1996
NORTH DAKOTA
Weed Control Research

WEED SCIENCE

BIOLOGICAL

CULTURAL

CHEMICAL

NDSU

Weed Research Projects, Department of Crop and Weed Sciences
NORTH DAKOTA STATE UNIVERSITY
Fargo, N.D. 58105

NOT FOR PUBLICATION

SUMMARY OF 1996
WEED CONTROL EXPERIMENTS

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WHEAT

OAT

ALFALFA

CANOLA

HERBICIDE APPLICATION TECHNOLOGY

Green section cont. General weed control in small grains, alfalfa, canola, and application technology

HERBICIDE APPLICATION TECHNOLOGY cont.

Blue section: Weed control in corn, potato, soybean, drybean, and sunflower.

CORN

Blue section cont.: Weed control in corn, potato, soybean, drybean, and sunflower.

POTATO

SOYBEAN

DRYBEAN

SUNFLOWER

CLIMATIC DATA-, Carrington 1996																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1		.01				.01	24	18	47	24	71	50	77	57E	77	60	77	56
2		.01	.04		.01		23	18	50	24	52	46	81	54	79	58	84	52
3		.02			.02	.03	22	13	52	22	68	46	73	57	75	58	82	56
4					.15		24	2	54	27	71	42	81	55	77	58	81	50
5			.17	1.67			32	4	54	36	76	49	82	64E	82	51	95	66
6				.01		.14	27	2	51	33	62	48	74	54	74	54	70	50
7							35	18	53	40	74	42	75	50	76	51	75	43
8							43	30	56	44	81	51	65	49E	73	46	82	49
9							54	31	46	28	88	56	68	45	73	44	85	50
10				.50	.07		65	34	46	25	90	56	72	48	83	55	71	38
11				.02			36	28	52	29	90	56	73	50	88	62	61	35
12		.01					36	27	55	35	81	52	72	50	80	55	60	44
13				.41			41	26	63	33	70	58	76	55E	78	56	68	39
14		.10	.02	.25			44	32	66	39	85	52	76	54E	76	54	68	35
15		.01					44	29	74	44	83	63	76	52E	80	48	71	38
16		.59					53	27	73	41	80	56	89E	59E	90	58	71	36
17		.17		1.11			64	29	69	46	83	48	77E	61E	91	65	67	47
18				.10	.01	.01	62	38	75	50	81	60	94	63E	83	61	68	42
19	.03		.22		.49	.16	38	30	71	43	71	51	78	64	72	52	63	52
20	.02			.72		.18	38	29	69	39	82	50	79	61	80	49	54	49
21					.05		38	28	72	38	72	47	77	55	77	52	62	45
22				.03			51	27	61	34	60	41	72	50	79	46	64	41
23			.61	.25		.01	55	35	60	32	60	48	73	53	87	55	59	37
24	.12						59	34	63	44	64	48	70	53	94	57	61	33
25	.04		.94				44	23	63	38	69	52	76	50	74	49	63	30
26				.24		.42	37	22	70	39	84	57	69	54	75	43	48	44
27	.03					.12	28	23	70	40	90	70E	70	53	82	46	55	36
28	.06		.20	.44		.03	48	24	74	32	89	72	75	50	86	57	50	36
29				.01		.02	57	22	74	32	80	60	71	51	84	58	49	28
30			.10				56	28	73	40	82	54	76	48	88	66	61	35
31		1.00							68	38			75	48	87	59		

CLIMATIC DATA-, Casselton 1996

	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1							37	0	61	30	77	49	76	61	80	52	86	60
2			T			2.8	37	26	61	27	57	51	76	61	81	55	87	66
3							37	26	52	27	68	49	82	54	82	56	89	60
4							27	15	56	34	74	37	84	37	86	70	84	58
5		.42			.80		33	17	61	39	77	44	78	54	77	62	87	58
6		.03					40	23	45	34	82	48	83	55	86	64	93	65
7		T	.32				40	25	52	36	68	46	85	57	82	55	75	54
8		.12					30	32	55	42	82	48	81	53	80	48	75	44
9		T		T			45	31	55	33	86	56	84	53	80	46	79	55
10		T			T		56	33	42	28	89	48	71	48	77	55	85	55
11	T						68	34	50	29	96	65	76	46	83	54	78	43
12	T						38	30	52	33	87	51	79	48	84	55	64	43
13		T		.18	.03		40	26	56	32	86	55	83	57	86	65	69	38
14		T					46	31	64	35	87	62	76	54	84	56	70	34
15		.10	.49				45	29	53	48	85	60	80	53	84	48	70	37
16							49	27	83	49	81	55	82	52	82	56	72	46
17		.52					51	29	76	50	83	58	83	57	84	58	75	44
18		.77					62	35	74	55	85	56	91	61	89	61	70	42
19			T	.04		.14	67	37	77	56	77	47	85	61	81	65	73	42
20	T		T		.12	.22	38	31	76	48	83	54	85	63	78	46	73	48
21		.03				.33	41	29	73	48	73	56	85	61	81	47	58	53
22							42	29	74	39	75	50	80	66	87	52	62	42
23							48	28	63	41	72	48	88	56	84	51	68	47
24	T		.75				60	33	47	59	60	55	78	54	85	57	68	35
25	T						58	54	69	43	67	50	78	60	95	61	67	36
26	.02		.51	.18		.81	50	27	66	43	78	54	75	53	80	46	62	38
27						.33	43	30	75	46	96	71	80	52	78	48	51	46
28						.71	47	30	71	40	73	71	81	60	81	50	50	39
29				.76			55	28	76	42	93	81	82	57	90	50	57	33
30				.23			58	29	77	47	76	61	75	53	88	58	55	37
31		.60							63	49			75	52	89	60		

CLIMATIC DATA- Crookston, 1996																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	T		.02			.16	29	18	50	27	77	46	79	51	79	60	83	59
2							32	19	52	28	63	42	83	56	81	65	85	59
3	.02				.02	T	27	8	55	29	65	36	83	55	80	67	84	54
4					.07		27	7	58	41	73	49	85	63	80	63	83	56
5			.34	.10			37	13	60	32	69	55	88	62	84	65	91	69
6		.04	.02			.13	28	14	58	40	65	47	78	51	81	58	75	51
7		.09		T			37	20	52	42	78	51	81	53	79	53	74	43
8				.22			43	31	53	31	82	57	69	47	74	46	78	53
9						.12	49	33	45	28	89	56	72	45	73	52	86	56
10							55	34	48	28	90	63	77	57	80	58	70	45
11				.27			40	27	50	25	92	65	78	57	83	57	65	48
12				.02			37	24	58	38	83	52	73	53	85	62	66	37
13							44	28	64	42	85	60	78	51	82	56	68	32
14				T			43	32	53	49	87	65	80	54	78	48	67	38
15			.03				41	28	75	48	82	60	80	53	82	55	71	45
16		.35		.04			48	32	80	51	83	56	88	61	85	61	70	43
17		1.40		.06			63	39	77	56	85	63	82	64	87	62	69	41
18		1.16		3.12			62	37	76	56	84	63	80	64	82	66	74	45
19	.04	.13	T		.22		38	29	73	52	77	47	82	60	76	46	75	49
20				.57		.18	40	30	68	48	85	55	73	59	80	63	60	51
21		T		.28	.02	.23	40	26	72	41	74	48	83	55	80	51	58	45
22							44	28	57	45	61	47	75	58	81	52	62	41
23	.04		.26	.08		T	52	30	66	44	60	50	75	56	83	57	61	33
24	.02			.06			52	33	67	42	66	45	72	52	94	54	64	35
25	.32		.31				47	25	69	49	75	52	71	50	76	45	68	37
26						.52	38	24	72	46	87	74	78	58	75	48	54	47
27				.70		.64	46	30	74	43	94	77	71	57	80	57	50	42
28			.28				51	30	75	44	92	68	70	57	88	60	52	32
29				.05			55	31	77	47	88	59	73	52	87	60	51	35
30							57	31	77	56	82	58	77	51	87	64	60	43
31		.47							62	52			78	54	88	66		

CLIMATIC DATA- Dickinson, 1996																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1			.03				29	17	59	28	66	42	85	55	88	57	80	56
2		.33	.05		1.04		26	18	47	33	62	46	87	60	91	56	84	45
3		.06		.17	.20		23	13	36	31	69	40	84	64	80	60	83	50
4		.10			.01		31	15	40	31	77	51	83	60	77	58	91	56
5			.05	.01			41	15	55	32	72	51	84	65	85	53	80	60
6		.40	.02	.01			44	26	43	39	69	50	81	53	69	49	72	48
7		.06					53	29	48	36	73	44	81	47	77	47	77	44
8		.01					56	31	56	37	87	50	71	46	80	47	83	46
9		.05			.05		76	33	37	28	92	57	75	43	76	54	84	52
10	.01	.01	.02				79	37	40	28	85	62	89	55	88	51	73	46
11	.09	.04	.29				37	23	50	33	89	56	78	50	96	60	67	35
12	.03	.01					45	21	55	36	76	55	75	54	98	61	71	40
13	.05						37	25	63	33	78	56	79	47	84	54	74	56
14		.07	.41				53	30	76	45	82	58	82	55	83	53	76	51
15		.01				.02	56	31	74	52	78	58	90	50	88	55	61	56
16		.09					65	33	67	51	81	55	89	64	94	60	74	55
17		.01		1.15		.44	71	41	66	49	82	59	75	64	96	65	61	54
18			.05		.01	1.04	62	38	75	46	83	54	86	62	79	61	54	44
19			.10		.01	.05	45	28	69	42	69	47	84	66	74	53	52	42
20				.76		.62	54	23	68	40	81	43	81	60	94	55	54	47
21			.01			.01	46	25	68	40	73	55	79	53	81	55	61	41
22			.37				58	22	66	40	59	47	77	49	86	45	60	34
23		.26	.03			.01	66	32	52	42	68	50	77	54	90	51	56	36
24	.05	.04					73	43	58	42	74	43	74	50	100	53	57	33
25	.11		.06				47	31	57	43	65	55	79	49	81	54	54	32
26	.04	.02	.03				54	28	60	44	84	58	78	56	82	52	50	37
27		.01		.04			57	29	65	43	94	69	78	50	96	58	57	41
28			.03				51	30	68	36	84	62	79	55	96	64	57	37
29	.02		.01		.31	.03	59	25	66	42	78	54	76	50	92	60	54	31
30	.04	.04					54	36	73	51	86	47	79	51	89	60	66	36
31		.90		.64					63	45			84	60	87	61		

CLIMATIC DATA- Fargo, 1996																			
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1				.01		1.18	32	25	57	33	79	53	84	60	82	60	85	64
2						.06	40	29	52	27	62	51	83	54	84	62	86	63
3							35	23	57	26	66	44	82	61	86	70	83	63
4					1.90		29	19	62	31	73	39	86	59	82	68	86	60
5		.21	.05	.11			39	23	55	40	81	55	91	65	87	66	91	73
6		.02	.20			.11	36	24	55	39	68	51	78	59	81	64	79	56
7			.04			.01	40	27	57	42	77	57	82	55	80	57	73	55
8		.12					48	34	58	48	84	52	70	52	76	52	79	50
9							58	34	50	34	89	58	73	47	76	48	85	58
10				.04			68	38	50	30	91	60	80	52	82	61	77	48
11				.30			40	34	51	29	94	65	84	61	84	61	66	41
12	.01						40	32	58	38	86	59	73	58	89	61	67	50
13							47	27	65	37	82	52	77	56	85	63	69	47
14		.06					48	32	54	48	89	62	81	54	77	56	68	39
15			.11				47	32	83	53	81	65	83	53	83	51	71	41
16		.08					51	26	78	52	83	62	92	62	87	59	74	46
17		1.85		.05			64	40	75	61	84	60	85	68	87	62	69	52
18							68	43	77	58	82	60	82	66	82	64	72	50
19					.03		47	34	76	52	79	52	82	65	77	55	72	52
20		.04				.17	41	33	72	50	83	54	80	63	82	50	60	54
21			.01			.14	43	32	75	50	77	54	88	60	87	64	60	51
22							47	29	62	40	66	44	77	56	82	50	68	44
23			.27				61	34	66	50	61	56	79	57	85	57	64	45
24			.01	.05			60	36	68	51	65	55	73	54	95	60	66	38
25	.11		.34			.22	52	32	66	47	79	53	78	50	79	57	63	37
26				.28		.63	41	28	73	46	94	72	82	51	77	45	53	48
27				.29		.75	48	27	71	47	97	74	76	63	80	58	51	46
28			.20	.07		.01	55	34	75	41	94	78	76	61	86	61	56	41
29				.21			57	29	74	45	89	68	74	56	88	65	55	33
30							60	27	78	53	84	57	78	53	88	64	64	42
31		.25							65	55			79	54	88	65		

CLIMATIC DATA- Hettinger, 1996																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1			.02				31	18	57	28	68	42	88	52	89	54	81	50
2		.10					28	22	48	37	65	43	85	59	89	61	82	44
3		.45		.50			25	16	37	32	69	41	81	62	83	62	86	50
4		.18	.73				27	15	35	31	74	48	82	57	78	54	94	58
5		.01	.17	.02		.04	43	12	55	29	71	51	83	64	87	45	83	61
6		.35		.13	.01	.26	49	25	47	38	65	48	76	58	71	50	70	50
7		.13					55	29	49	38	69	39	81	50	81	47	75	42
8							57	28	57	42	81	48	70	45	88	42	85	45
9		.12			.50		74	31	42	28	85	52	73	42	84	52	86	45
10		.10	.03				78	41	34	28	83	57	89	55	86	49	76	47
11			.04				41	27	49	29	85	56	78	53	94	57	68	36
12	.08						40	20	55	37	74	52	76	50	97	52	70	39
13	.17	.01					32	25	61	34	78	52	78	45	86	57	74	46
14	.07	.21	.01				52	28	76	43	84	57	80	49	87	51	76	50
15			.01				56	31	77	49	78	57	89	51	85	58	59	55
16		.59		.01			63	31	73	53	78	55	92	62	95	59	73	54
17		.06		.01		.97	70	42	64	52	80	59	78	59	93	64	61	52
18		.35			.01	1.60	61	38	72	46	81	59	86	58	82	61	54	43
19			.27			.15	51	30	67	42	69	51	90	66	75	52	49	42
20		.03				.60	58	24	65	40	77	45	84	61	94	53	54	46
21		.01	.17				48	24	67	40	72	52	80	50	82	49	62	38
22		.01	.04				55	20	62	40	58	51	79	47	84	40	61	33
23		.49	.01				66	29	50	43	70	49	79	49	92	55	56	32
24	.07	.20					74	42	56	45	73	45	75	47	98	56	59	32
25	.19	.07					45	30	52	43	76	57	81	44	83	57	51	32
26	.04	.60		.01			58	28	50	43	88	60	79	56	80	49	50	34
27		.13					56	29	62	43	93	69	79	51	95	56	57	40
28			.55				49	26	62	36	85	61	84	56	94	63	72	44
29	.02				.05		58	23	66	43	77	56	78	48	90	56	57	41
30	.02	.21					53	33	72	51	86	47	77	44	88	55	70	38
31		.20		.14					60	44			85	56	86	59		

