——		plants/m[b]	lb/A	lb/bu
Untreated			0	0	17.1	669	56.3
Express	0.083 oz	PRE	17	7	17.5	754	53.8
Express	0.125 oz	PRE	14	6	18.1	854	55.8
Harmony GT	0.083 oz	PRE	11	7	15.9	983	56.5
Harmony GT	0.125 oz	PRE	20	9	15.5	733	55.4
Sencor	0.25 lb	PRE	19	10	15.3	923	56.8
Prowl H2O	3 pt	PRE	8	4	15.0	573	55.1
Spartan	0.5 oz	PRE	19	16	15.7	647	56.6
2,4-DB	0.7 pt	PRE	25	13	16.0	611	55.5
Roundup UltraMax II	11 fl oz	PRE	0	0	15.0	636	55.5
LSD (0.05)			9	7	NS	259	NS
CV			38	56	10.3	20	3.0

[a]*Roundup UltraMax II + AMS (11 fl oz + 2.5 gal/100 gal) was applied alone or tankmixed with each treatment.*
[b]*Crop density is reported in plants per meter of row.*

No-till lentil tolerance to fall- and spring-applied Sonalan. Jenks, Markle, Willoughby. Individual plots were 15 by 30 ft and replicated three times. Herbicide treatments were applied with a granular spreader on November 9, 2004, and incorporated by one pass with a heavy harrow. Spring treatments were applied April 21, 2005 with either a tractor mounted CO_2-pressurized sprayer delivering 20 gpa through XR 80015 nozzles, or with a granular spreader. Air and soil temperatures were 56 and 48 F, respectively, relative humidity was 33%. Selected treatments were incorporated by one pass with a heavy harrow. The non-incorporated treatments were on the north end of the field and the incorporated treatments were on the south end to allow us to use a field-size heavy harrow for herbicide incorporation. 'Pennell' lentils were seeded May 2 at 60 lb/A into 7.5-inch rows. Data was collected on crop injury, crop density, and weed control (redroot pigweed=Rrpw, wild buckwheat=Wibw, Kochia=Kocz).

Most treatments caused only slight crop injury. Pendimax caused about 16% injury, while Sonalan at 10 lb caused as much as 14% injury. There were no differences in crop density between treatments. None of the treatments provided good control of all weeds. However, it should be noted that there were very dry conditions at application time in the fall and spring, which may have hindered herbicide incorporation. It should also be noted that even though this study was established in barley stubble, the field had not been in no-till in previous years. Fields that have been in no-till for several years will have weed seed primarily on or just below the soil surface, which is where the Sonalan should be for maximum activity. Lentil yield tended to be higher where Sonalan was not incorporated; however, we believe this is due to where the plots were located in the field and not necessarily due to crop injury. Below is a news release we distributed in fall 2005 to provide recommendations for Sonalan use in lentil. Note that Sonalan is now labeled for use in the fall only.

Table. No-till lentil tolerance to fall- and spring-applied Sonalan.

			Lentil			Rrpw		Wibw		Kocz	Yield	TW
Treatment[a]	Rate	Timing	Jun 18	Jul 7	Jun 24	Jun 18	Aug 25	Jun 18	Aug 25	Aug 25	Sep 9	Sep 9
			— % injury —		pl/m[b]	——— % control ———					lb/A	lb/bu
Not incorporated												
Untreated			0	0	18.2	0	0	0	0	0	850	55.5
Assure II	8 fl oz	POST	0	0	15.9	0	0	0	0	0	720	55.7
Sonalan	7.5 lb	Fall	4	2	18.2	43	77	52	53	72	1170	56.7
Sonalan	10 lb	Fall	7	3	15.0	40	80	40	48	77	1180	58.3
Sonalan	7.5 lb	11 DPP	9	7	16.4	66	75	72	62	75	1510	58.6
Sonalan	10 lb	11 DPP	14	14	18.1	88	86	94	85	72	1480	58.6
Pendimax	3 pt	11 DPP	16	16	15.5	77	78	90	83	77	1290	57.9
Sonalan	2 pt	11 DPP	0	0	17.6	3	53	13	27	37	960	57.8
Sonalan	2.5 pt	11 DPP	3	0	17.2	40	50	35	30	53	1120	55.7
Incorporated (Harrow)												
Sonalan	7.5 lb	Fall	8	7	18.0	69	68	100	67	73	910	54.7
Sonalan	10 lb	Fall	11	9	17.1	79	84	90	87	78	1150	57.3
Sonalan	7.5 lb	11 DPP	7	5	17.3	83	76	91	85	83	990	57.0
Sonalan	10 lb	11 DPP	11	11	15.9	91	79	94	92	79	1120	57.6
Sonalan	2 pt	11 DPP	4	2	18.3	48	47	57	67	43	850	55.6
Sonalan	2.5 pt	11 DPP	8	7	17.0	80	70	66	70	63	880	56.4
Untreated			0	0	18.8	0	0	0	0	0	880	56.7
LSD (0.05)			5	3	NS	23	17	35	29	14	380	NS
CV			44	0.9	9.5	27	18	38	33	15	21	3.9

[a]*Assure II + COC (8 fl oz + 1%) was applied postemergence to control grass weeds.*
[b]*Crop density is reported in plants per meter of row.*

LENTIL TOLERANCE TO SPARTAN AT TWO SEEDING RATES OF LENTIL

Lentil tolerance to Spartan at two seeding rates. Williston 2005. (Riveland and Jenks). The objective of this study is to determine if a higher seeding rate of lentil can overcome stand losses caused by Spartan when that herbicide is used PE on lentil.'AC Richlea' lentil were planted notill on May 17 into land cropped to durum wheat in 2004, using plot cone seeder with 6 inch rows at two seeding rates - 12 plts/ft2 and a higher 18 plts/ft2 . All treatments were applied on May 19 to a damp soil surface with 72 F, 36% RH, 95% clear sky and 3-7 mph ESE wind with topsoil at 67 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 25 ft plots. Glyphosate was applied to the whole plot area on May 19 to control emerged weeds. No lentil emergence. First rain received after PE applications was 0.20 on May 20. The experiment was a split plot in a randomized complete block design with four replications. Plots were evaluated for crop injury and weed control on July 27. Gyphosate drift from an application to the rest of the field in June caused abandonment of rep 4.Weed density was light to moderate. Lentil were machine harvested on August 8.

Treatment	Rate	Seed Rate	Plant Density	Crop Inj.	-Control- Ruth	prlt	Test Weight	Grain Yield
	oz ai/a	plts/ft2	plts/ft2	%	----%----		lbs/b	lbs/a
Spartan 75DF	1.0	12	7.0	20	99	94	58.6	816
Spartan 75DF	1.0	18	12.9	8	99	93	59.0	1117
Spartan 75DF	1.5	12	6.3	22	99	93	58.3	742
Spartan 75DF	1.5	18	12.1	8	99	93	58.7	993
Spartan 75DF	2.0	12	7.5	20	96	89	57.7	568
Spartan 75DF	2.0	18	9.9	12	99	96	58.5	927
Prowl H2O	2pt	12	8.0	8	99	99	58.6	1052
Prowl H2O	2pt	18	12.5	8	99	99	59.1	1238
Hand-Weeded	0	12	7.8	18	100	100	58.6	945
Hand-Weeded	0	18	11.9	8	100	100	58.8	1136
EXP MEAN			9.6	13	99	96	58.6	953
C.V. %			18.3	54	2	6	.5	17
LSD 5%			2.5	NS	NS	NS	.6	271

Summary: Seeding higher rates of lentil tended to increase yields and reduce the effect of Spartan stand reductions. Yield reductions were the highest when lentil was seeded at the recommended seeding rate of 12 seeds/ft2.

BROADLEAF WEED CONTROL IN LENTIL

Broadleaf weed control in lentil, Williston 2005. (Riveland and Jenks) 'Ac Richlea' lentil were planted notill on May 5 into land cropped to hrs wheat in 2004 using 7 inch rows at 60 lbs/a on May 17. All PE treatments were applied on May 14 to a dry soil surface with 54 F, 26% RH, 95% clear sky and 1-3 mph NNW wind with topsoil at 48 F. 2,4-DB treatments were applied late on June 24 to 8-10 inch lentil in bud stage and 3-4 inch redroot pigweed and kochia with 52 degree F, 68% RH, 90% clear Wind W 3-6 mph anddry plant and soil surfaces. 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 25 ft plots. Glyphosate was applied to the whole plot area on May 14 to control emerged weeds. No lentil emergence. First rain received after PE applications was 0.50 on May 18 and first rain event after 2,4-DB treatments was 0.57 inches on June 25. The experiment was a randomized complete block design with four replications. Plots were evaluated for crop injury and weed control on July 27. Weed density was light to moderate. Lentil were machine harvested on August 8.

Treatment	Rate oz ai/a	Plant Density plts/ft2	Crop Inj. %	-Control- Rrpw %	KOCZ %	Test Weight lbs/b	Grain Yield lbs/a
Spartan	1.5	6.6	30	85	90	61.3	1416
Spartan+Sencor	1.5+0.167	7.7	43	83	92	61.3	1457
Prowl H2O	2	8.0	3	82	55	61.1	1951
Spartan+Prowl H2O	1.5+2	7.0	38	92	82	61.1	1543
Prowl H2O+Sencor	2+0.167	7.8	25	90	77	61.3	1709
Prowl H2O+Express+NIS	2+0.083+0.25	8.0	15	83	57	61.2	1635
Prowl H2O+Express+NIS	2+0.125+0.25	8.3	23	85	70	61.2	1760
Prowl H2O+2,4-DB	2+0.7	7.4	7	73	20	61.3	1712
Prowl H2O+2,4-DB	2+1.4	7.3	18	73	40	61.3	1607
Untreated	0	7.5	0	0	0	61.4	1685
EXP MEAN		7.6	20	75	58	61.3	1648
C.V. %		16.8	68	12	38	.5	12
LSD 5%		NS	24	15	38	NS	NS

Summary: Spartan caused significant crop injury. Prowl alone did not. 2,4-DB tended to injure lentil at the highest rate of application but didn't seem to adequately control weeds.

Preemergence weed control in onion, Carrington. Schumacher, Carrie, Harlene Hatterman-Valenit, Collin Auwarter and Paul Hendrickson. Field research was conducted at the Carrington Research Center Carrington, ND, to compare early season weed control and crop injury with bromoxynil, DCPA, dimethenamid-P and pendimethalin (aqueous capsule formulation) in onion (*Allium cepa* L.). The soil was a Heimdal-Emerick/Fram-Wyard loam with 2.9 % organic matter and 7.9 pH, with soybean as the previous crop. Onion variety 'Teton' pelleted seed was planted on May 3 using a Stanhay four double-row planter unit, with 4-inch paired rows and 14-inches between main rows. Herbicides were applied at a low, medium and high rate starting with the middle labeled rate and increasing and decreasing the middle rate by half. Treatments were applied directly after planting, except bromoxynil which was applied as a delayed preemergence 10 days after planting. Herbicides were sprayed with a CO_2-pressurized backpack sprayer. Plots were 6 foot wide and 20 foot long and arranged in a randomized complete block design with four replicates. Best management practices were used for fertility, disease, insect and grass control. Treatments were evaluated for weed coverage and control, onion height and injury 1 and 3 weeks after application. On June 13, 28% liquid nitrogen was broadcast at a rate of 10 gpa over the entire trial. At the 5-leaf (July 1) stage, a standard application of bromoxynil and oxyfluorfen was made to all treatments, except checks. Rates were 0.375 lb ai/A and 0.125 lb ai/A, respectively. An application of pendimethalin at a rate of 0.62 lb ai/A was also made at the 5-leaf stage as a final late season weed control measure. A final weed control evaluation was made 20 weeks after treatment. On September 22, 10 feet 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, diseased and double bulbs were graded as culls regardless of diameter.