CLIMATIC DATA- Minot, 1996																			
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1			.16				23	18	58	27	69	49	78	56	82	59	83	54
2			.04		.08		20	14	53	34	53	44	83	58	81	59	83	50
3							20	7	53	26	72	43	82	64	86	62	80	47
4			.08		.47	.08	30	2	55	28	76	49	84	62	76	57	82	45
5						.04	38	8	53	36	74	54	80	65	82	57	82	57
6		.08	.04			.08	28	11	50	36	73	50	76	56	71	51	71	47
7		.20		.12			37	23	60	35	79	49	77	52	75	51	78	46
8		.08					41	27	55	35	89	56	67	49	74	49	82	51
9							53	29	41	28	96	63	74	46	77	46	84	51
10			.04				72	34	46	27	86	64	80	52	88	52	68	40
11			.08				37	27	53	30	91	58	70	51	89	62	59	37
12				.12			37	25	55	37	78	56	73	56	87	56	63	42
13							44	25	64	30	79	55	78	54	79	55	72	49
14		.04					48	32	75	48	85	56	78	56	77	51	73	41
15		.04					48	30	69	53	81	59	83	55	84	53	74	46
16		.16					60	28	70	51	82	54	91	59	93	60	71	44
17	.04	.04		.59		.04	73	43	67	54	85	54	80	68	98	60	69	52
18		.04				.08	58	34	73	45	82	62	82	63	84	64	67	51
19		.04	.28			.08	35	31	66	47	70	56	80	67	75	52	56	48
20	.04			1.42		.04	39	29	69	44	79	49	78	61	87	52	54	50
21						.12	44	28	68	40	70	47	74	54	80	49	59	46
22			.28				55	24	62	34	61	40	72	52	84	46	62	40
23			.59				58	32	58	40	58	48	72	56	89	60	58	40
24	.12		.04				59	38	62	42	65	49	70	52	99	55	60	36
25	.04		1.54				47	27	64	42	60	58	77	51	77	50	59	39
26				.16			39	24	71	35	71	57	65	59	82	48	53	37
27	.08						36	29	72	42	91	64	71	57	89	56	59	40
28						.16	52	25	74	42	83	68	78	52	90	58	51	37
29				.04		.04	61	30	74	40	79	60	72	52	90	59	45	28
30		.04					57	33	74	49	83	53	76	50	92	60	48	39
31		.08							69	48			75	52	89	64		

CLIMATIC DATA-, Olivia MN 1996																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1			.07				38	21	62	31	73	57	85	64	80	56	81	60
2							42	29	59	31	78	53	79	62	82	59	79	64
3		.55	.18				48	29	53	32	64	50	86	60	79	62	82	62
4				T			34	23	53	25	61	40	80	65	78	65	81	60
5		.21	.21		.44		37	21	59	42	72	42	84	62	80	65	83	60
6		T	.09	T			44	21	47	35	75	51	87	71	83	68	84	62
7		.10	.50	.74	1.21		45	31	44	37	73	51	79	55	89	61	83	58
8		.42				.16	40	27	58	42	79	54	83	57	78	58	68	58
9				T			48	28	56	49	82	58	72	51	78	51	74	48
10		.21			T	.24	54	32	59	41	86	57	76	48	76	51	80	50
11					.30		70	41	60	36	88	60	82	52	69	58	81	47
12	T			T			64	35	60	32	92	60	76	56	77	55	63	45
13	.08		.14		T		35	22	54	35	93	61	73	55	79	55	66	40
14		.33					38	28	63	42	86	61	81	53	85	58	67	33
15	.11	.54		.18			38	27	52	46	89	70	81	55	70	51	69	33
16			.81				53	27	68	51	86	64	83	60	76	53	70	43
17			.90				55	33	70	57	69	62	86	65	78	53	71	46
18		.03	.02	.05			70	33	92	58	66	59	90	66	77	55	69	42
19	.06	.89			T		61	34	77	61	69	61	85	61	78	58	71	44
20			.02		.22	.31	56	33	75	55	71	57	77	57	78	53	70	45
21		T	.02			.11	48	31	74	47	81	57	77	64	79	59	59	53
22	T	T	.03		1.30	.29	56	29	74	47	81	52	81	59	85	63	63	44
23		.08	.24	T		.02	47	24	73	48	71	56	80	53	78	53	69	46
24	T	T		.02			63	37	67	49	76	55	81	55	76	53	65	37
25	.02	T		T			72	44	65	49	74	54	72	59	78	59	67	40
26	.05	.11			.64	.25	58	28	53	46	87	60	78	51	87	58	64	48
27						.03	47	31	57	48	94	72	82	64	78	51	54	45
28		.46		2.00		.05	55	30	57	45	94	74	77	61	78	55	54	40
29				.26		.04	62	35	73	45	97	79	74	58	78	58	67	34
30				.04			61	27	76	44	89	61	73	50	81	57	56	38
31				T					77	52			75	52	79	51		

CLIMATIC DATA- Prosper, 1996																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1				.04		2.23	30	22	54	33	77	49	82	58	80	53	86	62
2						.01	35	26	51	30	62	51	83	53	82	57	86	60
3							30	20	55	30	67	43	79	57	85	66	84	61
4					.71		27	18	60	31	75	37	84	53	82	65	86	57
5		.22	.05	.07	.01		37	22	56	36	80	54	87	61	85	60	92	70
6		.03	.30	.01		.19	34	22	52	34	66	49	76	57	78	60	77	55
7		.01					37	26	55	41	78	48	80	51	78	53	74	49
8		.11		.01			45	32	55	46	83	48	69	50	75	49	80	45
9				.01			56	32	48	31	88	52	72	50	74	44	86	55
10				.08			64	33	48	29	91	51	77	45	82	54	76	47
11	.01			.33			39	32	51	32	96	59	79	58	83	55	66	41
12							38	30	56	34	86	64	72	57	87	53	69	45
13							45	28	64	32	85	55	75	57	81	58	69	41
14		.01		.01			46	32	53	47	89	58	79	54	76	52	68	31
15			.46				46	32	79	52	81	63	80	52	83	49	69	34
16		.13					49	29	77	49	84	60	88	55	86	51	72	46
17		1.60		.17			61	36	73	58	84	59	82	62	88	58	70	44
18		.01					64	41	76	56	82	56	80	66	81	62	73	39
19			.01		.03	.02	44	33	74	50	78	51	81	61	77	48	72	49
20		.06				.24	39	32	70	49	84	46	75	62	82	43	58	53
21						.05	40	32	72	48	77	53	84	56	85	59	60	50
22							47	28	60	42	67	47	75	51	84	47	67	40
23			.66				57	32	63	46	60	52	76	53	85	47	62	43
24			.01				57	32	67	46	66	52	72	53	94	54	67	34
25	.04		.45		.01	.19	51	32	65	43	76	51	79	51	77	50	63	35
26				.26		.69	40	29	73	44	90	70	80	49	77	44	50	47
27				.04		.72	46	29	71	46	93	72	74	60	82	44	51	44
28			.15	.11			52	33	76	40	91	75	73	57	86	58	55	39
29				.09			55	31	76	44	87	63	73	56	89	58	54	32
30							57	33	76	48	82	57	76	50	88	56	64	37
31		.52							63	54			80	50	90	60		

CLIMATIC DATA- St. Thomas 1996																			
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1				.05		.55	24	2	49	32	76	53	78	59	81	51	84	64
2						.01	24	14	50	28	64	45	85	51	82	58	83	57
3							25	12	52	27	68	43	83	56	81	66	82	57
4					.02		30	4	57	28	75	44	85	57	79	64	77	51
5			.11	.01		.35	34	11	62	36	68	54	83	63	86	60	90	62
6			.08				30	3	57	34	68	53	79	60	78	58	77	54
7				.05			32	1	55	38	79	50	79	51	77	56	75	49
8				.04			37	30	57	32	83	52	67	51	71	51	82	49
9							43	30	46	29	89	59	74	48	72	43	81	53
10				.21		.05	47	34	48	23	91	59	77	46	84	48	67	49
11				.15			34	27	53	26	92	60	72	57	84	58	63	48
12			.01	.02			32	24	59	29	85	65	73	59	80	50	66	44
13				.55			40	24	66	30	84	49	82	53	78	55	68	35
14				.02			42	31	53	46	87	53	77	54	76	54	67	31
15		.05					39	31	68	47	86	63	80	52	83	50	71	34
16		1.12		.01			47	28	72	46	82	54	86	57	90	54	68	38
17		1.97		.30			57	37	63	55	84	55	82	66	94	56	70	46
18		.01		.63			56	38	72	54	84	59	81	66	83	62	74	40
19			.03		.16		41	30	64	52	74	49	80	61	72	51	74	51
20		.01		.83		.15	38	28	68	50	80	52	76	59	82	48	59	47
21		.01		.02	.22		38	27	70	44	72	51	82	56	74	57	58	52
22						.01	46	27	56	40	60	45	75	54	81	52	64	44
23			.48			.10	43	32	65	43	56	46	73	57	87	54	61	41
24	.17			.02			46	31	65	39	68	50	72	57	95	52	60	34
25	.15		.47				41	30	70	43	65	48	76	54	73	48	66	33
26				.06		1.13	36	28	72	50	78	58	72	51	76	43	51	48
27				.13		.53	44	27	74	49	92	65	68	58	83	46	50	44
28			.14			.01	51	31	76	43	91	68	71	53	86	56	54	38
29							56	31	76	48	87	65	75	54	86	55	49	33
30						.02	55	33	78	51	81	57	76	54	90	53	49	41
31		.70							66	55			78	48	91	62		

CLIMATIC DATA- Williston, 1996

	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1			.12			.14	27	20	59	33	68	47	84	57	88	58	81	52
2		.12			.06		25	16	46	37	64	45	91	61	92	62	79	50
3				.77			23	7	52	34	72	41	87	65	80	60	77	50
4			.24	.01	.05	.19	34	6	46	29	80	53	90	65	78	58	77	52
5			.04	.02			43	16	55	26	72	52	81	63	85	55	73	55
6					.02		44	26	53	36	74	52	81	55	73	54	70	48
7		.20					52	28	57	33	79	51	72	50	78	55	82	45
8							58	33	50	31	93	52	69	47	79	46	79	48
9							77	34	45	28	97	62	77	45	77	54	82	55
10			.08				73	37	44	28	88	62	85	58	90	54	68	45
11			.75	.01E			42	28	53	34	89	54	72E	51E	92	60	66	35
12							44	26	57	30	77	50	75E	54E	98	63	72	41
13	.08			.02			47	28	65	33	76	59	79	50	84	56	77	59
14	.12						53	30	76	45	84	59	82	53	83	52	77	52
15						.25	56	33	71	47	80	56	90	53	88	57	62	55
16		.16					72	34	65	53	83	59	94	63	94	59	72	53
17	.08	.04		.47	.06	.06	70	43	69	50	85	63	86	62	99	64	62	53
18				.16	.17	.96	60	36	74	42	77	58	84	60	84	57	54	50
19		.04		.19E			42	31	66	42	71	51	84E	64E	76	51	59	44
20		.04		.78E		.05	40	30	68	44	78	44	78	59	87	54	57E	44E
21			.04	.04		.02	48	27	66	42	72	50	74	54	74	56	58E	42E
22			.71	.36		.01	57	28	64	37	67	46	76	52	85	46	58E	37E
23		.04	.16			.09	64	33	54	43	63	49	76	55	88	49	57E	38E
24	.04	.04					64	44	59	42	70	45	75	51	97	61	58	33
25	.08		.24				47	32	64	45	68	56	80	55	82	53	56	37
26	.04		.05	.12		.05	51	30	68	48	71	61	73	59	87	55	51	31
27	.04			.12			41	31	72	48	90	65	79	53	92	58	56	35
28				.01		.01	53	25	71	42	84	64	78	54	98	58	48	36
29							59	29	68	43	79	56	76	53	93	64	47	30
30	.08	.12					56	36	68	51	84	54	79	53	93	64	55	36
31				.45					72	46			79	59	93	65		

SOIL TEST RESULTS AT VARIOUS WEED EXPERIMENT LOCATIONS						
	Soil texture	Organic matter	pH	lb/A N	PPM P	PPM K
Buffalo, ND-Railroad	Loam	3.8	8.0	4	8	355
Camp Grafton, ND	Loamy sand	2.8	7.0	3	3	98
Carrington, ND	Loam	3.6	7.2	Fertilized by test		
Chaffee, ND	Fine sandy loam	6.7	7.4	20	36	950
Crookston, MN	Silty clay loam	3.1	7.9	208	7	190
Cuba, ND	Sandy loam	7.0	8.2	3	4	100
Fargo, ND (Section 22)	Silty clay	6.0	7.5	190	26	1095
Fargo (sugarbeet experiments)	Silty clay	5.6	7.1	129	26	430
Ft. Ransom, ND	Loam	7.0	6.8	2	3	245
Gardner, ND	Silty clay	4.7	7.5	55	28	470
Jamestown, ND (Pipestem Dam)	Loam	6.8	6.8	28	5	290
Minot, ND	Loam	2.7	7.0	Fertilized by test		
Minto, ND	Silty clay	4.2	7.9	337	18	480
Oakes, ND	Sandy loam	2.1	7.1	24	Very high	VH
Prosper, ND	Silty clay loam	3.2	7.0	90	23	315
Sheyenne ND, Grasslands (Goat)	Sandy loam	6.2	7.5	8	4	85
Sheyenne ND, Grasslands (Insect)	Loamy sand	2.5	6.9	3	7	125
St. Thomas, ND	Silt loam	3.5	7.9	181	19	235
Valley City, ND	Stony loam	9.4	6.7	5	5	1415
West Fargo, ND	Silty clay	3.6	7.2	8	42	1460
Williston, ND	Loam	2.3	6.8	Fertilized by test		
A.K. Ekre Grassland Preserve	Loamy sand	2.9	6.8	3	3	70

KEY TO ABBREVIATIONS AND EVALUATIONS

Crop injury, crop stand and weed control ratings are based on a visual estimate using a scale of 0 = no effect to 100 = complete kill.