Herbicide application dates, timings and environmental conditions for Carrington, 2005.

Application Date:	5/3/2005	5/9/2005	7/1/2005	7/1/05
Onion Stage:	PRE	Delayed PRE	5 lf	5 lf
Air Temp., (F):	56	54	75	75
Wind Velocity, (MPH):	7.0	13.5	7.4	7.4
Soil Temp., (F):	46	54	67	67
Operating Pressure:	30 psi	30 psi	30 psi	30 psi
Nozzle Type:	XR	XR	XR	XR
Nozzle Size:	8003	8003	8006	8003
Spray Volume, GPA:	20	20	50	20

Results: Dimethenamid-P applied at the high rate reduced plant stand and plant height. Treatment height did vary, but at the end of the season differences in height were not significant. At the end of the season DCPA at the low rate and bromoxynil at any rate had the highest weed density. However, all the plots were virtually weed free throughout the growing season. Pendimethalin plus Glyphosate applied as a delayed preemergence (786.5 cwt/A), DCPA at 6.75 g ai/A (768.2 cwt/A), bromoxynil at 0.156 g ai/A (761.9 cwt/A) and dimethenamid–P at 0.28 g ai/A (758.4 cwt/A) highest total yield with greater than 750 cwt/A.

Effect of herbicide on onion stand, weed control, onion grade and yield.

Herbicide	Rate (lb ai/A)	Onion Stand[1]	% Weed Control[2]		Yield (cwt/A)[3]			
		12WAT	4WAT	20WAT	1-2 ¼ in	2 ¼-3 in	3 in or >	Total
Pendimethalin	0.475	14.6	90	80	11.3	212.1	361	621.6
Pendimethalin	0.95	13.9	96.3	93.8	10.3	122.7	553.1	738.5
Pendimethalin	1.9	14	97.5	97.5	10	102.8	592.6	736.4
Pendimethalin[4] + Glyphosate[4]	0.95 + 0.5	14.3	97.5	96.3	10.2	140.4	568.5	786.5
DCPA	3.38	14.6	85	75	14.8	139.2	432.6	627.7
DCPA	6.75	15.4	95	97.5	13.4	126.1	560.2	768.2
DCPA	13.5	14.5	100	97.5	14.5	134.3	561.1	736.9
Bromoxynil	0.156	14.6	86.3	95	6.6	68.5	623	761.9
Bromoxynil	0.312	13.6	87.5	87.5	10.3	132.5	442.6	616.8
Bromoxynil	0.625	13	87.5	92.5	3	111.4	567.2	719.9
Dimethenamid-P	0.28	14.5	75	95	10	110	588.7	758.4
Dimethenamid -P	0.56	14.4	88.8	98.8	8.1	129.5	544.5	736.3
Dimethenamid-P	1.13	10.9	98.7	98.8	12.5	141.6	391.1	558.1
Glyphosate[4], Pendimethalin[5]	0.5 + 0.95	13.2	88.8	93.8	10.2	107.3	453.3	613.1
Weedy check	-	13.4	0	0	66.3	49.2	6.58	122.1
Hand-weeded check	-	15.3	100	100	8.6	98	601	734.4
(LSD 0.05)		2	8.6	9.8	17.9	85.5	133.7	5.4

[1]Average onion stand of two 6 ft rows.
[2] Average control of common lambsquarters and redroot pigweed.
[3] Cull yield not shown because of a lack of significance.
[4] Applied as a delayed preemergence 10 days after planting.
[5] Applied as a delayed preemergence at the 1 leaf.

Preemergence weed control in onion, Oakes. Schumacher, Carrie, Harlene Hatterman-Valenti, Collin Auwarter and Richard Greenland. A study was conducted at the Oakes Irrigation Research site Oakes, ND, to compare early weed control and crop injury with bromoxynil, DCPA, dimethenamid-P and pendimethalin (aqueous capsule formulation) in onion (*Allium cepa* L.) The soil was a Madock sandy loam with 2.2 % organic matter and 7.4 pH, with potato as the previous crop. Onion variety 'Varsity' pelleted seed was planted on April 18 using a Monosem four double-row planter. Herbicides were applied at a low, medium and high rate starting with the middle labeled rate and increasing and decreasing the middle rate by half. Treatments were applied directly after planting, except bromoxynil which was applied as a delayed preemergence10 days after planting. Herbicides were sprayed with a CO_2-pressurized backpack sprayer. Plots were 6 foot wide and 17 foot long and arranged in a randomized complete block design with four replicates. Best management practices were used for fertility, disease, insect and grass control. Treatments were evaluated for weed coverage and control, onion height and injury 1 and 3 weeks after application. On June 18 and July 7, 28 % liquid nitrogen was broadcast at a rate of 18.5 gpa over the entire trial. At the 3-leaf stage (June16), a standard application of bromoxynil and oxyfluorfen was made to all treatments, except checks. Rates were 0.375 lb ai/A and 0.125 lb ai/A, respectively. An application of pendimethalin at a rate of 0.62 lb ai/A was made around the 5-6 leaf stage (July 1) as a final late season weed control measure. A final weed control evaluation was taken 22 weeks after treatment. On October 4, 10 feet 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, diseased and double bulbs were graded as culls regardless of diameter.

Herbicide application dates, timings and environmental conditions for Oakes, 2005.

Application Date:	4/20/05	4/27/2005	6/16/2005	7/1/05
Onion Stage:	PRE	Delayed Pre	3 lf	5-6 lf
Air Temp., (F):	65	41	66	66
Wind Velocity, (MPH):	12.3	10.6	6.4	6.0
Soil Temp., (F):	54	42	65	67
Operating Pressure:	30 psi	30 psi	30 psi	30 psi
Nozzle Type:	Air Induction	Flat Fan	Flat Fan	Flat Fan
Nozzle Size:	11002	8002	8002	8002
Spray Volume, GPA:	20	18.5	18.5	18.5

Results: Dimethenamid-P applied at the high rate severely reduced plant stand. DCPA, dimethenamid-P and pendimethalin at the middle and high rates had good weed control. Bromoxynil at all rates had poor weed control. Pendimethalin at 0.95 and 1.9, DCPA at 13.5 and dimethenamid-P at 1.13 lb ai/A had good weed control 8 WAT. At the end of the season there was a severe decline in weed control due to intense weed pressure. No treatment yielded as good as the hand-weeded check (375.3 cwt/A). DCPA at 6.75 lb ai/A had the highest yield (196.9 cwt/A) followed by pendimethalin at 0.95 lb ai/A (151.1 cwt/A) and dimethenamid–P at 0.28 lb ai/A (144 cwt/A).

Effect of preemergence herbicide on plant stand, weed control, onion grade and yield.

		Onion Stand[1]	% Weed Control[2]		Yield (cwt/A)[3]			
Treatment	**Rate (lb ai/A)**	**11WAT**	**8WAT**	**22WAT**	**1-2 ¼ in**	**2 ¼-3 in**	**3 in or >**	**Total**
Pendimethalin	0.475	8.1	67.5	15	41.8	64	25.9	132.1
Pendimethalin	0.95	7	85	27.5	39	72.6	39.5	151.1
Pendimethalin	1.9	7	95	17.5	44.5	39	11.4	94.8
DCPA	3.38	10.4	71.3	17.5	49	59.5	23.6	133
DCPA	6.75	9.8	83.8	22.5	39.5	87.6	69.9	196.9
DCPA	13.5	8.1	95.5	17.5	43.6	58.1	15.4	118
Bromoxynil[4]	0.156	7.8	15	0	50.4	27.2	5	82.6
Bromoxynil	0.312	7.4	15	20	37.7	56.7	11.8	106.2
Bromoxynil	0.625	7.9	10	10	42.2	53.1	21.3	116.6
Dimethenamid-P	0.28	7.1	72.5	27.5	42.2	54.5	47.7	144.3
Dimethenamid -P	0.56	5.4	85	25	29.5	42.2	22.2	93.9
Dimethenamid-P	1.13	3.5	92.5	27.5	12.3	29.5	15.9	57.6
Weedy check	-	6.2	67.5	15	0	0	0	0[5]
Hand-weeded check	-	8.8	85	27.5	30.9	132.5	211.9	375.3
LSD (0.05)		3	16.8	23.2	20.8	42.6	45.8	84.7

[1]Average stand of two 6 ft rows.
[2] Average control of common lambsquarters and redroot pigweed.
[3] Cull yield not shown because of a lack of significance.
[4]Applied as a delayed preemergence 10 DAP.
[5]No onions greater than 1 inch were present.

Preemergence weed control in onion, Absaraka. Schumacher, Carrie, Harlene Hatterman-Valenti and Collin Auwarter. A study was conducted at the NDSU Horticulture Research Arboretum near Absaraka, ND, to compare early weed control and crop injury with bromoxynil, DCPA, dimethenamid-P and pendimethalin (aqueous capsule formulation) in onion (*Allium cepa* L.). The soil was a loam with 1.6 % organic matter and 6.7 pH, with potato as the previous crop. Onion variety 'Teton' pelleted seed was planted on May 16 using a Stanhay four double-row planter unit, with 4-inch paired rows and 14-inches between main rows. Herbicides were applied at a low, medium and high rate starting with the middle labeled rate and increasing and decreasing the middle rate by half. Treatments were applied directly after planting, except bromoxynil which was applied as a delayed preemergence 10 days after planting. Herbicides were sprayed with a CO_2-pressurized backpack sprayer. Plots were 6 foot wide and 20 foot long and arranged in a randomized complete block design with four replicates. Best management practices were used for fertility, disease, insect and grass control. Treatments were evaluated for weed coverage and control, onion height and injury 1 and 3 weeks after application. At the 3-leaf stage (June 23), a standard application of bromoxynil and oxyfluorfen was made to all treatments, except checks. Rates were 0.375 lb ai/A and 0.125 lb ai/A, respectively. An application of pendimethalin at a rate of 0.62 lb ai/A was made at the 5-leaf stage (July 13) as a final late season weed control measure. On June 30, 28% liquid nitrogen was broadcast at a rate of 20 gpa over the whole trial. A final weed control evaluation was made 21 weeks after treatment. On October 18, 10 feet 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, diseased and double bulbs were graded as culls regardless of diameter.

Herbicide application dates, timings and environmental conditions for HRA, 2005.

Application Date:	5/16/2005	5/23/2005	6/23/2005	7/13/05
Onion Stage:	PRE	Delayed PRE	3 lf	5 lf
Air Temp., (F):	70	63	76	74
Wind Velocity, (MPH):	10	6.1	12	3.8
Soil Temp., (F):	52	75	83	84
Operating Pressure:	30 psi	30 psi	30 psi	30 psi
Nozzle Type:	Flat Fan	Flat Fan	Flat Fan	Flat Fan
Nozzle Size:	8002	8005	8002	8002
Spray Volume, GPA:	20	20	50	20

Results: Dimethenamid-p at 1.13 lb ai/A severely reduced plant stand. All treatments except bromoxynil at 0.156 and 0.312 lb ai/A had good control 8 WAT. Pendimethalin and dimethenamid-P had better weed control than DCPA 20 WAT. Dimethenamid-P at 0.56 and 1.13 lb ai/A had the lowest yields (86 and 40.7 cwt/A). Pendimethalin at 0.475 lb ai/A had the best yield (293.5 cwt/A) but yields with DCPA at all three rates were similar.

Effect of preemergence herbicide on plant stand, weed control, onion grade and yield.

		Onion Stand[1]	% Weed Control[2]		Yield (cwt/A)[3]			
Treatment	**Rate (lb ai/A)**	**9WAT**	**8WAT**	**20WAT**	**1-2 ¼ in**	**2 ¼-3 in**	**3 in or >**	**Total**
Pendimethalin	0.475	12.6	96.3	90	49	231.9	10.3	293.5
Pendimethalin	0.95	10.4	98.8	90	54.9	132.5	9.7	198
Pendimethalin	1.9	8.5	100	98.8	30.9	103.9	16.9	160.2
DCPA	3.38	8.8	90	70	63.1	176.1	4.6	244.2
DCPA	6.75	10.8	88.8	62.5	96.7	121.2	2.6	222.2
DCPA	13.5	10	91.3	65	85.3	173.8	4.2	264.2
Bromoxynil[4]	0.156	11.1	75	42.5	103	99.4	1	205.1
Bromoxynil	0.312	9.8	72.5	40	81.2	112.1	2.7	197.8
Bromoxynil	0.625	9.4	86.3	80	62.2	143.4	4.4	212.3
Dimethenamid-P	0.28	10	92.5	83.8	65.3	159.7	8.4	234.8
Dimethenamid -P	0.56	7.1	97.5	93.5	24.5	53.1	6.5	86
Dimethenamid-P	1.13	3.3	100	97.5	13.6	24.5	2.1	40.7
Weedy check	-	8.9	0	0	0	0	0	0[5]
Hand-weeded check	-	10	100	100	65.3	190.6	5	261.8
LSD (0.05)		4	7.5	22.1	32.7	71.6	4.8	83.7

[1]Average stand of two 6 ft rows.
[2]Average control of common lambsquarters and redroot pigweed.
[3]Cull yield not shown because of a lack of significance.
[4]Applied as a delayed preemergence 10 DAP.
[5]No onions greater than 1 inch were present.

*Means followed by the same letters within each column are not significantly different using Fisher's protected LSD test at $P \leq 0.05$.
[1]Applied as a delayed preemergence 10 days after planting.

Effect of bromoxynil and oxyfluorfen rate and spray volume in onion, Carrington.
Schumacher, Carrie, Harlene Hatterman-Valenti, Collin Auwarter and Paul Hendrickson. Field research was conducted at the Carrington Research Extension Center Carrington, ND, to determine the effect of bromoxynil and oxyfluorfen rate and spray volume on early postemergence weed control in onion. The soil was a Heimdal-Emerick/Fram-Wyard loam with 2.9 % organic matter and 7.9 pH, with soybean as the previous crop. Onion variety 'Teton' pelleted seed was planted on May 3 using a Stanhay four double-row planter unit, with 4-inch paired rows and 14-inches between main rows. To evaluate bromoxynil and oxyfluorfen use rates, bromoxynil was applied at 0.075 and 0.3 lb ai/A and oxyfluorfen was applied at 0.025 and 0.1 lb ai/A. To evaluate the effect of volume, high and low herbicide rates were sprayed with an output of 10, 25 and 50 gal/A of water. Treatments were applied at the 1-leaf stage (June 9) and applied with a CO_2-pressurized backpack sprayer. Plots were 6 foot wide and 20 foot long and arranged in a randomized complete block design with four replicates. Best management practices were used for fertility, disease, insect and grass control. Treatments were evaluated for weed coverage and control, onion height and injury 1 and 3 weeks after application. On June 13, 28% liquid nitrogen was broadcast at a rate of 10 gpa over the entire trial. At the 5-leaf stage (July 1), a standard application of bromoxynil and oxyfluorfen was made to all treatments, except checks. Rates were 0.375 lb ai/A and 0.125 lb ai/A, respectively. An application of pendimethalin at a rate of 0.62 lb ai/A was also made at the 5-leaf stage as a final late season weed control measure. A final weed control evaluation was taken 15 weeks after treatment. On September 22, 10 feet 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, diseased and double bulbs were graded as culls regardless of diameter.

Herbicide application dates, timings and environmental conditions for Carrington, 2005.

Application Date:	6/9/05	7/1/2005	7/1/05
Onion Stage:	1 lf	5 lf	5 lf
Air Temp., (F):	59	75	75
Wind Velocity, (MPH):	7.6	7.4	7.4
Soil Temp., (F):	59	67	67
Operating Pressure:	30 psi	30 psi	30 psi
Nozzle Type:	XR	XR	XR
Nozzle Size:	80015, 8003 and 11006	8006	8003
Spray Volume, GPA:	10, 25, and 50	50	20

Results: Onion height did vary depending on the treatment early in the growing season. However, one week before harvest, height was the same for all treatments except the weedy check. Plant stand was same for all treatments. Treatments at the low rate and 50gal/A had the greatest weed density for both herbicides. Grades of cull, small and medium were not significantly different between treatments. There were differences between treatments for large grade onions and total yield. No treatment yielded as well as the hand-weeded check. Treatments with oxyfluorfen resulted in the same yield regardless of rate and volume. As for bromoxynil, the high rate at 25 and 50 gal/A had a better yield than 10 gal/A and low rate yield was the same with any volume.

Effect of herbicide rate and volume on onion injury, weed control, onion yield and grade

Herbicide	Rate (lb ai/A)	Volume (gal/A)	Onion Injury	% Weed Control[1]			Yield (cwt/A)[2]			
			1WAT	1WAT	3WAT	15WAT	1-2 ¼ in	2 ¼-3 in	3 in or >	Total
Weedy check	-	-	0	0	0	0	57.8	1.8	0	60.8
Hand-weeded check	-	-	0	100	100	100	11.4	278.6	527.5	849.4
Bromoxynil	0.075	10	1.3	81.3	60	73.8	43.8	148.4	430.4	643
Bromoxynil	0.075	25	0	75	50	52.5	21.3	207.6	285.9	533
Bromoxynil	0.075	50	0	52.5	17.5	40	9.3	258.9	193.3	491.4
Bromoxynil	0.3	10	2.5	87.5	78.8	78.8	12.9	145.7	409.3	593.7
Bromoxynil	0.3	25	5	81.3	76.3	81.3	34.9	245.9	370.3	677.9
Bromoxynil	0.3	50	3.8	78.8	70	70	16.6	202.1	418.1	684
Oxyfluorfen	0.025	10	3.8	75	61.3	60	12	167.7	371.9	586.7
Oxyfluorfen	0.025	25	2.5	81.3	50	70	34.5	208	385.7	648.2
Oxyfluorfen	0.025	50	3.75	60	32.5	47.5	29	243.2	248	540.7
Oxyfluorfen	0.1	10	3.6	77.5	57.5	82.5	22.7	186	367.1	587.8
Oxyfluorfen	0.1	25	5	93.8	77.5	88.8	48.1	161.5	390	609.2
Oxyfluorfen	0.1	50	5	80	65	75	30.6	136.8	449.7	628.9
LSD (0.05)			3.5	18	20.7	24.1	17.9	85.5	133.7	128.7

[1] Average control of common lambsquarters and redroot pigweed.
[2] Cull yield not shown because of a lack of significance.

Effect of bromoxynil and oxyfluorfen rate and spray volume in onion, Oakes.

Schumacher, Carrie, Harlene Hatterman-Valenti, Collin Auwarter and Richard Greenland. A study was conducted at the Oakes Irrigation Research site Oakes, ND, to determine the effect of bromoxynil and oxyfluorfen rate and spray volume on early postemergence weed control in onion. The soil was a Madock sandy loam with 2.2 % organic matter and 7.4 pH, with potato as the previous crop. Onion variety 'Varsity' pelleted seed was planted on April 18 using a Monosem four double-row planter. To evaluate bromoxynil and oxyfluorfen use rates, bromoxynil was applied at 0.075 and 0.3 lb ai/A and oxyfluorfen was applied at 0.025 and 0.1 lb ai/A. To evaluate the effect of volume, high and low herbicide rates were sprayed with an output of 10, 25 and 50 gal/A of water. Treatments were applied at the 1-leaf stage (May 30) with a CO_2-pressurized backpack sprayer. Plots were 6 foot wide and 17 foot long and arranged in a randomized complete block design with four replicates. Best management practices were used for fertility, disease, insect and grass control. Treatments were evaluated for weed coverage and control, onion height and injury 1 and 3 weeks after application. On June 18 and July 7, 28 % liquid nitrogen was broadcast at a rate of 18.5 gpa over the entire trial. At the 4-leaf stage (June 24), a standard application of bromoxynil and oxyfluorfen was made to all treatments, except checks. Rates were 0.375 lb ai/A and 0.125 lb ai/A, respectively. An application of pendimethalin at a rate of 0.62 lb ai/A was made around the 5-6 leaf stage (July 1) as a final late season weed control measure. A final weed control evaluation was taken 16 weeks after treatment. On October 4, 10 feet 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, diseased and double bulbs were graded as culls regardless of diameter.

Herbicide application dates, timings and environmental conditions for Oakes, 2005.

Application Date:	5/30/05	6/24/2005	7/1/05
Onion Stage:	1 lf	4 lf	5-6 lf
Air Temp., (F):	64	66	66
Wind Velocity, (MPH):	5.2	6.5	6.0
Soil Temp., (F):	59	72	67
Operating Pressure:	30 psi	30 psi	30 psi
Nozzle Type:	Flat fan	Flat Fan	Flat Fan
Nozzle Size:	8001, 02 and 05	8005	8002
Spray Volume, GPA:	10, 25 and 50	18.5	18.5

Results: Onion height did vary depending on the treatment early in the growing season. However, one week before harvest, height was the same for all treatments except the weedy check. Oxyfluorfen at 0.025 and 0.1 lbs/A at 50 gal/A showed the best control 1 and 3 WAT. There was a severe decline in weed control late in the season due to intense weed pressure. No treatment yielded as well as the hand-weeded check (288.6 cwt/A). Oxyfluorfen at 0.025 lb ai/A at 25 gal/A was had the best yield (175.2 cwt/A). Bromoxynil at 0.3 lb ai/A at 25 and 50 gal/A had lower yields than 10 gal/A and 0.075 lb ai/A yield was the same with any volume.

Effect of herbicide rate and volume on onion injury, weed control, onion yield and grade

Herbicide	Rate (lb ai/A)	Volume (gal/A)	Onion Injury	% Weed Control[1]			Yield (cwt/A)[2]			
			1WAT	1WAT	3WAT	16WAT	1-2 ¼ in	2 ¼-3 in	3 in or >	Total
Weedy check	-	-	0	0	0	0	0	0	0	0[3]
Hand-weeded check	-	-	0	100	100	100	34	108	146.6	288.6
Bromoxynil	0.075	10	3.8	85	57.5	17.5	48.1	39	10.4	97.6
Bromoxynil	0.075	25	1.3	73.8	47.5	10	38.6	32.2	18.6	89.4
Bromoxynil	0.075	50	1.3	65	45	0	50.8	29.5	7.7	88
Bromoxynil	0.3	10	5	88.8	73.8	5	40	26.8	6.4	73.1
Bromoxynil	0.3	25	5	76.3	35	0	28.6	12.3	3.6	44.5
Bromoxynil	0.3	50	1.3	83.8	57.5	7.5	36.8	17.3	0	54.5
Oxyfluorfen	0.025	10	26.3	88.8	91.3	25	40.4	76.2	58.5	175.2
Oxyfluorfen	0.025	25	26.3	71.3	87.5	5	35.4	45.8	22.7	103.9
Oxyfluorfen	0.025	50	18.8	73.3	86.3	17.5	43.1	48	25.4	116.6
Oxyfluorfen	0.1	10	25	83.8	77.5	0	24.1	36.8	39	99.8
Oxyfluorfen	0.1	25	37.5	90	78.8	0	33.1	60.8	38.1	132.1
Oxyfluorfen	0.1	50	31.3	91.3	96.3	12.5	43.1	57.6	38.1	134.8
LSD (0.05)			20.9	23.2	25	21.6	27.3	52.5	44.6	104.4

[1] Average control of common lambsquarters and redroot pigweed.
[2] Cull yield not shown because of a lack of significance.
[3] No onions greater than 1 inch were present.