Alfa = Alfalfa
Amaz = Amaranth
Barl, Bar = Barley
Bdlf = Broadleaf
Biww = Biennial wormwood
Bubu = Buffalobur
Bygr = Barnyardgrass
Cath = Canada thistle
Cano = Canola
Cocb = Common cocklebur
Colq = Common lambsquarters
Coma = Common mallow
Copu = Common purslane
Cram = Crambe
Dali = Dandilion
Dobr = Downy brome
Drbe = Dry bean
Duru = Durum wheat
Ebns = Eastern black nightshade
Fach = False chamomile
Fibw = Field bindweed
Fipc = Field pennycress
Fisb = Field sandbur
Flwe = Flixweed
Foba = Foxtail barley
Fomi, Ftmi = Foxtail millet
Fota, Fxtl = Foxtail species
Grft = Green foxtail
Girw = Giant ragweed
HNS, Hans = Hairy nightshade
Howe = Horseweed
HRSW = Hard red spring wheat
Kocz = Kochia
Lath = Ladysthumb
Lent = Lentils
Llsa = Lanceleaf sage
Mael = Marshelder
Mesa = Meadow salsify
Nabe = Navy bean
Nfcf = Nightflowering catchfly
Oats = Tame oats
Pest = Perennial sowthistle
Pesw = Pennsylvania smartweed
Pibe = Pinto bean
Pota = Potato
Powe = Pondweed
Prle = Prickly lettuce
Prmi = Proso millet (tame)
Prpw = Prostrate pigweed
Qugr = Quackgrass
Rrpw = Redroot pigweed
Ruth = Russian thistle
Safl, Saff = Safflower
Shpu = Shepherd's-purse
Smwe = Annual smartweed
Soyb, Sobe = Soybean
Spsp = Spotted spurge
Sugb, Sgbt = Sugarbeet
Snfl,Sufl = Sunflower
Swcl = Sweet clover
Tabw = Tame buckwheat
Tamu = Tansy mustard
Tumu = Tumble mustard
Tymu = Tame yellow mustard
Vowh = Volunteer wheat
Vele = velvetleaf
Vema = Venice mallow
Wht = Volunteer wheat
Wibw = Wild buckwheat
Wimu = Wild mustard
Wioa = Wild oat
Wipm = Wild-proso millet
Yeft = Yellow foxtail

METHODS

PPI = Preplant incorporated

PEI = Preemergence incorporated

PRE, PE = Preemergence

EPOST = Early Postemergence

P, PO, POST = Postemergence

POSTDIR = Postemergence Directed

MISCELLANEOUS

DF = Dry flowable

EC = Emulsifiable concentrate

F = Fall

FL = F = Flowable

S = Spring

L = Liquid flowable

WP = Wettable powder

WDG = Water dispersible granules

G = Granules or gallon/A

SG = Soluble granules

Inc = I = Incorporation

%ir = inju = Percent injury rating

%sr = %std, strd = Percent stand reduction

HT = Plant height

SPK = Spike stage

Tswt = TW = Test weight

Yld = Yield

alk = alkanolamine salt

bee = Butoxyethyl ester

dea = diethanolamine salt

dma = Dimethylamine salt

ioe = isooctyl ester

MS, MVO = methylated vegetable oil

PO, OC = Petroleum oil concentrate (17% emulsifier)

SURF = S = Surfactant

NIS = nonionic surfactant

28N, UAN = 28% liquid nitrogen fertilizer

AMS = ammonium sulfate

AMN = ammonium nitrate

ADJUVANT	COMPANY
Esterified vegetable oils/fatty acid	
Class Destiny	Cenex
Dash	BASF
Dash HC	BASF
Dyne-Amic	Helena
Hasten	WilFarm
MethOil	Terra
MSO	Loveland
ND-4	NDSU
ND-71	NDSU
ND-72	NDSU
Scoil	AGSCO
Sundance II	Rosens
Sun-It II	AGSCO
Esterified vegetable oils & organosilicone surfactant	
Eth-N-Gard	WilFarm
Rivet	Terra
W-1961	WilFarm
Fertilizer & drift retardant	
Array	Rosens
Nonionic surfactants	
Activate Plus	Terra
Activator 90	Loveland
Agra-Wet	Loveland
Amway 80	Amyway
Induce	Helena
Kenetic	Helena
L1-700	Loveland
Optima	Helena
Preference	Loveland
R-11	Wilbur-Ellis
R-900	WilFarm
Silwet L-77	Loveland
Spray Booster S	Cenex
X-77	Loveland

ADJUVANT	COMPANY
Petroleum oil concentrates	
Herbimax	Loveland
Mor-Act	Wilbur-Ellis
Ortech	Rosens
17% COC	Cenex
Prime Oil	Terra
Surfactant & fertilizer blends	
ASM Plus	Terra
Class Act	Cenex
Class Act II	Cenex
Class Act II DB	Cenex
Dispatch AMS	Loveland
Dispatch 2N	Loveland
Impressive	Rosen
Sensation	Rosens
Surfate	AGSCO
Water conditioning agent	
Choice	Loveland
Cayuse	Wilbur-Ellis
Zinc ammonium acetate	
ACA	Loveland

LIST OF HERBICIDES TESTED IN 1996

Common Name or Code Name	Abbreviation	Company	Formulation	Trade Name
AC 299,263, Imazamox	Rptr	American Cyanamid	1 lb/gal EC	Raptor
Acetochlor&Dichlormid	Acet&Dcmd	Zeneca	6.4 lb/gal EC 3.2 lb/gal ME	Surpass TopNotch
Acetochlor&MON 4660	Acet&4660	Monsanto	7 lb/gal EC	Harness
Acifluorfen	Acif, Blzr	BASF	2 lb/gal E,S	Blazer
Acifluorfen	-	American Cyanamid	2 lb/gal E	Status
Acifluorfen&Bentazon	Acif&Bent	BASF	0.67+3 lb/gal EC	Galaxy
Alachlor	Alac	Monsanto	4 lb/gal MT	Several
Atrazine	Atra	Various	90% DF	Numerous
Atrazine+2,4-D		UAP	3.25 F	Shotgun
Bentazon	Bent, Bsgn	BASF	4 lb/gal S	Basagran
Bromoxynil	Brox	Rhône-Poulenc	2 lb/gal EC	Buctril
CGA 248757, Fluthiacet	Actn, Flut	Ciba	75% SG	Action
CGA 277476, Oxasulfuron	Oxas, Expt	Ciba	75% SG	Expert
Clethodim	Clet, Slct	Valent	2 lb/gal 0.94 lb/gal	Select Prism
Clopyralid	Clpy	DowElanco	3 lb/gal S	Stinger
Clopyralid&2,4-D	Clpy&2,4-D	DowElanco	0.38 + 2 lb/gal S	Curtail
Cloransulam	Clor, FrstRt	DowElanco	84% DF	FirstRate
Cyanazine	Cyan	DuPont	90% DF	Bladex
Cyanazine	Cyan	Griffin	90% DF 4 L	Cy-Pro DF Cy-Pro 4L
Cyanazine+Atrazine	Cy-Pro AT	Griffin	4 F 75 DF	Cy-Pro AT L Cy-Pro AT DF
Cycloate	Cycl	Zeneca	6 lb/gal EC	Ro-Neet
Desmedipham	Desm	AgrEvo	1.3 lb/gal EC	Betanex
Desmedipham & Phenmedipham	Desm&Phen	AgrEvo	0.65+0.65 lb/gal E	Betamix
Desmedipham & Phenmedipham & Ethofumesate	Desm&Phen&Etho	AgrEvo	0.6+0.6+0.6 lb/gal E	Betamix Progress
Dicamba	Dica	Sandoz	4 lb/gal S	Banvel, Clarity

Dimethenamid	Dime, Frtr	Sandoz	6 lb/gal EC	Frontier
Diclofop	Dcfp	AgrEvo	3 lb/gal EC	Hoelon
Difenzoquat	Dife	American Cyanamid	2 lb/gal S	Avenge
Diquat	Diqu	Zeneca	2 lb/gal S	Diquat
Endothall	Endo	Elf Atochem	3 lb/gal S	Herbicide 273
EPTC	EPTC	Zeneca	7 lb/gal EC 25% G	Eptam
EPTC&Dichlormid	EPTC&Dcmd	Zeneca	6.7 lb/gal EC 25% G	Eradicane
EPTC&Dichlormid& Acetochlor	EPTC&Dcmd& Acet	Zeneca	6.8 EC	Doubleplay
Ethalfluralin	Etha	DowElanco	3 lb/gal EC 10% G	Sonalan
Ethofumesate	Etho	AgrEvo	4 lb/gal F	Nortron
Exp 31130A (isoxaflutole)	Isox	Rhône-Poulenc	75% DF	Balance
F8426 (carfentrazone)		FMC	50%	None
Fenoxaprop-P	Fenx-P	AgrEvo	0.79 lb/gal EC	Option II
Fenx&2,4-D&MCPA		AgrEvo	0.44+0.58+1.75 lb/gal EC	Tiller
Fenx&MCPA		AgrEvo	0.67+4 lb/gal EC	Dakota
Fenx&MCPA& Thifensulfuron& Tribenuron		AgrEvo	1.6:7.6:0.187:0.092	Cheyenne
Fluazifop-P	Flfp-P	Zeneca	2 lb/gal EC	Fusilade DX
Fluazifop-P& Fenoxaprop	Flfp&Fenx	Zeneca	2+0.66 lb/gal EC	Fusion
Flumetsulam& Metolachlor	Flms&Meto NAF2	DowElanco	0.2+7.47 lb/gal	Broadstrike+Dual
Flumetsulam& Trifluralin	Flms&Trif XRM-5313	DowElanco	0.25+3.4 lb/gal	Broadstrike+Treflan
Flumetsulam& Clopyralid	Flms & Clpy	DowElanco	23.1+62.3% DF	Broadstrike Plus, Hornet
Flumetsulam& Clpy&2,4-D	Flms&Clpy &2,4-D	DowElanco	84.3 % DF	Scorpion III
Flumiclorac	Flmc, Rsrc	Valent	0.86 lb/gal EC	Resource
Flumiclorac & lactofen		Valent	3.1 lb/gal/EC	Stellar
Glufosinate	Gluf, Lbrty	AgrEro	1 lb/gal EC	Liberty

Glyphosate-ipa	Glyt	Monsanto	3 lb ae/gal S	Roundup Ultra/RT, Glyphos
Glyphosate-tms	Glyt	Zeneca	6 lb ai/gal S	Touchdown
Glyphosate&2,4-D		Monsanto	0.9 + 1.5 lb/gal	Landmaster BW
Glyphosate& dicamba		Monsanto	1 + 2.9 bl/gal	Weedmaster
Halosulfuron	Halo, Prmt	Monsanto	75% DF	Permit
Hexazinone	Hexa	DuPont	75% DF 90% SP	Velpar
Imazaquin	Imqn	American Cyanamid	1.5 lb/gal S	Scepter
Imazaquin& Trifluralin		American Cyanamid	2.33 EL	Squadron
Imazethapyr	Imep, Prst	American Cyanamid	2 lb/gal S	Pursuit
Imazethapyr& Pendimethalin	Imep&Pend	American Cyanamid	2.9 EC	Pursuit Plus
Imazamethabenz	Immb	American Cyanamid	2.5 lb/gal EC	Assert
Imazameth		American Cyanamid	2 lb/gal	Plateau
Lactofen	Lact	Valent	2 lb/gal S	Cobra
MCPA	MCPA	Rhône-Poulenc	4 lb/gal EC, S	Several, Chiptox
Metolachlor& Benoxacor (active isomer)		Ciba		Dual II Magnum
Metolachlor& Atrazine		Ciba	6 lb/gal F	Bicep II
Metolachlor& Benoxacor	Meto&Bxcr	Ciba	7.8 lb/gal EC	Dual II
Metribuzin	Metr	Bayer DuPont	4 lb/gal F, 75% DF 4 lb/gal F, 75% DF	Sencor Lexone
Metsulfuron	Mets	DuPont	60% DF	Ally/Escort
MON-37500		Monsanto	75% DF	
Nicosulfuron	Nico	DuPont	75% DF	Accent
Oxyfluorfen	Oxyf	Rohm & Haas	1.6 lb/gal EC	Goal
Paraquat	Para	Zeneca	2.5 lb/gal S 2 lb/gal S	Gramoxone Extra Cyclone
Pendimethalin	Pend	American Cyanamid	4 lb/gal EC 3.3 lb/gal EC	Prowl
Picloram		DowElanco	2 lb/gal S	Tordon 22K
Picloram&2,4-D		DowElanco	2.54 lb/gal	Tordon 101
Picloram&Triclopyr	Picl&Trcp	DowElanco	3 lb/gal	Access

Propanil	Prnl	Rhom & Haas	80% DF	Stampede 80 EDF
Pyrazon	Pyzn	BASF	4.2 lb/gal F	Pyramin
Quinclorac		BASF	75% WP	Facet
Quizalofop-P	Qufp-P	DuPont	0.88 lb/gal EC	Assure II
Rimsulfuron		DuPont	25% DF	Matrix
Rimsulfuron& Thifensulfuron	Rims&Thif, Bsis	DuPont	75% DF	Basis
SAN 1289 Dimethenemid (active isomer)	Frntr	Sandoz	6 lb/gal EC	
SAN 1412 Dimethenamid & dicamba		Samdpz	6 lb/gal EC	
SAN 836H& Dicamba	SAN 1269H	Sandoz	70% WG	SAN1269H
Sethoxydim	Seth	BASF	1.5 lb/gal EC 1.0 lb/gal EC 1.3 lb/gal EC	Poast Poast-Plus Ultima 160
Sethoxydim	Prst	American Cyanamid	1.5 lb/gal EC	Prestige
Sulfentrazone		FMC	75% DF	Authority
Sulfometuron	Sume	DuPont	75% DF	Oust
Thiafluamide& Metribuzin		Bayer	68% DF	Axiom
Thifensulfuron	Thif, Pinn, Pncl	DuPont	25% DF	Pinnacle
Thifensulfuron& Chlorimuron	Cnct	DuPont	25% DF	Concert
Thifensulfuron& Tribenuron	Thif&Trib	DuPont	50%+25% DF	Harmony Extra
Tribenuron	Trib	DuPont	75% DF	Express
Triallate	Tria	Monsanto	4 lb/gal EC, 10% G	Far-Go
Triflusulfuron	Tfsu	DuPont	50% DF	Upbeet
Triasulfuron	Trsu	Ciba	75% DF	Amber
Triclopyr	Trcp	DowElanco	4 lb/gal EC	Garlon
Trifluralin	Trif	DowElanco	4 lb/gal EC 10% G	Several
2,4-D	2,4-D	Various	Various EC, S, WSP	Numerous
2,4-DB	2,4-DB	Various	2 lb/gal	Numerous

[a] Abbreviations in the tables may consist of only the first one, two, or three listed letters when space was limited. Abbreviations of numbered compounds vary with available space, but usually use the first letters and numbers.