Effect of bromoxynil and oxyfluorfen rate and spray volume in onion, Absaraka.
Schumacher, Carrie, Harlene Hatterman-Valenti and Collin Auwarter. A study was conducted at the NDSU Horticulture Research Arboretum near Absaraka, ND, to determine the effect of bromoxynil and oxyfluorfen rate and spray volume on early postemergence weed control in onion (*Allium cepa* L.). The soil was a loam with 1.6 % organic matter and 6.7 pH, with potato as the previous crop. Onion variety 'Teton' pelleted seed was planted on May 16 using a Stanhay four double-row planter unit, with 4-inch paired rows and 14-inches between main rows. To evaluate bromoxynil and oxyfluorfen use rates, bromoxynil was applied at 0.075 and 0.3 lb ai/A and oxyfluorfen was applied at 0.025 and 0.1 lb ai/A. To evaluate the effect of volume, high and low herbicide rates were sprayed with an output of 10, 25 and 50 gal/A of water. Treatments were applied at the 1-leaf stage (June 9) and applied with a CO_2-pressurized backpack sprayer. Plots were 6 foot wide and 20 foot long and arranged in a randomized complete block design with four replicates. Best management practices were used for fertility, insect, disease and grass control. Treatments were evaluated for weed coverage and control, onion height and injury 1 and 3 weeks after application. At the 3-leaf stage (June 23), a standard application of bromoxynil and oxyfluorfen was made to all treatments, except checks. Rates were 0.375 lb ai/A and 0.125 lb ai/A, respectively. An application of pendimethalin at a rate of 0.62 lb ai/A was made after the 5-leaf stage (July 13) as a final late season weed control measure. On June 30, 28% liquid nitrogen was broadcast at a rate of 20 gpa over the whole trial. A final weed control evaluation was taken 19 weeks after treatment. On October 18, 10 feet 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, diseased and double bulbs were graded as culls regardless of diameter.

Herbicide application dates, timings and environmental conditions for HRA, 2005.

Application Date:	6/9/05	6/23/2005	7/13/05
Onion Stage:	1 lf	3 lf	5 lf
Air Temp., (F):	74	76	74
Wind Velocity, (MPH):	7.4	12	3.8
Soil Temp., (F):	67	83	84
Operating Pressure:	30 psi	30 psi	30 psi
Nozzle Type:	Flat Fan	Flat Fan	Flat Fan
Nozzle Size:	8001, 8002 and 8005	8005	8002
Spray Volume, GPA:	10, 25, and 50	50	20

Results: Onion injury was not significantly different between treatments. There were no visible symptoms 3 WAT. Oxyfluorfen at 0.025 and 0.1 lb ai/A had good control regardless of volume. Bromoxynil control was best at 0.3 lb ai/A with 25 and 50 gal/A. Yields were similar for all treatments except for the weedy check.

Effect of herbicide rate and volume on onion injury, weed control, onion yield and grade.

Herbicide	Rate (lb ai/A)	Volume (gal/A)	Onion Injury	% Weed Control[1]			Yield (cwt/A)[2]			
			1WAT	1WAT	3WAT	19WAT	1-2 ¼ in	2 ¼-3 in	3 in or >	Total
Weedy check	-	-	0	0	0	0	0	0	0	0[3]
Hand-weeded check	-	-	0	100	100	100	116.2	175.6	68.5	362.6
Bromoxynil	0.075	10	1.3	75	71.3	88.8	86.7	202.4	109.4	400.2
Bromoxynil	0.075	25	2.5	67.5	67.5	70	98.9	124.8	75.8	300.8
Bromoxynil	0.075	50	0	75	65	83.8	111.2	135.7	86.2	335.3
Bromoxynil	0.3	10	0	72.5	67.5	86.3	108.9	121.6	89.4	324
Bromoxynil	0.3	25	1.3	86.3	83.8	96.3	73.1	211	203.7	489.2
Bromoxynil	0.3	50	1.3	82.5	70	96.3	90.3	177	108	376.6
Oxyfluorfen	0.025	10	25	88.8	77.5	77.5	93.9	164.7	67.2	327.6
Oxyfluorfen	0.025	25	5	87.5	67.5	57.5	109.8	150.2	54.5	316.3
Oxyfluorfen	0.025	50	2.5	83.8	72.5	70	44.5	147	123	314.5
Oxyfluorfen	0.1	10	20	94.8	88.8	93.8	69	249.6	152.1	427.4
Oxyfluorfen	0.1	25	12.5	93.8	91.3	96.3	68.1	155.6	160.1	385.2
Oxyfluorfen	0.1	50	15	92.5	82.5	83.8	97.1	165.2	136.1	405.2
LSD (0.05)			19	12.6	14.7	28.1	46.6	108.7	127.7	181.6

[1] Average control of common lambsquarters and redroot pigweed.
[2] Cull yield not shown because of a lack of significance.
[3] No onions greater than 1 inch were present.

Weed control in 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 new and reintroduced products applied either separately, tank-mixed, or sequentially for crop safety and weed control in Russet Burbank potato. The study was conducted on loamy sand soil with 1.8% organic matter and 7.6 pH. Oats was grown during 2004. 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 2, 2005. Weed seed: Grft (green foxtail), Rrpw (redroot pigweed), Colq (common lambsquarter), and Ebns (Eastern black nightshade) was spread prior to hilling. Ebns stand was not uniform and thus was not evaluated. Treatments were applied 3 days after hilling to the middle 2 rows. Crop injury and weed control were evaluated 2, 5, and 23 weeks after treatment. Water was not limiting as irrigation was scheduled every 3 to 4 d once potato had emerged following hilling. Potatoes were machine harvested September 27 and graded a few weeks later. Application, environmental, crop, and weed data are listed below:

Date:		6/1/05	7/1/03
Treatment:		PRE	POST
Sprayer:	gpa:	15	15
	psi:	30	30
	nozzle:	8002	8002
Air temperature (F):		60	82
Rel. hum. (%):		85	59
Wind (mph):		8	9
Soil moisture:		adequate	adequate
Cloud cover (%):		50	10
Potato:	Height (inch):	0	14

All herbicides except Sencor alone caused some visible injury 2 WAT (Table 1). Chateau alone or tank mixed caused the most injury (16-24%) at 2 WAT. All plants outgrew injury and by 5 WAT virtually no injury was visible. Weed control at 2 WAT was 85% or more for all treatments except V-10142 and Spartan for green foxtail. Weed control at 5 WAT was 85% or more for all treatments except Spartan for green foxtail. By 23 WAT, common lambsquarter control dropped below 85% (considered unacceptable) with Outlook, and Dual Magnum alone. Tuber grades for the various treatments are provided in Table 2. All treatments yielded greater than 400 cwt/A except the untreated, Spartan, low rate of Outlook, and several Chateau treatments. The highest yield (490 cwt/A) occurred with a tank mix of Eptam and Sencor followed by a postemergence application of Eptam. Growers receive a premium price for tubers 6 oz or more. The treatment of V-10142 at 0.27 lb ai/A had the greatest percentage of tubers at least 6 oz with 73%. The trial results indicated that irrigated potato growers have several management options for season long weed control.

Table 1. Potato injury and weed control 2, 5, and 23 weeks after treatment.

No.	Name	Rate	Pota	Grft	Rrpw	Colq	Pota	Grft	Rrpw	Colq	Grft	Rrpw	Colq
			6/17/2005				7/7/2005				8/23/2005		
		lb ai/a	% Injury	% Control			% Injury	% Control			% Control		
1	Untreated		0 e	0 d	0 c	0 c	0 a	0 d	0 c	0 c	0 c	0 b	0 c
2	Outlook	0.7	8 b-e	95 ab	98 a	91 ab	0 a	95 ab	98 a	93 ab	93 a	96 a	79 b
3	Outlook	0.98	8 b-e	96 ab	100 a	88 ab	0 a	98 ab	97 a	93 ab	96 a	100 a	83 ab
4	Prowl H2O	1.42	1 de	91 abc	85 b	94 ab	0 a	95 ab	98 a	98 a	95 a	91 a	94 ab
5	Outlook	0.7	10 b-e	95 ab	98 a	99 ab	3 a	97 ab	95 a	98 a	96 a	99 a	91 ab
	Prowl H2O												
6	Outlook	0.7	8 b-e	97 a	100 a	100 a	0 a	98 ab	100 a	99 a	95 a	100 a	89 ab
	Sencor	0.975											
7	Outlook	0.7	11 b-e	96 ab	93 ab	96 ab	1 a	96 ab	97 a	98 a	95 a	98 a	95 ab
	Spartan	0.0625											
8	V-10142	0.13	3 cde	81 c	100 a	96 ab	0 a	87 b	100 a	100 a	84 ab	99 a	96 ab
9	V-10142	0.27	1 de	85 bc	100 a	99 ab	0 a	91 ab	100 a	100 a	87 ab	100 a	98 a
10	Chateau	0.047	24 a	93 abc	100 a	98 ab	2 a	91 ab	100 a	99 a	89 ab	99 a	95 ab
11	V-10142	0.13	21 ab	90 abc	100 a	94 ab	1 a	92 ab	100 a	100 a	86 ab	100 a	94 ab
	Chateau	0.047											
12	V-10142	0.27	18 abc	89 abc	100 a	100 a	1 a	91 ab	100 a	100 a	90 ab	100 a	98 a
	Chateau	0.047											
13	Chateau	0.047	21 ab	94 ab	100 a	100 a	1 a	97 ab	100 a	100 a	91 ab	100 a	100 a
	V-10142	0.13											
	NIS 0.255%v/v												
14	Chateau	0.047	20 ab	95 ab	100 a	99 ab	3 a	97 ab	100 a	100 a	95 a	100 a	94 ab
	V-10142	0.27											
	NIS 0.255%v/v												
15	Eptam	4.38	3 cde	89 abc	96 a	86 b	0 a	89 ab	95 a	92 ab	89 ab	95 a	86 ab
16	Sencor	0.5	0 e	89 abc	91 ab	97 ab	0 a	97 ab	97 a	98 a	91 ab	95 a	96 ab
17	Spartan	0.047	4 cde	81 c	93 ab	95 ab	0 a	70 c	83 b	85 b	80 b	98 a	93 ab
18	Eptam	4.38	1 de	97 ab	98 a	95 ab	0 a	96 ab	100 a	96 a	90 ab	98 a	90 ab
	Sencor	0.5											
19	Eptam	4.38	3 cde	96 ab	100 a	95 ab	0 a	98 ab	99 a	98 a	95 a	98 a	93 ab
	Sencor	0.5											
	Eptam	3.5											
20	Eptam	4.38	3 cde	91 abc	93 ab	98 ab	0 a	88 ab	85 b	97 a	86 ab	93 a	88 ab
	Spartan	0.047											
21	Eptam	4.38	16 a-d	94 ab	100 a	100 a	1 a	90 ab	100 a	100 a	86 ab	100 a	99 a
	Chateau	0.047											
22	Stalwart	2	10 b-e	97 a	99 a	97 ab	0 a	98 ab	100 a	99 a	96 a	99 a	90 ab
	Sencor	0.5											
23	Dual Magnum	0.95	10 b-e	96 ab	100 a	98 ab	0 a	99 a	100 a	100 a	96 a	100 a	98 a
	Sencor	0.5											
24	Stalwart	2	9 b-e	95 ab	100 a	90 ab	0 a	98 ab	98 a	96 a	96 a	100 a	85 ab
25	Dual Magnum	0.95	6 b-e	91 abc	93 ab	88 ab	0 a	91 ab	97 a	94 ab	88 ab	91 a	83 ab