Herbicides and starter fertilizer on sugarbeet, Fargo, 1996. 'ACH 196' sugarbeet was seeded at a 4.5 inch spacing, 1.25 inches deep and in 22 inch rows May 3. Counter 15G insecticide at 11 pounds product per acre was applied in a 5 inch band over the row at planting. 10-34-0 starter fertilizer at 3 gallons per acre was applied modified in-furrow at planting. The first half of split application herbicide treatments was applied 2:00 PM May 25 when the air temperature was 70F, soil temperature at six inches was 52F, relative humidity was 33%, wind velocity was 11 mph, cloud cover was 50%, soil moisture was good and sugarbeet was in the cotyledon stage. The second half of split application treatments was applied 4:00 PM June 3 when the air temperature was 67F, soil temperature at six inches was 54F, relative humidity was 42%, wind velocity was 21 mph, cloud cover was 15%, soil moisture was good and sugarbeet was in the 2 to 4 leaf stage. All herbicide treatments were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Sugarbeet was sprayed with sethoxydim + Dash HC at 0.3 lb ai/A + 1 pint/A June 17 and with Super Tin 80WP fungicide at 5 oz product per acre August 8 and August 22. Sugarbeet were kept weed free throughout the growing season by hand weeding and row cultivation June 3, June 21 and June 28. Sugarbeet injury was evaluated June 18. Sugarbeet was counted in the center two rows of each 32 foot long plot May 23 and June 13 and counted and harvested from the center two rows September 24.

Treatment	Rate	Fertilizer	5-23 Sgbt Popl	6-13 Sgbt Popl	Sgbt inj	9-24 Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A		plts/64ft		%	plt/64'	%	%	ton/A		lb/A
Control	0	(10-34-0)	90	93	0	78	18.8	1.5	19.6	596	6709
Desm&Phen&Etho/ Desm&Phen&Etho	0.25 0.33	(10-34-0)	74	77	14	69	17.8	1.7	18.0	679	5788
Desm&Phen&Etho/ Desm&Phen&Etho	0.45 0.67	(10-34-0)	81	81	20	74	19.6	1.4	16.6	532	5972
Desm&Phen&Etho/ Desm&Phen&Etho	0.67 0.9	(10-34-0)	80	72	26	66	18.8	1.5	17.1	604	5796
Control	0	(no fert)	92	96	0	88	19.4	1.4	17.7	516	6340
Desm&Phen&Etho/ Desm&Phen&Etho	0.25 0.33	(no fert)	90	94	8	86	18.0	1.6	18.2	641	5931
Desm&Phen&Etho/ Desm&Phen&Etho	0.45 0.67	(no fert)	92	98	13	87	18.7	1.5	18.4	597	6259
Desm&Phen&Etho/ Desm&Phen&Etho	0.67 0.9	(no fert)	87	76	36	64	19.4	1.6	17.0	600	5987
C.V. %			12	13	30	11	5.0	8.8	12.1	12	12
LSD 5%			NS	16	6	13	NS	NS	NS	NS	NS
LSD 1%			NS	NS	9	17	NS	NS	NS	NS	NS
# OF REPS			4	4	4	4	4	4	4	4	4

SUMMARY: 10-34-0 as a starter fertilizer did not increase sugarbeet yield or reduce sugarbeet injury from desmedipham & phenmedipham & ethofumesate as compared to the same treatments without starter fertilizer. Sugarbeet injury increased as herbicide rate increased but yields were similar among all treatments. Sugarbeet stands on June 13 were less in plots treated with herbicide at 0.67/0.9 lb/A than in the untreated plots.

Postemergence herbicides, Crookston, 1996. EPTC + cycloate was applied May 14 and incorporated with a rototiller set four inches deep. Ethofumesate was applied preemergence after seeding sugarbeet. All soil applied treatments were applied in 17 gpa water at 40 psi through 8002 nozzles to the center four rows of six row plots 4:00 PM May 14 when the air temperature was 53F, relative humidity was 88%, soil temperature at six inches was 44F, wind velocity was 18 mph, cloud cover was 100% and soil moisture was good. 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 14. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first postemergence herbicide application was 3:00 PM May 30 when the air temperature was 77F, relative humidity was 36%, soil temperature at six inches was 64F, wind velocity was 23 mph, cloud cover was 60%, soil moisture was good, sugarbeet was in the cotyledon stage, common lambsquarters was in the cotyledon to 4 leaf stage and redroot pigweed, prostrate pigweed and wild buckwheat were in the cotyledon to 2 leaf stage. The second postemergence herbicide application was 12:00 PM June 7 when the air temperature was 75F, relative humidity was 51%, soil temperature at six inches was 58F, wind velocity was 7 mph, cloud cover was 15%, soil moisture was good, sugarbeet, redroot pigweed and prostrate pigweed were in the 2 leaf stage, common lambsquarters was in the 4 to 6 leaf stage and wild buckwheat was in the 1 to 3 leaf stage. The third postemergence herbicide application was 11:00 PM June 13 when the air temperature was 82F, relative humidity was 28%, soil temperature at six inches was 71F, wind velocity was 2-5 mph, cloud cover was 5%, soil moisture was good, sugarbeet was in the 4 to 6 leaf stage, redroot pigweed, prostrate pigweed and wild buckwheat were in the 6 leaf stage and common lambsquarters was in the 8 to 10 leaf stage. All postemergence treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sethoxydim + Dash at 0.38 lb ai/A + 1 quart/A was applied to the entire plot area June 11. Sugarbeet injury and common lambsquarters, wild buckwheat and prostrate pigweed control were evaluated June 24. Redroot pigweed control was evaluated June 24 and July 11.

Treatment*	Rate	June 24 Sgbt inj	Rrpw cntl	Colq cntl	Wibw cntl	Prpw cntl	7-11 Rrpw cntl
	lb/A	%	%	%	%	%	%
Untreated Hand Weeded Check	0	0	97	99	98	96	96
Desm&Phen&Etho/Desm&Phen&Etho	0.19/0.25	3	58	94	71	63	28
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	6	68	94	86	71	35
Desm&Phen&Etho/Desm&Phen&Etho	0.33/0.4	8	75	96	95	81	51
Desmedipham/Desmedipham	0.25/0.33	0	80	97	39	82	63
Desm+Tfsu+Clpy/	0.16+0.01+0.06						
Desm+Tfsu+Clpy/	0.25+0.01+0.06						
Desm+Tfsu+Clpy	0.25+0.01+0.06	4	99	100	100	97	94
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%						
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%						
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.06+1.5%	9	99	100	100	100	97
Desm+Tfsu+Clpy+MethOil/	0.16+0.008+0.06+1.5%						
Desm+Tfsu+Clpy+MethOil/	0.16+0.008+0.06+1.5%						
Desm+Tfsu+Clpy+MethOil	0.16+0.008+0.06+1.5%	20	100	100	100	100	98
Desm&Phen&Etho+Tfsu+Clpy/	0.16+0.01+0.06						
Desm&Phen&Etho+Tfsu+Clpy/	0.25+0.01+0.06						
Desm&Phen&Etho+Tfsu+Clpy	0.25+0.01+0.06	14	100	100	100	100	98

Table continued on next page.

Postemergence herbicides, Crookston, 1996. (continued)

Treatment*	Rate	June 24					7-11
		Sgbt inj	Rrpw cntl	Colq cntl	Wibw cntl	Prpw cntl	Rrpw cntl
	lb/A	%	%	%	%	%	%
Ethofumesate (PRE)/	2						
Desmedipham+Triflusulfuron/	0.16+0.0156						
Desmedipham+Triflusulfuron	0.25+0.0156	0	98	99	88	97	97
EPTC+Cycloate (PPI)/	0.9+1.5						
Desmedipham+Triflusulfuron/	0.16+0.0156						
Desmedipham+Triflusulfuron	0.25+0.0156	15	98	100	95	99	95
Ethofumesate (PRE)/	2						
Desmedipham+Triflusulfuron/	0.25+0.0156						
Desmedipham+Triflusulfuron	0.33+0.0156	0	97	100	90	98	94
EPTC+Cycloate (PPI)/	0.9+1.5						
Desmedipham+Triflusulfuron/	0.25+0.0156						
Desmedipham+Triflusulfuron	0.33+0.0156	26	99	99	98	99	97
Triflusulfuron+Clpy+MethOil/	0.0238+0.09+1%						
Triflusulfuron+Clpy+MethOil	0.0238+0.09+1%	4	81	87	97	80	71
--/Endothall	1	4	0	0	100	0	3
--/Endothall	2	19	16	3	100	18	3
--/Endothall+ACA(PCC-700)	1+10.67 fl oz prod	4	0	0	80	0	8
--/Endothall+ACA(PCC-700)	2+10.67 fl oz prod	20	5	0	100	3	15
Desmedipham+Triflusulfuron/	0.25+0.0156						
Desmedipham+Triflusulfuron	0.33+0.0156	1	91	96	45	91	77
Desmedipham+Tfsu+R-11/	0.25+0.0156+0.25%						
Desmedipham+Tfsu+R-11	0.33+0.0156+0.25%	5	90	92	55	90	81
Desmedipham+Tfsu+R-11/	0.25+0.0238+0.25%						
Desmedipham+Tfsu+R-11	0.33+0.0238+0.25%	1	94	99	59	93	88
Triflusulfuron+R-11/	0.0156+0.25%						
Triflusulfuron+R-11	0.0156+0.25%	0	57	55	45	58	30
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156						
Desm&Phen&Etho+Triflusulfuron	0.33+0.0156	0	89	97	89	91	84
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0156						
Desm&Phen&Etho+Triflusulfuron	0.25+0.0156	3	88	98	85	87	79
Desm&Phen&Etho+Triflusulfuron/	0.16+0.0156						
Desm&Phen&Etho+Triflusulfuron	0.19+0.0156	3	86	97	69	85	66
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0117						
Desm&Phen&Etho+Triflusulfuron	0.33+0.0117	8	91	97	97	94	89
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0117						
Desm&Phen&Etho+Triflusulfuron	0.25+0.0117	1	93	97	82	93	81
Desm&Phen&Etho+Triflusulfuron/	0.16+0.0117						
Desm&Phen&Etho+Triflusulfuron	0.19+0.0117	1	86	98	65	85	76
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156						
Desm&Phen&Etho+Tfsu+Clpy	0.33+0.0156+0.09	4	93	98	94	93	75
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0117						
Desm&Phen&Etho+Tfsu+Clpy	0.33+0.0117+0.09	5	90	96	83	86	63
Desm&Phen&Etho+Desmedipham/	0.125+0.125						
Desm&Phen&Etho+Desmedipham	0.165+0.165	0	85	94	50	84	64
Desm&Phen&Etho+Desmedipham/	0.165+0.165						
Desm&Phen&Etho+Desmedipham	0.2+0.2	11	79	98	76	83	73

Table continued on next page.

Postemergence herbicides, Crookston, 1996. (continued)

Treatment*	Rate	June 24 Sgbt inj	Rrpw cntl	Colq cntl	Wibw cntl	Prpw cntl	7-11 Rrpw cntl
	lb/A	%	%	%	%	%	%
Desm&Phen&Etho+Desmedipham/	0.1+0.15						
Desm&Phen&Etho+Desmedipham	0.132+0.198	3	80	97	79	78	61
Desm&Phen&Etho+Desmedipham/	0.132+0.198						
Desm&Phen&Etho+Desmedipham	0.16+0.24	5	93	96	86	91	69
Desm&Phen&Etho+Desmedipham/	0.082+0.168						
Desm&Phen&Etho+Desmedipham	0.109+0.221	4	84	98	73	88	54
Desm&Phen&Etho+Desmedipham/	0.109+0.221						
Desm&Phen&Etho+Desmedipham	0.132+0.268	5	87	95	89	88	76
Desmedipham+Triflusulfuron/	0.08+0.004						
Desmedipham+Triflusulfuron/	0.08+0.004						
Desmedipham+Triflusulfuron	0.08+0.004	0	96	93	61	96	94
Desm+Triflusulfuron+MethOil/	0.08+0.004+1.5%						
Desm+Triflusulfuron+MethOil/	0.08+0.004+1.5%						
Desm+Triflusulfuron+MethOil	0.08+0.004+1.5%	3	98	97	94	99	95
Desmedipham+Triflusulfuron/	0.16+0.008						
Desmedipham+Triflusulfuron/	0.16+0.008						
Desmedipham+Triflusulfuron	0.16+0.008	0	100	98	55	100	99
Desm+Triflusulfuron+MethOil/	0.16+0.008+1.5%						
Desm+Triflusulfuron+MethOil/	0.16+0.008+1.5%						
Desm+Triflusulfuron+MethOil	0.16+0.008+1.5%	9	96	98	95	98	95
EXP MEAN		6	80	86	81	81	70
C.V. %		106	10	5	14	9	18
LSD 5%		8	11	6	16	10	17
LSD 1%		11	14	8	21	13	23
# OF REPS		4	4	4	4	4	4

* Meth Oil = methylated seed oil from Terra; R-11 = non-ionic surfactant from Wilbur-Ellis; ACA(PCC-700) = Zinc Ammonium Acetate, 15% N, 17% Zn.

SUMMARY: Averaged over all treatments, redroot pigweed control was 80% on June 24 and 70% on July 11. Pigweed control declined more with the weaker treatments than with the better treatments. Adding Meth Oil to desmedipham + triflusulfuron + clopyralid increased sugarbeet injury. Seven treatments gave 95% or greater control of all weed species on June 24 and of redroot pigweed on July 11. They were 1) Hand weeded check; 2 and 3) three applications of two rates of desmedipham + triflusulfuron + clopyralid + Meth Oil; 4) three applications of desmedipham & phenmedipham & ethofumesate + triflusulfuron + clopyralid; 5 and 6) EPTC + cycloate(PPI) plus two applications of two rates of desmedipham + triflusulfuron and 7) three applications of desmedipham + triflusulfuron + Meth Oil at higher rate. Of these seven treatments, numbers 3 and 6 caused more sugarbeet injury than numbers 1, 2 and 7. The lower rate of desmedipham + triflusulfuron over EPTC + cycloate (treatment 5) gave less sugarbeet injury than the higher rate over EPTC + cycloate (treatment 6). Note that the use of EPTC + cycloate saved one postemergence treatment. Three of the seven treatments included Meth Oil. ACA did not reduce sugarbeet injury from endothall but ACA did reduce wild buckwheat control from endothall at 1 lb/A.