Table 2. Effect of herbicides on potato yield and grade

No.	Name	Rate	<4oz	4-6oz	6-10oz	10-12oz	12-14oz	>14oz	Total	>6oz
		lb ai/a				Cwt/A				%
1	Untreated		61 ab	109 a	156 a-d	37 a	17 a	13 a	392 abc	56 ab
2	Outlook	0.7	64 ab	103 a	167 a-d	33 a	13 a	19 a	399 abc	58 ab
3	Outlook	0.98	54 ab	92 a	171 a-d	41 a	30 a	40 a	429 abc	66 ab
4	Prowl H2O	1.42	50 ab	84 a	197 abc	50 a	39 a	30 a	450 abc	70 ab
5	Outlook	0.7	59 ab	102 a	171 a-d	36 a	18 a	25 a	410 abc	61 ab
	Prowl H2O									
6	Outlook	0.7	64 ab	106 a	170 a-d	38 a	26 a	24 a	428 abc	60 ab
	Sencor	0.975								
7	Outlook	0.7	71 ab	101 a	166 a-d	42 a	20 a	22 a	421 abc	59 ab
	Spartan	0.0625								
8	V-10142	0.13	51 ab	105 a	211 ab	57 a	24 a	27 a	474 ab	67 ab
9	V-10142	0.27	45 b	75 a	198 abc	61 a	33 a	31 a	442 abc	73 a
10	Chateau	0.047	75 a	91 a	135 cd	31 a	19 a	16 a	365 abc	54 b
11	V-10142	0.13	69 ab	89 a	179 a-d	45 a	25 a	35 a	443 abc	64 ab
	Chateau	0.047								
12	V-10142	0.27	57 ab	81 a	164 a-d	52 a	27 a	39 a	419 abc	67 ab
	Chateau	0.047								
13	Chateau	0.047	63 ab	90 a	146 bcd	40 a	24 a	18 a	381 abc	60 ab
	V-10142	0.13								
	NIS 0.255%v/v									
14	Chateau	0.047	63 ab	84 a	149 a-d	44 a	26 a	35 a	402 abc	63 ab
	V-10142	0.27								
	NIS 0.255%v/v									
15	Eptam	4.38	54 ab	90 a	171 a-d	55 a	33 a	32 a	436 abc	67 ab
16	Sencor	0.5	54 ab	96 a	212 a	46 a	22 a	19 a	450 abc	66 ab
17	Spartan	0.047	51 ab	92 a	168 a-d	36 a	21 a	19 a	387 abc	63 ab
18	Eptam	4.38	60 ab	103 a	193 a-d	57 a	27 a	27 a	468 ab	64 ab
	Sencor	0.5								
19	Eptam	4.38	51 ab	99 a	205 ab	54 a	43 a	38 a	490 a	69 ab
	Sencor	0.5								
	Eptam	3.5								
20	Eptam	4.38	54 ab	82 a	166 a-d	50 a	34 a	30 a	415 abc	67 ab
	Spartan	0.047								
21	Eptam	4.38	68 ab	82 a	139 cd	35 a	23 a	23 a	371 bc	58 ab
	Chateau	0.047								
22	Stalwart	2	63 ab	102 a	195 a-d	59 a	28 a	30 a	477 ab	65 ab
	Sencor	0.5								
23	Dual Magnum	0.95	60 ab	100 a	195 a-d	53 a	24 a	25 a	458 abc	65 ab
	Sencor	0.5								
24	Stalwart	2	65 ab	103 a	179 a-d	40 a	27 a	24 a	438 abc	61 ab
25	Dual Magnum	0.95	53 ab	98 a	179 a-d	51 a	27 a	29 a	438 abc	63 ab

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

Simulated glyphosate drift to seed potatoes. Harlene M. Hatterman-Valenti, Collin P. Auwarter, and Paul G. Mayland.
A field trial was initiated during 2004 at the NDSU Agriculture Experiment Station research site near Prosper, ND to evaluate the effect of simulated drift to daughter tubers used for seed the following year. The trial was conducted on clay loam soil with 3.7% O.M. and 6.9 pH. Simulated drift rates of glyphosate were applied to Russet Burbank and Red Lasoda potato plants in 2004 during the early senescence stage at rates one-third, one-sixth, one-twelfth, one-twenty-fourth, and one-forty-eight the use rate for spring wheat desiccation. Following harvest, samples from each plot were placed into cold storage until the following March. A subsample from each plot was slowly warmed to initiate sprout formation and the visual evaluation of bud break. The remaining samples were cut into 2 oz pieces with at least two eyes to each piece; dusted with a seed piece treatment, and stored at 65° F with approximately 90% RH until planted. The 2005 plots were 2 rows by 10 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 12, 2005. Extension recommendations were used for cultural practices. Plots were desiccated on September 12 and 19, and harvested October 11. Tubers were hand graded into the various categories shortly after harvest.

Application, environmental, crop, and weed data are listed below:

Date:		9/10/04
Treatment:		POST
Sprayer:	gpa:	30
	psi:	40
	nozzle:	8002
Temperature:	Air (F):	66
	Soil (4 inch):	62
Rel. hum. (%):		56
Wind (mph):		6
Soil moisture:		adequate
Cloud cover (%):		15
Potato:	Height (inch):	28

Table 1. Sprout inhibition, yield and grade after glyphosate spray drift to Russet Burbank seed potatoes the previous year.

Trt	Treatment	Rate	Sprout Inhib	<4 oz	4-6oz	6-10oz	10-12oz	12-14oz	>14oz	total	> 4 oz
			%	Cwt/A							
1	Untreated		0 d	48 ab	47 a	66 ab	15 ab	7 ab	28 a	210 ab	163 ab
2	Glyphosate AMS	0.25 lb ae/A 4 lb/100 gal	100 a	25 b	6 b	7 c	2 c	1 b	0 b	41 c	16 c
3	Glyphosate AMS	0.125 lb ae/A 2 lb/100 gal	100 a	31 ab	12 b	11 c	4 c	1 b	3 b	62 c	31 c
4	Glyphosate AMS	0.0625 lb ae/A 1 lb/100 gal	75 b	31 ab	20 b	17 c	7 bc	1 b	9 b	86 c	55 c
5	Glyphosate AMS	0.0313 lb ae/A 0.5 lb/100 gal	18 c	34 ab	25 ab	37 bc	9 bc	4 b	11 b	120 bc	86 bc
6	Glyphosate AMS	0.0156 lb ae/A 0.25 lb/100 gal	0 d	68 a	48 a	72 a	21 a	20 a	9 b	239 a	170 a

Table 2. Sprout inhibition, yield, and grade after glyphosate spray drift to Red Lasoda seed potatoes the previous year.

Trt	Treatment	Rate	Sprout inhib	<4 oz	4-6oz	6-10oz	10-12oz	12-14oz	>14oz	total	> 4 oz
			%	---------- Cwt/A ----------							
1	Untreated		0 f	36 b	54 a	113 a	37 a	26 ab	46 ab	311 a	276 a
2	Glyphosate AMS	0.25 lb ae/A 4 lb/100 gal	100 a	44 ab	21 b	26 c	9 b	9 bc	23 b	132 c	88 c
3	Glyphosate AMS	0.125 lb ae/A 2 lb/100 gal	90 b	35 b	22 b	40 bc	21 ab	6 c	36 ab	160 bc	124 bc
4	Glyphosate AMS	0.0625 lb ae/A 1 lb/100 gal	80 c	38 ab	21 b	41 bc	11 ab	9 bc	43 ab	162 bc	124 bc
5	Glyphosate AMS	0.0313 lb ae/A 0.5 lb/100 gal	35 d	35 b	26 b	65 bc	37 a	18 abc	60 a	241 ab	206 ab
6	Glyphosate AMS	0.0156 lb ae/A 0.25 lb/100 gal	15 e	50 a	30 b	74 ab	21 ab	30 a	36 ab	241 ab	191 ab

All glyphosate rates (Red Lasoda) and all rates except 0.0156 lb ae/A (Russet Burbank) reduced sprout initiation of daughter tubers the following year (Tables 1 and 2). Plant populations were reduced in several instances, which were reflected in lower tuber yields, while plant height and number of stems per plant were not influenced by the herbicide (data not shown). Total yield for both cultivars was reduced when glyphosate at 0.0625 lb ae/A or more was applied to plants the previous fall compared to the untreated. Tuber size distribution varied but in general, all sizes except the < 4 oz category were reduced when glyphosate was applied to plant the previous fall compared to the untreated.

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

A study was conducted to evaluate adjuvants for use with Reglone. A reduced rate of Reglone was used in order to separate adjuvant effects. Red Norland seed pieces were planted May 23 at the NDSU research site near Prosper, ND. The trial was conducted on clay loam soil with 3.7% O.M. and 6.9 pH. Plots were 2 rows by 15 ft arranged in a RCB design with 3 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 13, using a CO2 backpack sprayer equipped with 8002 flat fan nozzles with an output of 30 GPA and a pressure of 40 psi. Environmental conditions at the time of application included: 55 °F air temp., 61 % R.H., 7 mph wind velocity, and 50 % Cloud Cover. The standard application of Reglone at 2 pt/A plus NIS at 0.25% v/v was included for comparison.

Effect of adjuvant on potato desiccation using Reglone.

	Rating date			9/16	9/24
	Rating data type:				
	Desiccation			foliage	foliage
	DAA			3	11
Trt No.	Treatment Name	Rate	Unit	------ %	------
1	Untreated			20	50
2	Reglone	0.5	pt/a	53	82
3	Reglone	0.5	pt/a	70	90
	InterLock	4	fl oz/a		
	Preference	0.25	% v/v		
4	Reglone	0.5	pt/a	75	93
	AG 05017	4	fl oz/a		
	Preference	0.25	% v/v		
5	Reglone	0.5	pt/a	68	88
	AG 04021	8	fl oz/a		
6	Reglone	0.5	pt/a	75	95
	Superb HC (AG 01023)	0.5	% v/v		
7	Reglone	0.5	pt/a	67	83
	AG 05006	0.5	% v/v		
8	Reglone	0.5	pt/a	67	92
	AG 05006	0.5	% v/v		
	InterLock	4	fl oz/a		
9	Reglone	2	pt/a	87	97
	NIS	0.25	% v/v		
	LSD (P=.05)			11	8

The treatments were applied when the plants were beginning to senescence. No treatment provided as much necrosis as the standard of Reglone at 2 pt/a + NIS 3 days after application (DAA). Hoewever, all provided more necrosis than the untreated or Reglone without an adjuvant. By 11 DAA, several treatments provided similar necrosis as the standard even though the Reglone rate was one-fourth as much. The only treatments that did not provide similar necrosis as the standard were Reglone alone, Reglone + AG 04021 and Reglone + AG 05006.

Carfentrazone-ethyl (Aim) as a desiccant on irrigated potatoes. Harlene Hatterman-Valenti and Collin P. Auwarter.

A study was conducted to compare desiccation with carfentrazone to the diquat standard for irrigated potato. Russet Burbank seed pieces were planted May 26 on the Northern Plains Potato Growers research site near Tappen, ND. The soil is a Maddock fine loamy sand with 1.4% OM and a 8.05 pH. Plots were 4 rows by 25 ft arranged in a randomized complete block design with 4 replicates. The potato seed pieces were planted in 36 inch rows at 12 inch spacing between plants. An insecticide was applied in-furrow at planting and a fungicide maintenance program was utilized throughout the growing season. The desiccant treatments were applied using a CO_2 backpack sprayer equipped with 8002 flat fan nozzles with an output of 20 GPA and a pressure of 30 psi.