Postemergence herbicides, Fargo, 1996. EPTC + cycloate was applied May 2 and incorporated with a rototiller set four inches deep. Ethofumesate was applied preemergence after seeding sugarbeet. All soil applied treatments were applied in 17 gpa water at 40 psi through 8002 nozzles to the center four rows of six row plots 6:25 PM May 2 when the air temperature was 53F, relative humidity was 76%, soil temperature at six inches was 43F, wind velocity was 7 mph, cloud cover was 80% and soil moisture was good. 'ACH 196' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 2. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first postemergence herbicide application was 4:40 PM May 23 when the air temperature was 66F, relative humidity was 45%, soil temperature at six inches was 55F, wind velocity was 15 mph, cloud cover was 95%, soil moisture was good, and sugarbeet and redroot pigweed were in the cotyledon stage. The second postemergence herbicide application was 5:30 PM May 30 when the air temperature was 74F, relative humidity was 44%, soil temperature at six inches was 60F, wind velocity was 20 mph, cloud cover was 75%, soil moisture was good, sugarbeet was in the 2 leaf stage and redroot pigweed was in the cotyledon to 2 leaf stage. The third postemergence herbicide application was 3:30 PM June 7 when the air temperature was 80F, relative humidity was 51%, soil temperature at six inches was 60F, wind velocity was 8-10 mph, cloud cover was 35%, soil moisture was good, sugarbeet was in the 4 leaf stage and redroot pigweed was in the 2 to 4 leaf stage. The fourth postemergence herbicide application was 2:30 PM June 13 when the air temperature was 84F, relative humidity was 25%, soil temperature at six inches was 74F, wind velocity was 3 mph, cloud cover was 85%, soil moisture was good, sugarbeet was in the 6 leaf stage and redroot pigweed was in the 4 to 6 leaf stage. All postemergence treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sethoxydim + Dash HC at 0.3 lb ai/A + 1 pint/A was applied to the entire plot area June 17. Sugarbeet was cultivated June 28. Untreated hand weeded check plots were weeded June 11 and maintained weed free throughout the growing season. Super Tin 80WP at 5 oz product/A was applied to all plots August 8 and August 22. Sugarbeet injury and redroot pigweed control were evaluated June 25. Sugarbeet from the center two rows of each 32 foot long plot was counted and harvested September 26.

Treatment*	Rate	Sgbt inj	Rrpw cntl
	lb/A	%	%
Untreated Hand Weeded Check	0	0	99
Desm&Phen&Etho/Desm&Phen&Etho	0.19/0.25	0	41
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	0	55
Desm&Phen&Etho/Desm&Phen&Etho	0.33/0.4	0	43
Desmedipham/Desmedipham	0.25/0.33	0	60
Desm+Tfsu+Clpy/	0.16+0.01+0.06		
Desm+Tfsu+Clpy/	0.25+0.01+0.06		
Desm+Tfsu+Clpy	0.25+0.01+0.06	0	95
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.06+1.5%	3	86
Desm+Tfsu+Clpy+MethOil/	0.16+0.008+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil/	0.16+0.008+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil	0.16+0.008+0.06+1.5%	4	99
Desm&Phen&Etho+Tfsu+Clpy/	0.16+0.01+0.06		
Desm&Phen&Etho+Tfsu+Clpy/	0.25+0.01+0.06		
Desm&Phen&Etho+Tfsu+Clpy	0.25+0.01+0.06	0	91

Table continued on next page.

Postemergence herbicides, Fargo, 1996. (continued)

Treatment*	Rate	Sgbt inj	Rrpw cntl
	lb/A	%	%
Ethofumesate (PRE)/ Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron	2 0.16+0.0156 0.25+0.0156	6	88
EPTC+Cycloate (PPI)/ Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron	0.9+1.5 0.16+0.0156 0.25+0.0156	16	85
Ethofumesate (PRE)/ Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron	2 0.25+0.0156 0.33+0.0156	0	86
EPTC+Cycloate (PPI)/ Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron	0.9+1.5 0.25+0.0156 0.33+0.0156	28	86
Triflusulfuron+Clpy+MethOil/ Triflusulfuron+Clpy+MethOil	0.0238+0.09+1% 0.0238+0.09+1%	3	83
--/Endothall	1	0	0
--/Endothall	2	0	0
--/Endothall+ACA(PCC-700)	1+10.67 fl oz prod	0	0
--/Endothall+ACA(PCC-700)	2+10.67 fl oz prod	0	0
Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron	0.25+0.0156 0.33+0.0156	0	80
Desmedipham+Tfsu+R-11/ Desmedipham+Tfsu+R-11	0.25+0.0156+0.25% 0.33+0.0156+0.25%	0	75
Desmedipham+Tfsu+R-11/ Desmedipham+Tfsu+R-11	0.25+0.0238+0.25% 0.33+0.0238+0.25%	0	78
Triflusulfuron+R-11/ Triflusulfuron+R-11	0.0156+0.25% 0.0156+0.25%	0	65
Desm&Phen&Etho+Triflusulfuron/ Desm&Phen&Etho+Triflusulfuron	0.25+0.0156 0.33+0.0156	0	75
Desm&Phen&Etho+Triflusulfuron/ Desm&Phen&Etho+Triflusulfuron	0.19+0.0156 0.25+0.0156	0	75
Desm&Phen&Etho+Triflusulfuron/ Desm&Phen&Etho+Triflusulfuron	0.16+0.0156 0.19+0.0156	0	86
Desm&Phen&Etho+Triflusulfuron/ Desm&Phen&Etho+Triflusulfuron	0.25+0.0117 0.33+0.0117	0	64
Desm&Phen&Etho+Triflusulfuron/ Desm&Phen&Etho+Triflusulfuron	0.19+0.0117 0.25+0.0117	0	66
Desm&Phen&Etho+Triflusulfuron/ Desm&Phen&Etho+Triflusulfuron	0.16+0.0117 0.19+0.0117	0	53
Desm&Phen&Etho+Triflusulfuron/ Desm&Phen&Etho+Tfsu+Clpy	0.25+0.0156 0.33+0.0156+0.09	0	74
Desm&Phen&Etho+Triflusulfuron/ Desm&Phen&Etho+Tfsu+Clpy	0.25+0.0117 0.33+0.0117+0.09	0	76
Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham	0.125+0.125 0.165+0.165	0	68
Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham	0.165+0.165 0.2+0.2	0	58
Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham	0.1+0.15 0.132+0.198	0	58
Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham	0.132+0.198 0.16+0.24	0	58

Table continued on next page.

Postemergence herbicides, Fargo, 1996. (continued)

Treatment*	Rate	Sgbt inj	Rrpw cntl
	lb/A	%	%
Desm&Phen&Etho+Desmedipham/	0.082+0.168		
Desm&Phen&Etho+Desmedipham	0.109+0.221	0	48
Desm&Phen&Etho+Desmedipham/	0.109+0.221		
Desm&Phen&Etho+Desmedipham	0.132+0.268	0	55
Desmedipham+Triflusulfuron/	0.08+0.004		
Desmedipham+Triflusulfuron/	0.08+0.004		
Desmedipham+Triflusulfuron	0.08+0.004	0	93
Desm+Triflusulfuron+MethOil/	0.08+0.004+1.5%		
Desm+Triflusulfuron+MethOil/	0.08+0.004+1.5%		
Desm+Triflusulfuron+MethOil	0.08+0.004+1.5%	0	94
Desmedipham+Triflusulfuron/	0.16+0.008		
Desmedipham+Triflusulfuron/	0.16+0.008		
Desmedipham+Triflusulfuron	0.16+0.008	0	96
Desm+Triflusulfuron+MethOil/	0.16+0.008+1.5%		
Desm+Triflusulfuron+MethOil/	0.16+0.008+1.5%		
Desm+Triflusulfuron+MethOil	0.16+0.008+1.5%	1	94
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.06+1.5%	4	100
Desm+Tfsu+Clpy/	0.16+0.008+0.06		
Desm+Tfsu+Clpy/	0.16+0.008+0.06		
Desm+Tfsu+Clpy/	0.16+0.008+0.06		
Desm+Tfsu+Clpy	0.16+0.008+0.06	1	100
C.V. %		212	15
LSD 5%		5	14
LSD 1%		6	19
# OF REPS		4	4

* Meth Oil = methylated seed oil from Terra; R-11 = non-ionic surfactant from Wilbur-Ellis; ACA(PCC-700) = Zinc Ammonium Acetate, 15% N, 17% Zn.

Postemergence herbicides, Fargo, 1996. (harvest data)

Treatment*	Rate	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	%	%	ton/A		lb/A
Untreated Hand Weeded Check	0	18.0	1.7	23.1	662	7484
Desm&Phen&Etho/Desm&Phen&Etho	0.19/0.25	18.4	1.7	22.5	687	7432
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	19.2	1.4	20.5	526	7233
Desm&Phen&Etho/Desm&Phen&Etho	0.33/0.4	18.7	1.5	21.5	592	7330
Desmedipham/Desmedipham	0.25/0.33	18.8	1.5	21.8	569	7474
Desm+Tfsu+Clpy/	0.16+0.01+0.06					
Desm+Tfsu+Clpy/	0.25+0.01+0.06					
Desm+Tfsu+Clpy	0.25+0.01+0.06	18.9	1.6	23.3	624	7984
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%					
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%					
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.06+1.5%	18.6	1.6	22.4	616	7550

Table continued on next page.

Postemergence herbicides, Fargo, 1996. (continued)

Treatment*	Rate	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	%	%	ton/A		lb/A
Desm+Tfsu+Clpy+MethOil/	0.16+0.008+0.06+1.5%					
Desm+Tfsu+Clpy+MethOil/	0.16+0.008+0.06+1.5%					
Desm+Tfsu+Clpy+MethOil	0.16+0.008+0.06+1.5%	19.3	1.5	21.7	574	7644
Desm&Phen&Etho+Tfsu+Clpy/	0.16+0.01+0.06					
Desm&Phen&Etho+Tfsu+Clpy/	0.25+0.01+0.06					
Desm&Phen&Etho+Tfsu+Clpy	0.25+0.01+0.06	19.0	1.5	21.0	577	7256
Ethofumesate (PRE)/	2					
Desmedipham+Triflusulfuron/	0.16+0.0156					
Desmedipham+Triflusulfuron	0.25+0.0156	19.1	1.5	21.7	575	7585
EPTC+Cycloate (PPI)/	0.9+1.5					
Desmedipham+Triflusulfuron/	0.16+0.0156					
Desmedipham+Triflusulfuron	0.25+0.0156	19.0	1.5	21.6	593	7474
Ethofumesate (PRE)/	2					
Desmedipham+Triflusulfuron/	0.25+0.0156					
Desmedipham+Triflusulfuron	0.33+0.0156	19.2	1.5	20.9	568	7362
EPTC+Cycloate (PPI)/	0.9+1.5					
Desmedipham+Triflusulfuron/	0.25+0.0156					
Desmedipham+Triflusulfuron	0.33+0.0156	19.1	1.4	21.8	550	7633
Triflusulfuron+Clpy+MethOil/	0.0238+0.09+1%					
Triflusulfuron+Clpy+MethOil	0.0238+0.09+1%	18.7	1.6	21.1	624	7162
--/Endothall	1	19.1	1.4	21.1	543	7412
--/Endothall	2	18.8	1.5	21.2	585	7267
--/Endothall+ACA(PCC-700)	1+10.67 fl oz prod	19.2	1.5	21.3	550	7479
--/Endothall+ACA(PCC-700)	2+10.67 fl oz prod	18.6	1.4	21.9	563	7407
Desmedipham+Triflusulfuron/	0.25+0.0156					
Desmedipham+Triflusulfuron	0.33+0.0156	19.0	1.5	21.7	572	7527
Desmedipham+Tfsu+R-11/	0.25+0.0156+0.25%					
Desmedipham+Tfsu+R-11	0.33+0.0156+0.25%	19.1	1.5	21.6	580	7501
Desmedipham+Tfsu+R-11/	0.25+0.0238+0.25%					
Desmedipham+Tfsu+R-11	0.33+0.0238+0.25%	18.4	1.5	23.2	621	7675
Triflusulfuron+R-11/	0.0156+0.25%					
Triflusulfuron+R-11	0.0156+0.25%	19.3	1.6	20.4	597	7143
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156					
Desm&Phen&Etho+Triflusulfuron	0.33+0.0156	18.6	1.5	22.8	609	7661
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0156					
Desm&Phen&Etho+Triflusulfuron	0.25+0.0156	19.3	1.4	21.3	522	7578
Desm&Phen&Etho+Triflusulfuron/	0.16+0.0156					
Desm&Phen&Etho+Triflusulfuron	0.19+0.0156	19.1	1.4	22.3	554	7789
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0117					
Desm&Phen&Etho+Triflusulfuron	0.33+0.0117	18.9	1.5	22.4	583	7714
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0117					
Desm&Phen&Etho+Triflusulfuron	0.25+0.0117	18.4	1.5	20.8	613	6969
Desm&Phen&Etho+Triflusulfuron/	0.16+0.0117					
Desm&Phen&Etho+Triflusulfuron	0.19+0.0117	18.8	1.4	22.4	560	7715
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156					
Desm&Phen&Etho+Tfsu+Clpy	0.33+0.0156+0.09	19.1	1.5	21.3	581	7422
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0117					
Desm&Phen&Etho+Tfsu+Clpy	0.33+0.0117+0.09	19.4	1.5	22.2	564	7875
Desm&Phen&Etho+Desmedipham/	0.125+0.125					
Desm&Phen&Etho+Desmedipham	0.165+0.165	19.0	1.6	20.2	616	6965

Table continued on next page.