Application Date:	September 8	September 15
Application Timing	'A'	'B'
Time of Day	9:00	9:00
Air Temp. ^{0}F	68	62
% R.H.	64	53
Wind Velocity (mph)	7	6
% Cloud Cover	50	20

Potato desiccation with carfentrazone-ethyl

	Rating date			----9/11----		----9/15----		----9/18----		----9/21----		----9/28----	
	Rating data type: Desiccation			Stem	Lvs	Stem	Lvs	Stem	Lvs	Stem	Lvs	Stem	Lvs
	DAA: 'A'-'B'			3	3	7	7	10-3	10-3	13-6	13-6	20-13	20-13
Trt No.	Treatment Name	Rate lb ai/A	Appl Code										
1	Carf+MSO	0.08+1%	AB	35	63	66	90	80	96	96	100	100	100
2	Carf+MSO	0.10+1%	AB	49	71	74	92	91	100	99	100	100	100
3	Carf+MSO	0.125+1%	AB	49	76	73	93	83	98	97	100	100	100
4	Carf+MSO	0.148+1%	A	55	79	78	93	86	100	95	100	100	100
5	Diquat+NIS	0.5+0.25%	AB	85	97	97	100	100	100	100	100	100	100
6	Untreated			0	5	21	46	41	63	61	81	84	97
	LSD (P=.05)			12	11	17	8	16	6	6	5	3	1

The diquat treatment showed greater stem and leaf desiccation compared to the carfentrazone treatments at 3 days after application (DAA). By 7 DAA, carfentrazone applied at 0.148 lb ai/A had similar stem and leaf desiccation as the diquat standard. By 10 DAA, the split application of carfentrazone at 0.10 lb ai/a had similar desiccation as a single application of carfentrazone at 0.148 lb ai/A and the diquat standard. At 13 and 20 DAA, all performed similarly with almost complete necrosis of stem and leaves.

Weed control in pumpkin - Oakes. Greenland, Richard G. Weed control is difficult in pumpkins because few herbicides are available for pumpkin production. A new herbicide, Sandea, recently came on the market for use in pumpkins. We tested this herbicide along with others at the Oakes Irrigation Research Site on an Embden sandy loam soil on a field that had been in field corn the previous year. The corn was flailed and the field was disked in the fall, then the field was chisel plowed, disked, and field cultivated in the spring. Pumpkins were planted on May 27 in 8-ft rows and an in-row spacing of 1 ft. Pumpkin plants were later thinned to an in-row spacing of 3 ft. The study was irrigated with overhead sprinkler irrigation. PRE treatments were applied on May 27. The POST treatment was applied on June 24 with pumpkins 6 inches tall and 12 inches across and weeds 1 to 5 inches tall. All Treatments were applied with a CO2-pressurized backpack sprayer using AI 110-04 flat fan nozzles, 23 gpa, at 52 psi.

Table 1.Control of redroot pigweed, lambsquarters, hairy nightshade, foxtail, and purslane by herbicides in the Oakes Irrigation Research Site 2005 pumpkin weed control study.

Herbicides	Rates	Application timing	Redroot Pigweed		Lambsquarters		Hairy nightshade		Foxtail		Purslane	
			Jun 22	Jul 27	Jun 22	Jul 27	Jun 22	Jul 27	Jun 22	Jul 27	Jun 22	Jul 27
			0 to 10[1]									
Authority	3 oz	PRE	10.0 a[2]	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	9.3 ab	4.8 cde	10.0 a	7.8 bd
Outlook	1 pt	PRE	10.0 a	8.8 b	8.8 bc	7.8 bc	9.8 a	8.8 abc	10.0 a	9.0 a	9.8 a	8.5 ac
Raptor	5 oz	PRE	9.5 a	7.7 c	9.5 abc	8.3 b	8.8 b	8.3 abc	8.3 b	6.3 bc	8.0 b	6.0 ef
Authority + Raptor	2 oz + 4 oz	PRE	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	9.5 ab	8.3 b	5.0 cd	9.5 a	7.5 ce
Outlook + Raptor	1 pt + 4 oz	PRE	10.0 a	7.8 c	10.0 a	8.3 b	10.0 a	9.3 ab	9.8 a	8.5 ab	10.0 a	7.6 be
Outlook + Authority	1 pt + 2 oz	PRE	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	10.0 a	9.8 a	8.5 ab	10.0 a	8.0 bc
Sandea	½ oz	PRE	10.0 a	10.0 a	10.0 a	10.0 a	6.8 d	4.3 f	8.5 b	5.5 cd	9.8 a	9.5 ab
Outlook + Sandea	1 pt + ½ oz	PRE	10.0 a	10.0 a	9.8 ab	9.8 a	9.8 a	7.5 d	10.0 a	8.3 ab	9.8 a	9.3 ab
Sandea + NIS	½ oz + ¼%	POST	8.0 b	10.0 a	7.3 e	7.0 c	7.3 cd	6.0 e	7.0 c	2.8 e	5.5 c	5.5 f
Outlook fb Sandea + NIS	1 pt fb ½ oz+¼%	PRE fb POST	10.0 a	10.0 a	8.5 cd	7.3 c	10.0 a	8.8 abc	10.0 a	9.8 a	10.0 a	8.3 ac
Handweeded check			7.3 c	10.0 a	6.8 e	10.0 a	7.8 c	10.0 a	7.0 c	10.0 a	5.0 c	10.0 a
Unweeded check			7.3 c	8.0 bc	7.5 de	6.0 d	7.5 c	7.8 cd	7.0 c	3.8 de	5.8 c	6.3 df
Probability			<.0001	0.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
C.V. (%)			2	3	4	4	3	6	8	22	8	14

[1]Ratings from 0 to 10 with 0 = weed completely covers plot; 10 = no weeds in plot.
[2]Values in the same column followed by the same letter are not significantly different at the 0.05 level.

Table 2. Pumpkin Injury, stand, number and yield of pumpkins, fruit size, and overall pumpkin quality score in the Oakes Irrigation Research Site 2005 pumpkin weed control study.

Herbicide(s)	Rates	Application timing	Pumpkin (Jun 22) injury	Pumpkin (Jun 22) stand	Number of pumpkins marketable	Number of pumpkins total	Pumpkin yield marketable	Pumpkin yield total	Fruit size	Overall score
			%	---------- 1000s/acre ----------			------ tons/acre -----		lbs/fruit	1 to 10
Authority	3 oz	PRE	55 e[1]	3.6	2.6	3.0 ac	15.0	16.7 bc	11.8	8.0 a
Outlook	1 pt	PRE	15 c	4.6	2.1	3.0 ac	13.7	17.9 ac	13.0	7.6 abc
Raptor	5 oz	PRE	18 c	3.6	2.0	2.6 bd	12.6	14.0 cd	12.1	7.8 abc
Authority + Raptor	2 oz + 4 oz	PRE	40 de	4.5	2.4	2.8 ad	16.1	17.2 bc	13.2	7.6 abc
Outlook + Raptor	1 pt + 4 oz	PRE	28 cd	3.9	2.7	3.8 a	17.8	21.7 ab	12.8	7.3 cd
Outlook + Authority	1 pt + 2 oz	PRE	28 cd	4.0	2.6	3.4 ab	17.0	21.0 ab	13.3	7.5 abc
Sandea	½ oz	PRE	23 c	3.8	2.0	2.6 bd	10.8	12.7 cd	11.0	7.4 bcd
Outlook + Sandea	1 pt + ½ oz	PRE	23 c	2.2	2.0	2.6 bd	13.3	15.4 cd	14.7	7.9 ab
Sandea + NIS	½ oz + ¼%	POST	3 ab	2.5	1.6	1.9 d	8.7	10.0 d	10.9	7.4 bcd
Outlook fb Sandea + NIS	1 pt fb ½ oz+¼%	PRE fb POST	5 b	4.4	2.0	3.2 ab	13.2	21.5 ab	13.6	7.3 cd
Handweeded check			0 a	3.0	2.7	3.8 a	18.6	23.7 a	13.4	6.9 d
Unweeded check			3 ab	4.5	1.8	2.1 cd	12.3	14.1 cd	12.5	7.3 cd
Probability			<.0001	0.33	0.43	0.008	0.099	0.0009	0.09	0.04
C. V. (%)			26	38	31	23	29	22	12	6

[1]Values in the same column followed by the same letter are not significantly different at the 0.05 level.

Results. Authority injured pumpkins the most, but Sandea, Outlook and Raptor also injured pumpkins. The injury disappeared later in the season. Authority gave good to excellent control of all weeds except foxtail and purslane. Outlook and Raptor gave fair to good control of all weeds. Sandea gave excellent pigweed control, but poor nightshade, foxtail, and purslane control. It controlled lambsquarters when applied PRE but not when applied POST. Yields were lower with Sandea treatments due to weed competition. Best weed control across all weeds was Outlook plus any one of the other herbicides. Highest yields were with the hand weeded check and with Outlook plus any one of the other herbicides.

SPARTAN ON SAFFLOWER - NOTILL RECROP

Spartan on safflower sown directly into notill recrop stubble. Williston 2005. (Riveland and Bradbury)

'Finch' safflower was planted on land cropped to hrs wheat wheat in 2004 using a planter having 7 inch rows seeding at 30 lbs/a on April 29. The PPI treatments were applied on April 22 to a dry soil surface with 60 F temperature, clear sky, wind NW at 1-2 mph And RH 16%. PE treatments were applied on May 5 at 8:15 am to a dry soil surface with 45 degree F temperature, 50% RH, wind NNW at 4-8 mph, and 95% clear sky. 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 application was 1.12 inches on May 8. The experiment was a randomized complete block design with four replications. Plots were evaluated for crop injury and weed control on August 27. Weed densities were light for all species rated. Safflower was machine harvested on September 15.

Treatment	Product Rate oz/a	Stand Density plts/ft2	Crop Inj. %	--Weed Control-- Rrpw %	Ruth %	Kocz %	Test Weight lbs/bu	Yield lbs/a	Seed Oil %OD
Spartan	2.0 PP	5.6	4	92	88	82	44.0	1222	32.6
Spartan	1.0 PE	6.1	1	78	63	17	43.5	1183	32.5
Spartan	1.5 PE	5.9	0	91	93	55	43.9	1200	32.6
Spartan	2.0 PE	5.2	1	96	93	85	43.9	1246	32.7
Spartan	2.5 PE	5.2	5	95	96	96	44.4	1249	33.0
Spartan	3.0 PE	5.8	5	99	90	98	44.5	1187	32.8
Weedy Check	0	6.0	3	0	0	0	42.7	1116	32.5
Weedfree Check	0	5.1	5	97	93	100	44.2	1160	32.6
EXP MEAN		5.6	3	81	77	67	43.9	1195	32.7
C.V. %		16.7	144	8	13	17	1.7	12	1.5
LSD 5%		NS	NS	9	18	20	NS	NS	NS

Summary: Spartan did not cause significant crop injury at any application rate so no yield differences occurred.

SPARTAN ON SAFFLOWER - TILLED RECROP

Spartan on safflower sown into tilled recrop. Williston 2005. (Riveland and Bradbury)

'Finch' safflower was planted land cropped to hrs wheat wheat in 2004 using a planter having 7 inch rows seeding at 30 lbs/a on April 29. The PPI treatments were applied on April 22 to a dry soil surface with 60 F temperature, clear sky,wind NW at 1-2 mph And RH 16%. PE treatments were applied on May 5 at 8:15 am to a dry soil surface with 45 degree F temperature, 50% RH, wind NNW at 4-8 mph, and clear sky. 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 application was 1.12 inches on May 12. The experiment was a randomized complete block design with four replications. Plots were evaluated for crop injury and weed control on August 27. Weed density averaged 1-2 plants/ft2. Safflower was machine harvested on September 15.

Treatment	Product Rate oz/a	Stand Density plts/ft2	Crop Inj. %	--Weed Control-- Ruth %	Colq %	Rrpw %	Test Weight lbs/bu	Yield lbs/a	Seed Oil %OD
Spartan	2.0 PP	5.7	7			66	44.9	632	31.2
Spartan	1.0 PE	6.3	2			93	44.2	864	31.1
Spartan	1.5 PE	5.6	3			93	44.2	905	31.6
Spartan	2.0 PE	5.9	3			96	44.6	952	31.7
Spartan	2.5 PE	5.0	7			93	44.7	912	31.7
Spartan	3.0 PE	5.1	12			99	44.6	947	32.0
Weedy Check	0	5.8	0			0	43.5	653	31.0
Weedfree Check	0	5.3	0			99	43.9	859	32.0
EXP MEAN		5.6	4			80	44.3	841	31.5
C.V. %		15.6	142			16	1.2	13	1.4
LSD 5%		NS	NS			22	NS	187	NS

Summary: Spartan applied PP yield significantly less than the the PE Spartan treatments. Spartan PE did not cause crop injury this year.

Evaluation of Everest Herbicide on Sunflower at Hettinger

Eric Eriksmoen

Pre-plant (PP) treatments were applied on April 20. 'Triumph 620CL', an oil type sunflower was seeded on May 3. Pre-emergence (PRE) treatments were applied on May 10. Post emergence (POST) treatments were applied on June 3 to 2 leaf sunflower. Treatments were applied with a tractor mounted CO^2 propelled plot sprayer delivering 10 gpa at 30 psi to 5 foot wide by 20 foot long plots. The trial was a randomized complete block design with four replications. The trial was sprayed with 24 oz/acre Roundup Ultra Max on May 10 to control weeds. Soil pH was 6.6 and soil organic matter was 3.1%. Plots were evaluated for crop injury on June 2, June 9, June 17 and on July 22. The trial was not harvested.

	Treatment	Application Timing	Product Rate	Crop Injury			
				June 2	June 9	June 17	July 22
		*	oz/A	%	%	%	%
1	Untreated			0	0	0	0
2	Everest	PP	0.3	0	2	5	4
3	Everest	PP	0.6	45	28	35	22
4	Everest	PRE	0.3	2	9	18	6
5	Everest	PRE	0.6	32	8	12	5
6	Everest + NIS	POST	0.3 + 0.25%	--	5	45	40
7	Everest + NIS	POST	0.6 + 0.25%	--	5	40	18
C.V. %				44.6	87.2	38.8	44.1
LSD .05				10	10	13	9

* Application Timing: Pre-plant (PP) = April 20, Pre-emergence (PRE) = May 10, Post emergence (POST) = June 3.

Summary

Sunflower appears to have a fair degree of tolerance to Everest Herbicide. Injury symptoms were limited to crop stunting for pre-plant and pre-emergence treatments and leaf chlorosis and crop stunting for post emergence treatments. Levels of crop injury may be too high and too inconsistent for acceptable Everest Herbicide tolerance to this crop at this time.

Sunflower response to Valor. Zollinger, Richard K., Brian M. Jenks and Jerry L. Ries. An experiment was conducted near Valley City, ND, to evaluate sunflower response to four Valor rates applied PRE at four application timings. Valor treatments were applied 3 weeks before planting (WBP), 2 WBP, 1 WBP, and PRE. 3 WBP treatments were applied May 3, 2005 at 1:00 pm with 52 F air, 48 F subsoil at a four inch depth, 21% relative humidity, 0% clouds, 1 to 3 mph N wind, dry soil surface, and moist subsoil. 2 WBP treatments were applied May 10 at 12:30 pm with 56 F air, 56 F subsoil at a four inch depth, 50% clouds, 56% relative humidity, 5 to 10 mph NW wind, moist soil surface and subsoil. 1 WBP treatments were applied May 19 at 11:30 am with 61 F air, 59 F subsoil at a four inch depth, 100% clouds, 95% relative humidity, 3 to 6 mph N wind, dry soil surface, and moist subsoil. Four rows per plot of Mycogen '8N429CL' sunflower were planted May 25, followed by the application of PRE treatments at 9:30 am with 59 F air, 56 F subsoil at a four inch depth, 90% clouds, 89% relative humidity, 2 to 6 mph N wind, moist soil surface and subsoil. Soil characteristics are 56% sand, 38% silt, 6% clay, sandy loam texture, 4.7% organic matter, and 5.0 pH. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Sunflower response to Valor has been variable across the west and midwest. Valor causes significant sunflower injury and decreased population. Valor applied up to 3 WBP was not safe to sunflower and injury increased as Valor was applied closer to planting. Spartan was safe to sunflower applied PRE. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table 1. Sunflower response to Valor, Valley City (Zollinger and Ries).

		Sunflower Injury - June 15				Stand Count - June 23			
Treatment	Rate	3 WBP	2 WBP	1 WBP	Pre	3 WBP	2 WBP	1 WBP	PRE
	(product/A)	(%)	(%)	(%)	(%)	plants/row[1]	plants/row	plants/row	plants/row
Valor	2oz	40	43	50	63	53	37	27	24
Valor	3oz	57	60	70	85	31	33	28	12
Valor	4oz	65	55	67	85	31	26	24	11
Valor	6oz	75	68	73	93	22	25	23	7
Spartan	8fl oz	-	-	-	3	-	-	-	63
Untreated		0	0	0	0	---------- 66 ----------			
LSD (0.05)		---------- 17 ----------				---------- 4 ----------			

Sunflower response to Valor herbicide. Jenks, Markle, and Willoughby. Valor was applied approximately 3, 2, and 1 week before planting (WBP) on May 10, May 19, and May 24, respectively. Preemergence (PRE) treatments were applied on May 30. On May 10, air and soil temperatures were 54 and 51 F, respectively, and relative humidity was 70%. On May 19, air and soil temperatures were 73 and 63 F, respectively, and relative humidity was 47%. On May 24, air and soil temperatures were 65 and 58 F, respectively, and relative humidity was 46%. On May 10, air and soil temperatures were 67 and 50 F, respectively, and relative humidity was 64%. All treatments were applied with a bicycle sprayer delivering 20 gpa at 30 psi through XR 80015 nozzles. Individual plots were 10 x 30 ft and replicated three times. The study was initiated on oat stubble from 2004.

The objective of this study was to evaluate sunflower tolerance to different rates of Valor herbicide. Previous studies have shown severe crop injury when applied PRE. Sunflower density was determined by counting all plants in the two middle rows. Valor applied 3 WBP reduced sunflower stand 45-85% compared to the untreated. Valor applied 2 WBP reduced sunflower stand 25-78%. Valor applied 1 WBP reduced sunflower stand 63-79%. Valor applied PRE reduced sunflower stand 31-64%. Spartan was applied PRE as a comparison to the Valor treatments. Sunflower stand in the Spartan treatment was similar to or greater than the untreated. The table below shows the total number of sunflower plants in the two middle rows and sunflower density expressed as a percent of the untreated.

Table. Sunflower response to Valor herbicide.

			Sunflower density	
Treatment	Rate	Timing	Jun 22	Jun 22
			# / 2 rows	% of untreated
Valor	2 oz	3 WBP	25	55
Valor	3 oz	3 WBP	19	42
Valor	4 oz	3 WBP	15	33
Valor	6 oz	3 WBP	7	15
Valor	2 oz	2 WBP	34	75
Valor	3 oz	2 WBP	23	51
Valor	4 oz	2 WBP	15	34
Valor	6 oz	2 WBP	10	22
Valor	2 oz	1 WBP	17	37
Valor	3 oz	1 WBP	12	26
Valor	4 oz	1 WBP	14	31
Valor	6 oz	1 WBP	10	21
Valor	2 oz	PRE	31	69
Valor	3 oz	PRE	23	51
Valor	4 oz	PRE	22	50
Valor	6 oz	PRE	16	36
Spartan	4 oz	PRE	50	111
Untreated			45	100
LSD (0.05)			12	28
CV			35	35

Volunteer canola control in sunflower. Jenks, Markle, and Willoughby. Clearfield sunflowers were seeded May 17 at 20,000 plants/A into 30-inch rows. Canola was then seeded over the top to simulate a volunteer canola (VC) situation. Herbicide treatments were applied preemergence (PRE) on May 19 with a bicycle sprayer delivering 20 gpa at 30 psi through XR 80015 nozzles. Air and soil temperatures were 83 and 72 F, respectively, and relative humidity was 29%. Postemergence treatments were applied to 3-leaf canola May 19 with a bicycle sprayer delivering 10 gpa at 40 psi through XR 8001 nozzles. Air and soil temperatures were 74 and 62 F, respectively, and relative humidity was 68%. Treatments to 6-leaf canola were applied June 23 with a bicycle sprayer delivering 10 gpa at 40 psi through XR 8001 nozzles. Air and soil temperatures were 80 and 75 F, respectively, relative humidity was 74%. Individual plots were 10 x 30 ft and replicated three times.

Spartan provided only fair control of VC. Express and Assert at 0.6 or 0.8 pt provided good to excellent VC control at either application stage. These results are generally similar to the study conducted in 2004.

Table. Volunteer canola control in sunflower.

Treatment	Rate	Timing	Volunteer canola	
			Jun 30	Jul 14
			% control	
Spartan	4 oz	PRE	80	69
Express + NIS	0.167 oz + 0.125% v/v	3-leaf	96	95
Express + NIS	0.167 oz + 0.125% v/v	6-leaf	74	91
Assert + NIS	0.8 pt + 0.25% v/v	3-leaf	92	94
Assert + NIS	0.8 pt + 0.25% v/v	6-leaf	69	87
Assert + NIS	0.6 pt + 0.25% v/v	3-leaf	89	94
Assert + NIS	0.6 pt + 0.25% v/v	6-leaf	66	83
Untreated			0	0
LSD (0.05)			7	6
CV			6	4

Clearfield sunflower kochia control. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Sibley, ND, to evaluate kochia control in from herbicide programs in clearfield sunflower. EPP (early pre-plant) treatments were applied May 3, 2005 at 12:00 pm with 52 F air, 41 F subsoil at a four inch depth, 10% relative humidity, 0% clouds, 4 to 6 mph SW wind, dry soil surface, and moist subsoil. Mycogen '8N429CL' Clearfield sunflower was planted May 6. PRE treatments were applied May 10 at 10:30 am with 57 F air, 54 F subsoil at a four inch depth, 65% relative humidity, 25 to 50% clouds, 5 to 12 mph NW wind, damp soil surface, and damp subsoil. Soil characteristics are 6.5% sand, 73.2 % sand, 20.3% clay, silt loam texture, 6.0% OM, and 6.5 pH. POST treatments were applied June 7 at 10:45 am with 60 F air, 60 F soil surface, 90% relative humidity, 100% clouds, 6 to 9 mph N wind, wet soil surface, wet subsoil, and no dew present to V2 to V4 sunflower. Weed species present were: 1 to 2 inch (1 to 5/ft^2) kochia in the plots with EPP and PRE treatments, and 2 to 8 inch (2 to 30/ft^2) kochia in the plot with POST only treatment. 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 for EPP and PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles for POST treatment. The experiment had a randomized complete block design with three replicates per treatment.