Treatment*	Rate	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	%	%	ton/A		lb/A
Desm&Phen&Etho+Desmedipham/	0.165+0.165					
Desm&Phen&Etho+Desmedipham	0.2+0.2	18.9	1.6	22.1	598	7606
Desm&Phen&Etho+Desmedipham/	0.1+0.15					
Desm&Phen&Etho+Desmedipham	0.132+0.198	19.3	1.4	21.2	524	7564
Desm&Phen&Etho+Desmedipham/	0.132+0.198					
Desm&Phen&Etho+Desmedipham	0.16+0.24	19.1	1.6	21.1	597	7342
Desm&Phen&Etho+Desmedipham/	0.082+0.168					
Desm&Phen&Etho+Desmedipham	0.109+0.221	19.3	1.5	21.4	551	7578
Desm&Phen&Etho+Desmedipham/	0.109+0.221					
Desm&Phen&Etho+Desmedipham	0.132+0.268	18.8	1.6	21.0	618	7139
Desmedipham+Triflusulfuron/	0.08+0.004					
Desmedipham+Triflusulfuron/	0.08+0.004					
Desmedipham+Triflusulfuron	0.08+0.004	18.3	1.5	22.4	615	7461
Desm+Triflusulfuron+MethOil/	0.08+0.004+1.5%					
Desm+Triflusulfuron+MethOil/	0.08+0.004+1.5%					
Desm+Triflusulfuron+MethOil	0.08+0.004+1.5%	18.9	1.5	20.3	591	6979
Desmedipham+Triflusulfuron/	0.16+0.008					
Desmedipham+Triflusulfuron/	0.16+0.008					
Desmedipham+Triflusulfuron	0.16+0.008	19.6	1.4	21.0	531	7559
Desm+Triflusulfuron+MethOil/	0.16+0.008+1.5%					
Desm+Triflusulfuron+MethOil/	0.16+0.008+1.5%					
Desm+Triflusulfuron+MethOil	0.16+0.008+1.5%	19.3	1.4	20.8	527	7382
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%					
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%					
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%					
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.06+1.5%	18.7	1.6	22.1	621	7469
Desm+Tfsu+Clpy/	0.16+0.008+0.06					
Desm+Tfsu+Clpy/	0.16+0.008+0.06					
Desm+Tfsu+Clpy/	0.16+0.008+0.06					
Desm+Tfsu+Clpy	0.16+0.008+0.06	18.9	1.6	21.2	615	7267
C.V. %		3.9	10.0	7.1	13	7
LSD 5%		NS	NS	NS	NS	NS
LSD 1%		NS	NS	NS	NS	NS
# OF REPS		4	4	4	4	4

* Meth Oil = methylated seed oil from Terra; R-11 = non-ionic surfactant from Wilbur-Ellis; ACA(PCC-700) = Zinc Ammonium Acetate, 15% N, 17% Zn.

Summary

EPTC + cycloate followed by postemergence herbicides gave more sugarbeet injury than other treatments. Nine treatments gave 93% or greater control of redroot pigweed. They were 1) hand weeded check; 2 and 3) three applications of desmedipham + triflusulfuron + clopyralid with and without Meth Oil at higher rate; 4, 5, 6 and 7) three applications of desmedipham + triflusulfuron at both rates with and without Meth Oil; and 8 and 9) four applications of desmedipham + triflusulfuron + clopyralid with or without Meth Oil. The soil applied herbicides followed by two applications of postemergence herbicides gave less redroot pigweed control than three applications of postemergence herbicides. This is contrary to the results at St. Thomas and Crookston with the same treatments.

None of these treatments affected sugarbeet yield or quality.

Postemergence broadleaf herbicides, Gardner, 1996. 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 16. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting for sugarbeet root maggot control. The first herbicide application was 11:00 AM June 4 when the air temperature was 70F, relative humidity was 48%, soil temperature at six inches was 56F, wind velocity was 0-5 mph, cloud cover was 5%, soil moisture was good, sugarbeet was in the cotyledon stage and wild mustard was in the 2 to 4 leaf stage. The second herbicide application was 12:00 PM June 11 when the air temperature was 93F, relative humidity was 36%, soil temperature at six inches was 71F, wind velocity was 2-4 mph, cloud cover was 10%, soil moisture was good, sugarbeet was in the 2 to 4 leaf stage and wild mustard was in the 4 to 6 leaf stage. The third herbicide application was 11:15 AM June 17 when the air temperature was 82F, relative humidity was 55%, soil temperature at six inches was 72F, wind velocity was 8 mph, cloud cover was 10%, soil moisture was good, sugarbeet was in the 6 leaf stage and wild mustard was in the 8 to 12 leaf stage (7 inches tall). All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury and wild mustard control were evaluated July 6.

Treatment*	Rate	Sugarbeet injury	Wild Mustard
	lb/A	%	%
Desmedipham/Desmedipham	0.25/0.33	0	90
Desm/Desm/Desm	0.16/0.25/0.25	0	96
Desm&Phen&Etho/Desm&Phen&Etho	0.19/0.25	0	68
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	0	82
Desm&Phen&Etho/	0.16		
Desm&Phen&Etho/	0.25		
Desm&Phen&Etho	0.25	0	84
Desm&Phen&Etho+Desmedipham/	0.125+0.125		
Desm&Phen&Etho+Desmedipham	0.165+0.165	0	83
Desm&Phen&Etho+Desmedipham/	0.08+0.08		
Desm&Phen&Etho+Desmedipham/	0.125+0.125		
Desm&Phen&Etho+Desmedipham	0.125+0.125	0	94
Desm&Phen&Etho+Desm+Endo/	0.08+0.08+0.16		
Desm&Phen&Etho+Desm+Endo/	0.125+0.125+0.25		
Desm&Phen&Etho+Desm+Endo	0.125+0.125+0.25	0	95
Desm&Phen&Etho+Endothall/	0.16+0.16		
Desm&Phen&Etho+Endothall/	0.25+0.25		
Desm&Phen&Etho+Endothall	0.25+0.25	0	84
Desm&Phen&Etho+Clopyralid/	0.16+0.06		
Desm&Phen&Etho+Clopyralid/	0.25+0.06		
Desm&Phen&Etho+Clopyralid	0.25+0.06	6	89
Desmedipham+Endothall/	0.16+0.16		
Desmedipham+Endothall/	0.25+0.25		
Desmedipham+Endothall	0.25+0.25	3	90
Desmedipham+Clopyralid/	0.16+0.06		
Desmedipham+Clopyralid/	0.25+0.06		
Desmedipham+Clopyralid	0.25+0.06	4	99
Desmedipham+Triflusulfuron/	0.16+0.008		
Desmedipham+Triflusulfuron/	0.16+0.008		
Desmedipham+Triflusulfuron	0.16+0.008	0	100

Table continued on next page.

Postemergence broadleaf herbicides, Gardner, 1996. (continued)

Treatment*	Rate	Sugarbeet injury	Wild Mustard
	lb/A	%	%
Desmedipham+Triflusulfuron/	0.08+0.004		
Desmedipham+Triflusulfuron/	0.08+0.004		
Desmedipham+Triflusulfuron	0.08+0.004	0	93
Desm+Tfsu+MethOil/	0.16+0.008+1.5%		
Desm+Tfsu+MethOil/	0.16+0.008+1.5%		
Desm+Tfsu+MethOil	0.16+0.008+1.5%	0	96
Desm+Tfsu+MethOil/	0.08+0.004+1.5%		
Desm+Tfsu+MethOil/	0.08+0.004+1.5%		
Desm+Tfsu+MethOil	0.08+0.004+1.5%	0	97
Desm+Tfsu+Clpy/	0.16+0.01+0.06		
Desm+Tfsu+Clpy/	0.25+0.01+0.06		
Desm+Tfsu+Clpy	0.25+0.01+0.06	4	100
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.06+1.5%	8	94
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0156		
Desm&Phen&Etho+Triflusulfuron	0.25+0.0156	0	95
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156		
Desm&Phen&Etho+Triflusulfuron	0.33+0. 0156	0	96
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0117		
Desm&Phen&Etho+Triflusulfuron	0.25+0.0117	0	92
Desm&Phen&Etho+Tfsu+Clpy/	0.16+0.01+0.06		
Desm&Phen&Etho+Tfsu+Clpy/	0.25+0.01+0.06		
Desm&Phen&Etho+Tfsu+Clpy	0.25+0.01+0.06	1	100
Tfsu+Clpy+MethOil/	0.0156+0.09+1%		
Tfsu+Clpy+MethOil	0.0156+0.09+1%	3	100
Tfsu+Clpy+MethOil/	0.0238+0.09+1%		
Tfsu+Clpy+MethOil	0.0238+0.09+1%	3	99
Desm+Endo+Tfsu+Clpy/	0.16+0.16+0.01+0.06		
Desm+Endo+Tfsu+Clpy/	0.25+0.25+0.01+0.06		
Desm+Endo+Tfsu+Clpy	0.25+0.25+0.01+0.06	9	100
C.V. %		209	4
LSD 5%		5	5
LSD 1%		6	7
# OF REPS		4	4

*Meth Oil = methylated seed oil from Terra

Summary

All of the treatments caused less than 10% sugarbeet injury. Desmedipham & phenmedipham & ethofumesate gave less control of wild mustard than desmedipham. Endothall and clopyralid did not improve wild mustard control when added to desmedipham & phenmedipham & ethofumesate but triflusulfuron in combination greatly improved wild mustard control. Triflusulfuron + clopyralid + Meth Oil gave 100% wild mustard control.

Postemergence broadleaf herbicides, Minto, 1996. 'ACH 196' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 13. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting for sugarbeet root maggot control. The first herbicide application was 4:00 PM June 3 when the air temperature was 70F, relative humidity was 41%, soil temperature at six inches was 58F, wind velocity was 16 mph, cloud cover was 5%, soil moisture was good and sugarbeet and redroot pigweed were in the 2 leaf stage. The second herbicide application was 3:30 PM June 10 when the air temperature was 94F, relative humidity was 30%, soil temperature at six inches was 71F, wind velocity was 20-25 mph, cloud cover was 10%, soil moisture was good and sugarbeet and redroot pigweed were in the 4 leaf stage. The third herbicide application was 1:30 PM June 17 when the air temperature was 86F, relative humidity was 48%, soil temperature at six inches was 74F, wind velocity was 2-5 mph, cloud cover was 35%, soil moisture was good, sugarbeet was in the 6 to 8 leaf stage and redroot pigweed was in the 6 leaf stage. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury and redroot pigweed control were evaluated June 27.

Treatment*	Rate	Sugarbeet injury	Redroot Pigweed
	lb/A	%	%
Desmedipham/Desmedipham	0.25/0.33	6	96
Desm/Desm/Desm	0.16/0.25/0.25	1	99
Desm&Phen&Etho/Desm&Phen&Etho	0.19/0.25	5	53
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	13	83
Desm&Phen&Etho/ Desm&Phen&Etho/ Desm&Phen&Etho	0.16 0.25 0.25	14	80
Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham	0.125+0.125 0.165+0.165	13	85
Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham	0.08+0.08 0.125+0.125 0.125+0.125	9	94
Desm&Phen&Etho+Desm+Endo/ Desm&Phen&Etho+Desm+Endo/ Desm&Phen&Etho+Desm+Endo	0.08+0.08+0.16 0.125+0.125+0.25 0.125+0.125+0.25	8	84
Desm&Phen&Etho+Endothall/ Desm&Phen&Etho+Endothall/ Desm&Phen&Etho+Endothall	0.16+0.16 0.25+0.25 0.25+0.25	10	65
Desm&Phen&Etho+Clopyralid/ Desm&Phen&Etho+Clopyralid/ Desm&Phen&Etho+Clopyralid	0.16+0.06 0.25+0.06 0.25+0.06	20	93
Desmedipham+Endothall/ Desmedipham+Endothall/ Desmedipham+Endothall	0.16+0.16 0.25+0.25 0.25+0.25	15	93
Desmedipham+Clopyralid/ Desmedipham+Clopyralid/ Desmedipham+Clopyralid	0.16+0.06 0.25+0.06 0.25+0.06	6	100
Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron	0.16+0.008 0.16+0.008 0.16+0.008	5	100

Table continued on next page.

Postemergence broadleaf herbicides, Minto, 1996. (continued)

Treatment*	Rate	Sugarbeet injury	Redroot Pigweed
	lb/A	%	%
Desmedipham+Triflusulfuron/	0.08+0.004		
Desmedipham+Triflusulfuron/	0.08+0.004		
Desmedipham+Triflusulfuron	0.08+0.004	4	100
Desm+Tfsu+MethOil/	0.16+0.008+1.5%		
Desm+Tfsu+MethOil/	0.16+0.008+1.5%		
Desm+Tfsu+MethOil	0.16+0.008+1.5%	9	100
Desm+Tfsu+MethOil/	0.08+0.004+1.5%		
Desm+Tfsu+MethOil/	0.08+0.004+1.5%		
Desm+Tfsu+MethOil	0.08+0.004+1.5%	4	100
Desm+Tfsu+Clpy/	0.16+0.01+0.06		
Desm+Tfsu+Clpy/	0.25+0.01+0.06		
Desm+Tfsu+Clpy	0.25+0.01+0.06	10	100
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.06+1.5%	10	100
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0156		
Desm&Phen&Etho+Triflusulfuron	0.25+0.0156	9	97
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156		
Desm&Phen&Etho+Triflusulfuron	0.33+0.0156	9	98
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0117		
Desm&Phen&Etho+Triflusulfuron	0.25+0.0117	11	94
Desm&Phen&Etho+Tfsu+Clpy/	0.16+0.01+0.06		
Desm&Phen&Etho+Tfsu+Clpy/	0.25+0.01+0.06		
Desm&Phen&Etho+Tfsu+Clpy	0.25+0.01+0.06	25	100
Tfsu+Clpy+MethOil/	0.0156+0.09+1%		
Tfsu+Clpy+MethOil	0.0156+0.09+1%	3	96
Tfsu+Clpy+MethOil/	0.0238+0.09+1%		
Tfsu+Clpy+MethOil	0.0238+0.09+1%	5	97
Desm+Endo+Tfsu+Clpy/	0.16+0.16+0.01+0.06		
Desm+Endo+Tfsu+Clpy/	0.25+0.25+0.01+0.06		
Desm+Endo+Tfsu+Clpy	0.25+0.25+0.01+0.06	15	100
C.V. %		65	9
LSD 5%		9	11
LSD 1%		11	15
# OF REPS		4	4

* Meth Oil = methylated seed oil from Terra

SUMMARY: The two treatments with 20% or more sugarbeet injury both included desmedipham & phenmedipham & ethofumesate + clopyralid. Desmedipham & phenmedipham & ethofumesate gave less control of redroot pigweed than desmedipham. Desmedipham alone applied twice gave exceptionally good control of redroot pigweed in this experiment. Adding endothall to desmedipham & phenmedipham & ethofumesate caused a reduction in redroot pigweed control. Adding triflusulfuron, clopyralid or desmedipham to desmedipham & phenmedipham & ethofumesate resulted in improved control of redroot pigweed. Triflusulfuron + clopyralid + Meth Oil gave 96% or 97% redroot pigweed control.

Postemergence broadleaf herbicides, Olivia, 1996. 'Van der Have 66140' sugarbeet was seeded May 24. The first herbicide application was 1:00 PM June 13 when the air temperature was 70F, relative humidity was 65%, wind was calm, cloud cover was 50%, soil moisture was good, sugarbeet was in the cotyledon to 2 leaf stage and common lambsquarters was in the cotyledon stage. The second herbicide application was 1:00 PM June 19 when the air temperature was 80F, relative humidity was 80%, wind velocity was 0-5 mph, cloud cover was 25%, soil moisture was good, sugarbeet was in the 2 to 4 leaf stage and common lambsquarters was in the cotyledon stage to 1 inch tall. The third herbicide application was 3:00 PM June 26 when the air temperature was 88F, relative humidity was 87%, wind was 10-15 mph, cloud cover was 20%, soil moisture was good, sugarbeet was in the 2 to 6 leaf stage and common lambsquarters was in the cotyledon stage to 3 inches tall. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury and common lambsquarters control were evaluated July 8.

Treatment*	Rate	Sugarbeet injury	Common Lambsquarters control
	lb/A	%	%
Desmedipham/Desmedipham	0.25/0.33	0	70
Desm/Desm/Desm	0.16/0.25/0.25	0	96
Desm&Phen&Etho/Desm&Phen&Etho	0.19/0.25	3	70
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	5	83
Desm&Phen&Etho/ Desm&Phen&Etho/ Desm&Phen&Etho	0.16 0.25 0.25	4	99
Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham	0.125+0.125 0.165+0.165	3	97
Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham	0.08+0.08 0.125+0.125 0.125+0.125	10	99
Desm&Phen&Etho+Desm+Endo/ Desm&Phen&Etho+Desm+Endo/ Desm&Phen&Etho+Desm+Endo	0.08+0.08+0.16 0.125+0.125+0.25 0.125+0.125+0.25	1	83
Desm&Phen&Etho+Endothall/ Desm&Phen&Etho+Endothall/ Desm&Phen&Etho+Endothall	0.16+0.16 0.25+0.25 0.25+0.25	5	86
Desm&Phen&Etho+Clopyralid/ Desm&Phen&Etho+Clopyralid/ Desm&Phen&Etho+Clopyralid	0.16+0.06 0.25+0.06 0.25+0.06	10	91
Desmedipham+Endothall/ Desmedipham+Endothall/ Desmedipham+Endothall	0.16+0.16 0.25+0.25 0.25+0.25	3	95
Desmedipham+Clopyralid/ Desmedipham+Clopyralid/ Desmedipham+Clopyralid	0.16+0.06 0.25+0.06 0.25+0.06	3	97
Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron	0.16+0.008 0.16+0.008 0.16+0.008	6	92

Table continued on next page.

Postemergence broadleaf herbicides, Olivia, 1996. (continued)

Treatment*	Rate	Sugarbeet injury	Common Lambsquarters control
	lb/A	%	%
Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron	0.08+0.004 0.08+0.004 0.08+0.004	3	73
Desm+Tfsu+MethOil/ Desm+Tfsu+MethOil/ Desm+Tfsu+MethOil	0.16+0.008+1.5% 0.16+0.008+1.5% 0.16+0.008+1.5%	5	75
Desm+Tfsu+MethOil/ Desm+Tfsu+MethOil/ Desm+Tfsu+MethOil	0.08+0.004+1.5% 0.08+0.004+1.5% 0.08+0.004+1.5%	0	79
Desm+Tfsu+Clpy/ Desm+Tfsu+Clpy/ Desm+Tfsu+Clpy	0.16+0.01+0.06 0.25+0.01+0.06 0.25+0.01+0.06	11	92
Desm+Tfsu+Clpy+MethOil/ Desm+Tfsu+Clpy+MethOil/ Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.06+1.5% 0.08+0.004+0.06+1.5% 0.08+0.004+0.06+1.5%	6	94
Desm&Phen&Etho+Triflusulfuron/ Desm&Phen&Etho+Triflusulfuron	0.19+0.0156 0.25+0.0156	3	76
Desm&Phen&Etho+Triflusulfuron/ Desm&Phen&Etho+Triflusulfuron	0.25+0.0156 0.33+0.0156	5	90
Desm&Phen&Etho+Triflusulfuron/ Desm&Phen&Etho+Triflusulfuron	0.19+0.0117 0.25+0.0117	8	93
Desm&Phen&Etho+Tfsu+Clpy/ Desm&Phen&Etho+Tfsu+Clpy/ Desm&Phen&Etho+Tfsu+Clpy	0.16+0.01+0.06 0.25+0.01+0.06 0.25+0.01+0.06	14	100
Tfsu+Clpy+MethOil/ Tfsu+Clpy+MethOil	0.0156+0.09+1% 0.0156+0.09+1%	0	35
Tfsu+Clpy+MethOil/ Tfsu+Clpy+MethOil	0.0238+0.09+1% 0.0238+0.09+1%	4	49
Desm+Endo+Tfsu+Clpy/ Desm+Endo+Tfsu+Clpy/ Desm+Endo+Tfsu+Clpy	0.16+0.16+0.01+0.06 0.25+0.25+0.01+0.06 0.25+0.25+0.01+0.06	9	95
C.V. %		120	17
LSD 5%		8	20
LSD 1%		NS	26
# OF REPS		4	4

*Meth Oil = methylated seed oil from Terra

Summary

Three applications of desmedipham or desmedipham & phenmedipham & ethofumesate gave better control of common lambsquarters than two applications. Desmedipham + triflusulfuron + clopyralid gave better control of common lambsquarters than desmedipham + triflusulfuron. Triflusulfuron + clopyralid + Meth Oil gave poor control of common lambsquarters.

Postemergence broadleaf herbicides, Ortonville, 1996. 'ACH 309' sugarbeet was seeded May 15. The first herbicide application was 3:00 PM June 10 when the air temperature was 80F, relative humidity was 70%, wind velocity was 5-10 mph, cloud cover was 65%, soil moisture was good, sugarbeet, common cocklebur and common lambsquarters were in the cotyledon stage and kochia was in the cotyledon to 2 leaf stage. The second herbicide application was 2:30 PM June 17 when the air temperature was 87F, relative humidity was 89%, wind velocity was 0-5 mph, cloud cover was 30%, soil moisture was good, sugarbeet and common cocklebur were in the 2 leaf stage, common lambsquarters was in the 2 to 4 leaf stage and kochia was in the 2 to 6 leaf stage. The third herbicide application was 2:00 PM June 24 when the air temperature was 90F, relative humidity was 92%, wind was calm, cloud cover was 20%, soil moisture was good, sugarbeet and common cocklebur were in the 4 leaf stage, common lambsquarters was in the 4 to 8 leaf stage and kochia was in the 6 leaf stage to 0.5 inch rosette diameter. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Kochia, common cocklebur and common lambsquarters control and sugarbeet injury were evaluated July 9.

Treatment*	Rate	Sgbt inj	Kocz cntl	Cocb cntl	Colq cntl
	lb/A	%	%	%	%
Desmedipham/Desmedipham	0.25/0.33	0	35	43	90
Desm/Desm/Desm	0.16/0.25/0.25	0	55	50	88
Desm&Phen&Etho/Desm&Phen&Etho	0.19/0.25	0	35	15	69
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	0	15	8	56
Desm&Phen&Etho/ Desm&Phen&Etho/ Desm&Phen&Etho	0.16 0.25 0.25	0	35	44	95
Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham	0.125+0.125 0.165+0. 165	0	25	36	90
Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham/ Desm&Phen&Etho+Desmedipham	0.08+0.08 0.125+0.125 0.125+0.125	0	30	40	91
Desm&Phen&Etho+Desm+Endo/ Desm&Phen&Etho+Desm+Endo/ Desm&Phen&Etho+Desm+Endo	0.08+0.08+0.16 0.125+0.125+0.25 0.125+0.125+0.25	0	21	34	88
Desm&Phen&Etho+Endothall/ Desm&Phen&Etho+Endothall/ Desm&Phen&Etho+Endothall	0.16+0.16 0.25+0.25 0.25+0.25	0	33	48	94
Desm&Phen&Etho+Clopyralid/ Desm&Phen&Etho+Clopyralid/ Desm&Phen&Etho+Clopyralid	0.16+0.06 0.25+0.06 0.25+0.06	0	44	100	90
Desmedipham+Endothall/ Desmedipham+Endothall/ Desmedipham+Endothall	0.16+0.16 0.25+0.25 0.25+0.25	0	24	63	91
Desmedipham+Clopyralid/ Desmedipham+Clopyralid/ Desmedipham+Clopyralid	0.16+0.06 0.25+0.06 0.25+0.06	0	46	100	93
Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron/ Desmedipham+Triflusulfuron	0.16+0.008 0.16+0.008 0.16+0.008	0	88	71	81

Table continued on next page.

Postemergence broadleaf herbicides, Ortonville, 1996. (continued)

Treatment*	Rate	Sgbt inj	Kocz cntl	Cocb cntl	Colq cntl
	lb/A	%	%	%	%
Desmedipham+Triflusulfuron/	0.08+0.004				
Desmedipham+Triflusulfuron/	0.08+0.004				
Desmedipham+Triflusulfuron	0.08+0.004	0	78	43	51
Desm+Tfsu+MethOil/	0.16+0.008+1.5%				
Desm+Tfsu+MethOil/	0.16+0.008+1.5%				
Desm+Tfsu+MethOil	0.16+0.008+1.5%	0	93	81	75
Desm+Tfsu+MethOil/	0.08+0.004+1.5%				
Desm+Tfsu+MethOil/	0.08+0.004+1.5%				
Desm+Tfsu+MethOil	0.08+0.004+1.5%	0	96	84	66.
Desm+Tfsu+Clpy/	0.16+0.01+0.06				
Desm+Tfsu+Clpy/	0.25+0.01+0.06				
Desm+Tfsu+Clpy	0.25+0.01+0.06	0	93	100	94
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%				
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%				
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.06+1.5%	0	93	100	71
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0156				
Desm&Phen&Etho+Triflusulfuron	0.25+0.0156	0	76	61	69
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156				
Desm&Phen&Etho+Triflusulfuron	0.33+0.0156	0	76	78	84
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0117				
Desm&Phen&Etho+Triflusulfuron	0.25+0.0117	0	85	58	85
Desm&Phen&Etho+Tfsu+Clpy/	0.16+0.01+0.06				
Desm&Phen&Etho+Tfsu+Clpy/	0.25+0.01+0.06				
Desm&Phen&Etho+Tfsu+Clpy	0.25+0.01+0.06	0	94	100	92
Tfsu+Clpy+MethOil/	0.0156+0.09+1%				
Tfsu+Clpy+MethOil	0.0156+0.09+1%	0	96	100	31
Tfsu+Clpy+MethOil/	0.0238+0.09+1%				
Tfsu+Clpy+MethOil	0.0238+0.09+1%	0	98	100	40
Desm+Endo+Tfsu+Clpy/	0.16+0.16+0.01+0.06				
Desm+Endo+Tfsu+Clpy/	0.25+0.25+0.01+0.06				
Desm+Endo+Tfsu+Clpy	0.25+0.25+0.01+0.06	0	95	100	96
C.V. %		0	19	22	13
LSD 5%		NS	17	20	15
LSD 1%		NS	22	27	20
# OF REPS		4	4	4	4

*Meth Oil = methylated seed oil from Terra

Summary

Treatments including triflusulfuron gave better control of kochia than other treatments. Addition of Meth Oil to the low rate of desmedipham + triflusulfuron gave improved control of kochia, cocklebur and common lambsquarters. Treatments including clopyralid gave total control of cocklebur. Desmedipham gave better control of cocklebur and common lambsquarters than desmedipham & phenmedipham & ethofumesate when applied twice.

Postemergence broadleaf herbicides, Redwood Falls, 1996. 'Hilleshog 5135' sugarbeet was seeded May 17. The first herbicide application was 2:00 PM June 5 when the air temperature was 65F, relative humidity was 40%, wind was 0-5 mph, cloud cover was 65%, soil moisture was good, sugarbeet was in the cotyledon stage, giant foxtail was 0.25 to 1 inch tall and redroot pigweed was in the cotyledon stage to 0.25 inches tall. The second herbicide application was 1:30 PM June 12 when the air temperature was 73F, relative humidity was 55%, wind was 5-10 mph, cloud cover was 30%, soil moisture was good, sugarbeet was in the 2 leaf stage, giant foxtail was 0.5 to 2 inches tall and redroot pigweed was 0.25 to 1 inch tall. The third herbicide application was 3:00 PM June 19 when the air temperature was 85F, relative humidity was 90%, wind was 0-5 mph, cloud cover was 25%, soil moisture was good, sugarbeet was in the 4 leaf stage, giant foxtail was 0.5 to 4 inches tall and redroot pigweed was 0.5 to 3 inches tall. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Giant foxtail and redroot pigweed control and sugarbeet injury were evaluated July 9.

Treatment*	Rate	Giant Foxtail	Redroot Pigweed
	lb/A	--- %	control ---
Desmedipham/Desmedipham	0.25/0.33	23	93
Desm/Desm/Desm	0.16/0.25/0.25	36	97
Desm&Phen&Etho/Desm&Phen&Etho	0.19/0.25	16	51
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	20	50
Desm&Phen&Etho/	0.16		
Desm&Phen&Etho/	0.25		
Desm&Phen&Etho	0.25	60	88
Desm&Phen&Etho+Desmedipham/	0.125+0.125		
Desm&Phen&Etho+Desmedipham	0.165+0.165	26	58
Desm&Phen&Etho+Desmedipham/	0.08+0.08		
Desm&Phen&Etho+Desmedipham/	0.125+0.125		
Desm&Phen&Etho+Desmedipham	0.125+0.125	50	91
Desm&Phen&Etho+Desm+Endo/	0.08+0.08+0.16		
Desm&Phen&Etho+Desm+Endo/	0.125+0.125+0.25		
Desm&Phen&Etho+Desm+Endo	0.125+0.125+0.25	45	91
Desm&Phen&Etho+Endothall/	0.16+0.16		
Desm&Phen&Etho+Endothall/	0.25+0.25		
Desm&Phen&Etho+Endothall	0.25+0.25	40	76
Desm&Phen&Etho+Clopyralid/	0.16+0.06		
Desm&Phen&Etho+Clopyralid/	0.25+0.06		
Desm&Phen&Etho+Clopyralid	0.25+0.06	45	81
Desmedipham+Endothall/	0.16+0.16		
Desmedipham+Endothall/	0.25+0.25		
Desmedipham+Endothall	0.25+0.25	43	84
Desmedipham+Clopyralid/	0.16+0.06		
Desmedipham+Clopyralid/	0.25+0.06		
Desmedipham+Clopyralid	0.25+0.06	33	98
Desmedipham+Triflusulfuron/	0.16+0.008		
Desmedipham+Triflusulfuron/	0.16+0.008		
Desmedipham+Triflusulfuron	0.16+0.008	35	89

Table continued on next page.