On May 27, no injury was observed on any plants. Sunflower was emerging to cotyledon stage. Kochia in untreated plots were 1 to 2 inches. Kochia in plots with 40 to 50% kochia control was 0.5 to 1 inch. Cool and wet weather had occurred since the middle of May. On June 21, there appeared to be about a 30:70 ratio of susceptible:tolerant kochia in plots which accounts for the low ratings from POST treatments. Kochia plants were either completely dead, intermediate or partly injured, or completely unaffected. There was evidence of much deer feeding as tops of sunflower plants had been removed. At July 10, the study was abandoned due to enormous amounts of kochia in the study and from deer feeding.

Table. Clearfield sunflower kochia control (Zollinger and Ries).

Treatment[1]	Rate	May 27 Kochia	June 7 Kochia	June 21 Kochia	July 5 Kochia
	(product/A)	- (%) -	- (%) -	- (%) -	- (%) -
EPP					
Prowl H_2O	42.2fl oz	43	63	63	32
Prowl H_2O+Valor	42.2fl oz+2oz	57	70	68	48
EPP/POST					
Valor/Beyond+NIS+28% N	2oz/4fl oz+0.25% v/v+2.5% v/v	43	33	72	57
Prowl H_2O+Valor/ Beyond+NIS+28% N	42.2fl oz+2oz/ 4fl oz+0.25% v/v+2.5% v/v	50	67	84	75
PRE					
Prowl H_2O	42.2fl oz	43	40	25	13
Prowl H_2O+Spartan	42.2fl oz+1.5fl oz	99	96	93	85
Prowl H_2O+Spartan	42.2fl oz+3fl oz	99	99	99	99
PRE/POST					
Prowl H_2O/Beyond+NIS+28% N	42.2fl oz/4fl oz+0.25% v/v+2.5% v/v	43	83	92	83
Prowl H_2O+Spartan/ Beyond+NIS+28% N	42.2fl oz+1.5fl oz/ 4fl oz+0.25% v/v+2.5% v/v	99	99	99	99
Prowl H_2O+Spartan/ Beyond+NIS+28% N	42.2fl oz+3fl oz/ 4fl oz+0.25% v/v+2.5% v/v	99	99	99	99
Prowl H_2O+Spartan/ Beyond+NIS+28% N	42.2fl oz+3fl oz/ 8fl oz+0.25% v/v+2.5% v/v	99	99	99	99
Spartan/Beyond+NIS+28% N	1.5fl oz/4fl oz+0.25% v/v+2.5% v/v	99	91	95	93
Spartan/Beyond+NIS+28% N	3fl oz/4fl oz+ 0.25% v/v+2.5% v/v	99	99	99	99
POST					
Beyond+NIS+28% N	4fl oz+0.25%v/v+2.5% v/v			30	35
Untreated		0	0	0	0
LSD (0.05)		6	15	10	15

[1]NIS = nonionic surfactant = R-11; 28% N = 28-0-0.

Weed control programs in Clearfield sunflower. Jenks, Markle, and Willoughby. Clearfield sunflowers were seeded May 31 into 30-inch rows. Herbicide treatments were applied early preplant (EPP) on May 10, and preplant (PP) on May 24 at 20 gpa through XR 80015 nozzles. On May 10, air and soil temperatures were 52 and 51 F, respectively, and relative humidity was 75%. On May 24, air and soil temperatures were 73 and 60 F, respectively, and relative humidity was 32%. Postemergence were applied on July 1 to 10 to 12-inch sunflower with a bicycle sprayer delivering 10 gpa at 40 psi through XR 8001 nozzles. Air and soil temperatures were 67 and 61 F, respectively, and relative humidity was 68%, Individual plots were 10 x 30 ft and replicated three times.

Herbicide treatments caused minimal crop injury except for Valor, which reduced sunflower stand almost 50%. Valor provided excellent weed control, but caused excessive crop injury. Combinations of Prowl and/or Spartan followed by Beyond provided better weed control than Prowl alone or Beyond alone. Prowl applied PP provided better weed control than Prowl EPP. Statistically, there were no significant yield differences, which may be due, in part, to a heavy October snowstorm that delayed harvest and resulted in some stem breakage and possible yield loss.

Table. Weed control programs in Clearfield sunflower.

		Sunflower			Kochia		Prpw		Wibw		Biww	Yield	TW
Treatment[a]	Rate	Jun 22	Jun 22	Aug 3	Jun 24	Aug 3	Jun 24	Aug 3	Jun 24	Aug 3	Aug 3	Oct 24	Oct 24
		no.[b]	%[c]	% inj	% control							lb/A	lb/bu
PP													
Prowl	2.6 pt	55	93	0	95	74	95	73	85	73	0	1857	29.8
Prowl + Spartan	2.6 pt + 1 oz	56	95	0	100	100	99	99	99	95	42	2021	30.0
Prowl + Spartan	2.6 pt + 2 oz	57	97	0	98	100	98	97	100	97	57	1863	30.0
PP/POST													
Prowl/ Beyond	2.6 pt/ 4 fl oz	55	93	3	98	84	94	99	82	81	58	1756	29.7
Prowl + Spartan/ Beyond	2.6 pt + 1 oz/ 4 fl oz	56	95	3	98	98	98	100	100	100	73	2159	29.6
Prowl + Spartan/ Beyond	2.6 pt + 2 oz/ 4 fl oz	60	103	3	98	100	99	100	100	97	75	1804	29.9
Prowl + Spartan/ Beyond	2.6 pt + 2 oz/ 8 fl oz	55	94	7	100	100	99	100	99	97	91	1753	29.5
Spartan/ Beyond	1 oz/ 4 fl oz	57	97	3	98	100	95	99	90	83	77	1947	29.6
Spartan/ Beyond	2 oz/ 4 fl oz	56	95	2	100	100	99	100	99	91	87	1725	29.6
EPP													
Prowl	2.6 pt	55	93	0	90	75	89	73	63	33	0	2090	29.7
Prowl + Valor	2.6 pt + 2 oz	32	54	33	100	93	99	92	100	91	100	1650	29.0
EPP/POST													
Prowl + Valor/ Beyond	2.6 pt + 2 oz/ 4 fl oz	33	56	42	99	93	99	100	99	97	95	1577	28.8
Valor/ Beyond	2 oz/ 4 fl oz	34	57	37	100	96	99	100	96	94	93	1273	28.8
POST													
Beyond	4 fl oz	56	95	4	--	52	--	87	--	13	49	2014	29.5
Untreated		59	100	0	0	0	0	0	0	0	0	1715	29.6
LSD (0.05)		8	14	5	5	8	4	6	14	19	17	NS	NS
CV		10	10	31	4	6	3	4	10	15	17	18	1.8

[a]*Prowl = Prowl H2O; Beyond was applied with NIS and 28% N at 0.25% v/v and 2.5% v/v, respectively.*
[b]*Sunflower density reported in number of sunflower plants in two 30-foot rows.*
[c]*Sunflower density reported as percent of untreated check.*

Weed management in direct-seeded imidazolinone-resistant sunflower. Gregory J. Endres and Blaine G. Schatz. (Carrington Research Extension Center, North Dakota State University, Carrington, ND 58421) Weed control and crop response were investigated with selected soil-applied herbicides in direct-seeded, imidazolinone-resistant (Clearfield™) sunflower. The trial had a randomized complete block design with three replicates. The experiment was conducted on a loam soil with 6.7 pH and 2.9% organic matter at the NDSU Carrington Research Extension Center. Herbicide treatments were applied to 10 by 30 ft plots with a CO_2 pressurized hand-held plot sprayer at 17 gal/A and 30 psi through 8002 flat fan nozzles. Preplant (PP) fall sulfentrazone treatments were applied October 25, 2004, on a moist soil surface with 47 F, 71% RH, 15% clear sky, and 11 mph wind. Early PP spring treatments were applied April 30, 2005 on a dry soil surface with 34 F, 59% RH, 100% cloudy sky, and 13 mph wind. Rainfall totaled 1.22 inches during May 1 to 8. PP spring treatments were applied on May 25 on a dry soil surface with 62 F, 37% RH, 100% cloudy sky, and 9 mph wind. Rainfall totaled 0.83 inches during May 26 to June 5. Glyphosate at 0.75 lb ae/A + AMS at 1% v/v was applied across the trial on June 3. Mycogen '8N429CL' was direct-seeded in wheat stubble in 30-inch rows on June 10 and hand-thinned to 20,000 plants/A on July 6. PRE treatments were applied on a moist soil surface on June 13 with 60 F, 86% RH, 100% cloudy sky, and 12 mph wind. Rainfall totaled 1.64 inches during June 13 to 26. POST imazamox was applied on July 2 with 68 F, 83% RH, 90% clear sky, and 9 mph wind to V4- to V6-stage sunflower, tillering yellow foxtail, 2- to 5-inch tall common lambsquarters, 1- to 6-inch tall redroot pigweed, and 0.5- to 1-inch tall dandelion. Weed densities on July 5 were: yellow foxtail = 25 plants/ft^2, common lambsquarters = 1 plant/ft^2, redroot pigweed = 4 plants/ft^2, and dandelion = 1 plant/ft^2. The trial was harvested with a plot combine on October 26.

Adequate rainfall occurred for timely activation of soil-applied herbicides. Visual evaluation of soil-applied treatments on July 1 (before POST application of imazamox) indicated 79 to 81% control of yellow foxtail with pendamethalin (Table 1). Flumioxazin and carfentrazone/sulfentrazone controlled dandelion 81 to 90% and redroot pigweed 93 to 99%. Except for dandelion, weed control generally improved with imazamox following soil-applied treatments. Dandelion was suppressed (40 to 73% control) while redroot pigweed control was excellent (89 to 99%) with all treatments when evaluated on August 5. Treatments that included sulfentrazone provided 97 to 99% common lambsquarters control. No crop injury was detected in the trial (data not shown). Seed yield was significantly greater with all herbicide treatments compared to the untreated check (Table 2). Seed yield with fall-applied sulfentrazone was lower compared to other treatments. Yield greater than 1500 lb/A was achieved with PP spring-applied sulfentrazone, and flumioxazin.

Table 2. Direct-seeded imidazolinone-resistant sunflower response to herbicides.

Herbicide[1]			Seed	Test
Treatment	Rate	Timing	yield	weight
	ai/A		lb/A	lb/bu
untreated check	x	x	503	29.3
Sulfentrazone/Imazamox	0.188/0.031	PPF/POST	1086	28.2
Sulfentrazone/Sulfentrazone/Imazamox	0.094/0.094/0.031	PPF/PPS/POST	1162	28.7
Sulfentrazone/Imazamox	0.188/0.031	EPPS/POST	1382	28.6
Sulfentrazone/Imazamox	0.188/0.031	PPS/POST	1575	29.0
Flumioxazin/Imazamox	0.063/0.031	EPPS/POST	1519	28.4
Flumioxazin/Imazamox	0.063/0.031	PPS/POST	1540	28.9
Pendamethalin/Imazamox	1.5/0.031	EPPS/POST	1263	28.6
Pendamethalin/Imazamox	1.5/0.031	PPS/POST	1490	28.4
Carfentrazone+NIS/Sulfentrazone/ Imazamox	0.008+0.25%/0.188/ 0.031	PPS/PRE/POST	1337	28.9
Imazamox	0.031	POST	1460	28.3
LSD (0.05)			306	NS

[1]Treatments: All imazamox treatments include NIS at 1% v/v and UAN at 2.5% v/v. Pendamethalin=Prowl H_20; NIS=Preference, a nonionic surfactant from Agriliance, at 0.25% v/v. Timing: PPF=October 25, 2004; EPPS=April 30, 2005; PPS=May 25; PRE=June 13; POST=July