Postemergence broadleaf herbicides, Redwood Falls, 1996. (continued)

Treatment*	Rate	Giant Foxtail	Redroot Pigweed
	lb/A	--- %	control ---
Desmedipham+Triflusulfuron/	0.08+0.004		
Desmedipham+Triflusulfuron/	0.08+0.004		
Desmedipham+Triflusulfuron	0.08+0.004	39	78
Desm+Tfsu+MethOil/	0.16+0.008+1.5%		
Desm+Tfsu+MethOil/	0.16+0.008+1.5%		
Desm+Tfsu+MethOil	0.16+0.008+1.5%	68	89
Desm+Tfsu+MethOil/	0.08+0.004+1.5%		
Desm+Tfsu+MethOil/	0.08+0.004+1.5%		
Desm+Tfsu+MethOil	0.08+0.004+1.5%	46	73
Desm+Tfsu+Clpy/	0.16+0.01+0.06		
Desm+Tfsu+Clpy/	0.25+0.01+0.06		
Desm+Tfsu+Clpy	0.25+0.01+0.06	65	99
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%		
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.06+1.5%	63	86
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0156		
Desm&Phen&Etho+Triflusulfuron	0.25+0.0156	34	50
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156		
Desm&Phen&Etho+Triflusulfuron	0.33+0.0156	38	60
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0117		
Desm&Phen&Etho+Triflusulfuron	0.25+0.0117	25	63
Desm&Phen&Etho+Tfsu+Clpy/	0.16+0.01+0.06		
Desm&Phen&Etho+Tfsu+Clpy/	0.25+0.01+0.06		
Desm&Phen&Etho+Tfsu+Clpy	0.25+0.01+0.06	66	88
Tfsu+Clpy+MethOil/	0.0156+0.09+1%		
Tfsu+Clpy+MethOil	0.0156+0.09+1%	30	61
Tfsu+Clpy+MethOil/	0.0238+0.09+1%		
Tfsu+Clpy+MethOil	0.0238+0.09+1%	25	34
Desm+Endo+Tfsu+Clpy/	0.16+0.16+0.01+0.06		
Desm+Endo+Tfsu+Clpy/	0.25+0.25+0.01+0.06		
Desm+Endo+Tfsu+Clpy	0.25+0.25+0.01+0.06	63	93
C.V. %		23	16
LSD 5%		14	17
LSD 1%		18	23
# OF REPS		4	4

*Meth Oil = methylated seed oil from Terra

Summary

None of the treatments caused sugarbeet injury. Adding Meth Oil to desmedipham + triflusulfuron at 0.16 + 0.008 lb/A improved control of giant foxtail but not redroot pigweed. Desmedipham applied twice gave redroot pigweed control similar to desmedipham applied three times. Desmedipham & phenmedipham & ethofumesate gave less control of redroot pigweed than desmedipham. Adding desmedipham to desmedipham & phenmedipham & ethofumesate improved redroot pigweed control.

Postemergence herbicides, St. Thomas, 1996. EPTC + cycloate was applied May 13 and incorporated with a rototiller set four inches deep. Ethofumesate was applied preemergence after seeding sugarbeet. All soil applied treatments were applied in 17 gpa water at 40 psi through 8002 nozzles to the center four rows of six row plots 5:00 PM May 13 when the air temperature was 65F, relative humidity was 25%, soil temperature at six inches was 44F, wind velocity was 2 mph, cloud cover was 5% and soil moisture was good. 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 13. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first postemergence herbicide application was 1:45 PM June 3 when the air temperature was 65F, relative humidity was 53%, soil temperature at six inches was 58F, wind velocity was 18 mph, cloud cover was 5%, soil moisture was good, and sugarbeet and prostrate pigweed were in the cotyledon to 2 leaf stage. The second postemergence herbicide application was 1:00 PM June 10 when the air temperature was 90F, relative humidity was 42%, soil temperature at six inches was 71F, wind velocity was 10-15 mph, cloud cover was 20%, soil moisture was good, sugarbeet was in the 4 leaf stage and prostrate pigweed was in the 4 to 8 leaf stage. The third postemergence herbicide application was 3:00 PM June 17 when the air temperature was 84F, relative humidity was 44%, soil temperature at six inches was 78F, wind velocity was 6 mph, cloud cover was 40%, soil moisture was good, sugarbeet was in the 6 leaf stage and prostrate pigweed was 6 inches in diameter. All postemergence treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sethoxydim + Dash HC at 0.5 lb ai/A + 1 pint/A was applied to the entire plot area July 2. Sugarbeet injury was evaluated June 27. Prostrate pigweed control was evaluated June 27 and July 16.

		June 27		July 16
		Sgbt	Prpw	Prpw
Treatment*	Rate	inj	cntl	cntl
	lb/A	%	%	%
Untreated Weedy Check	0	0	0	0
Desm&Phen&Etho/Desm&Phen&Etho	0.19/0.25	5	58	20
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	6	49	41
Desm&Phen&Etho/Desm&Phen&Etho	0.33/0.4	11	78	70
Desmedipham/Desmedipham	0.25/0.33	5	84	74
Desm+Tfsu+Clpy/	0.16+0.01+0.06			
Desm+Tfsu+Clpy/	0.25+0.01+0.06			
Desm+Tfsu+Clpy	0.25+0.01+0.06	20	100	100
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%			
Desm+Tfsu+Clpy+MethOil/	0.08+0.004+0.06+1.5%			
Desm+Tfsu+Clpy+MethOil	0.08+0.004+0.06+1.5%	10	99	97
Desm+Tfsu+Clpy+MethOil/	0.16+0.008+0.06+1.5%			
Desm+Tfsu+Clpy+MethOil/	0.16+0.008+0.06+1.5%			
Desm+Tfsu+Clpy+MethOil	0.16+0.008+0.06+1.5%	15	100	100
Desm&Phen&Etho+Tfsu+Clpy/	0.16+0.01+0.06			
Desm&Phen&Etho+Tfsu+Clpy/	0.25+0.01+0.06			
Desm&Phen&Etho+Tfsu+Clpy	0.25+0.01+0.06	25	100	99
Ethofumesate (PRE)/	2			
Desmedipham+Triflusulfuron/	0.16+0.0156			
Desmedipham+Triflusulfuron	0.25+0.0156	6	99	98

Table continued on next page.

Postemergence herbicides, St. Thomas, 1996. (continued)

Treatment*	Rate	June 27 Sgbt inj	June 27 Prpw cntl	July 16 Prpw cntl
	lb/A	%	%	%
EPTC+Cycloate (PPI)/	0.9+1.5			
Desmedipham+Triflusulfuron/	0.16+0.0156			
Desmedipham+Triflusulfuron	0.25+0.0156	30	100	96
Ethofumesate (PRE)/	2			
Desmedipham+Triflusulfuron/	0.25+0.0156			
Desmedipham+Triflusulfuron	0.33+0.0156	6	95	94
EPTC+Cycloate (PPI)/	0.9+1.5			
Desmedipham+Triflusulfuron/	0.25+0.0156			
Desmedipham+Triflusulfuron	0.33+0.0156	39	100	95
Triflusulfuron+Clpy+MethOil/	0.0238+0.09+1%			
Triflusulfuron+Clpy+MethOil	0.0238+0.09+1%	6	85	63
--/Endothall	1	10	8	0
--/Endothall	2	19	31	8
--/Endothall+ACA(PCC-700)	1+10.67 fl oz prod	3	0	0
--/Endothall+ACA(PCC-700)	2+10.67 fl oz prod	8	0	0
Desmedipham+Triflusulfuron/	0.25+0.0156			
Desmedipham+Triflusulfuron	0.33+0.0156	6	86	75
Desmedipham+Tfsu+R-11/	0.25+0.0156+0.25%			
Desmedipham+Tfsu+R-11	0.33+0.0156+0.25%	5	73	60
Desmedipham+Tfsu+R-11/	0.25+0.0238+0.25%			
Desmedipham+Tfsu+R-11	0.33+0.0238+0.25%	10	95	81
Triflusulfuron+R-11/	0.0156+0.25%			
Triflusulfuron+R-11	0.0156+0.25%	0	59	10
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156			
Desm&Phen&Etho+Triflusulfuron	0.33+0.0156	10	81	56
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0156			
Desm&Phen&Etho+Triflusulfuron	0.25+0.0156	8	81	35
Desm&Phen&Etho+Triflusulfuron/	0.16+0.0156			
Desm&Phen&Etho+Triflusulfuron	0.19+0.0156	3	66	35
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0117			
Desm&Phen&Etho+Triflusulfuron	0.33+0.0117	5	79	48
Desm&Phen&Etho+Triflusulfuron/	0.19+0.0117			
Desm&Phen&Etho+Triflusulfuron	0.25+0.0117	6	76	59
Desm&Phen&Etho+Triflusulfuron/	0.16+0.0117			
Desm&Phen&Etho+Triflusulfuron	0.19+0.0117	0	60	38
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156			
Desm&Phen&Etho+Tfsu+Clpy	0.33+0.0156+0.09	6	71	30
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0117			
Desm&Phen&Etho+Tfsu+Clpy	0.33+0.0117+0.09	9	84	53
Desm&Phen&Etho+Desmedipham/	0.125+0.125			
Desm&Phen&Etho+Desmedipham	0.165+0.165	5	65	35
Desm&Phen&Etho+Desmedipham/	0.165+0.165			
Desm&Phen&Etho+Desmedipham	0.2+0.2	6	76	65
Desm&Phen&Etho+Desmedipham/	0.1+0.15			
Desm&Phen&Etho+Desmedipham	0.132+0.198	1	65	45

Table continued on next page.

Postemergence herbicides, St. Thomas, 1996. (continued)

Treatment*	Rate	June 27 Sgbt inj	June 27 Prpw cntl	July 16 Prpw cntl
	lb/A	%	%	%
Desm&Phen&Etho+Desmedipham/	0.132+0.198			
Desm&Phen&Etho+Desmedipham	0.16+0.24	8	75	66
Desm&Phen&Etho+Desmedipham/	0.082+0.168			
Desm&Phen&Etho+Desmedipham	0.109+0.221	3	73	64
Desm&Phen&Etho+Desmedipham/	0.109+0.221			
Desm&Phen&Etho+Desmedipham	0.132+0.268	10	88	73
Desmedipham+Triflusulfuron/	0.08+0.004			
Desmedipham+Triflusulfuron/	0.08+0.004			
Desmedipham+Triflusulfuron	0.08+0.004	4	96	84
Desm+Triflusulfuron+MethOil/	0.08+0.004+1.5%			
Desm+Triflusulfuron+MethOil/	0.08+0.004+1.5%			
Desm+Triflusulfuron+MethOil	0.08+0.004+1.5%	5	99	90
Desmedipham+Triflusulfuron/	0.16+0.008			
Desmedipham+Triflusulfuron/	0.16+0.008			
Desmedipham+Triflusulfuron	0.16+0.008	5	99	95
Desm+Triflusulfuron+MethOil/	0.16+0.008+1.5%			
Desm+Triflusulfuron+MethOil/	0.16+0.008+1.5%			
Desm+Triflusulfuron+MethOil	0.16+0.008+1.5%	14	100	100
EXP MEAN		9	73	58
C.V. %		90	13	20
LSD 5%		11	13	16
LSD 1%		15	18	22
# OF REPS		4	4	4

* Meth Oil = methylated seed oil from Terra; R-11 = non-ionic surfactant from Wilbur-Ellis; ACA(PCC-700) = Zinc Ammonium Acetate, 15% N, 17% Zn.

Summary

Averaged over all treatments, prostrate pigweed control was 73% on June 27 and 58% on July 16. Pigweed control declined more with the weaker treatments than with the better treatments. Ten treatments gave 94% or greater control of prostrate pigweed on July 16. They were 1, 2 and 3)desmedipham + triflusulfuron + clopyralid applied three times with and without Meth Oil; 4)three applications of desmedipham & phenmedipham & ethofumesate + triflusulfuron + clopyralid; 5, 6, 7 and 8)ethofumesate or EPTC + cycloate(PPI) plus two applications of desmedipham + triflusulfuron; and 9 and 10)three applications of desmedipham + triflusulfuron at the higher rate with and without Meth Oil. Plots treated with EPTC + cycloate had more sugarbeet injury than plots treated with ethofumesate. The use of ethofumesate or EPTC + cycloate saved one postemergence treatment. The low rate of desmedipham + triflusulfuron + clopyralid + Meth Oil applied three times gave similar weed control to the higher rate of the same treatment. ACA reduced sugarbeet injury from endothall but also reduced June 27 prostrate pigweed control from endothall at 2 lb/A.

Postemergence herbicides plus Lorsban 75 WG, Fargo, 1996. 'ACH 196' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 2. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting for sugarbeet root maggot control. The first half of split application herbicide treatments was applied 3:30 PM May 24 when the air temperature was 68F, relative humidity was 51%, soil temperature at six inches was 54F, wind velocity was 9 mph, cloud cover was 5%, soil moisture was good and sugarbeet was in the cotyledon stage. The second half of split applications was 4:00 PM June 3 when the air temperature was 67F, relative humidity was 42%, soil temperature at six inches was 54F, wind velocity was 21 mph, cloud cover was 15%, soil moisture was good and sugarbeet was in the 2 to 4 leaf stage. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury was evaluated June 17.

Treatment	Rate	Sugarbeet injury
	lb/A	%
Desmedipham&Phenmedipham&Ethofumesate/	0.33	
Desmedipham&Phenmedipham&Ethofumesate	0.4	14
Desm&Phen&Etho+Lorsban-WG/	0.33+1	
Desm&Phen&Etho+Lorsban-WG	0.4+1	6
Desmedipham/	0.33	
Desmedipham	0.4	10
Desmedipham+Lorsban-WG/	0.33+1	
Desmedipham+Lorsban-WG	0.4+1	8
Desmedipham+Clopyralid/	0.33+0.12	
Desmedipham+Clopyralid	0.4+0.12	19
Desmedipham+Clopyralid+Lorsban-WG/	0.33+0.12+1	
Desmedipham+Clopyralid+Lorsban-WG	0.4+0.12+1	9
Desmedipham+Triflusulfuron/	0.33+0.02	
Desmedipham+Triflusulfuron	0.4+0.02	11
Desmedipham+Triflusulfuron+Lorsban-WG/	0.33+0.02+1	
Desmedipham+Triflusulfuron+Lorsban-WG	0.4+0.02+1	8
Desmedipham&Phenmedipham&Ethofumesate/	0.5	
Desmedipham&Phenmedipham&Ethofumesate	0.5	23
Desm&Phen&E+Lorsban-WG/	0.5+1	
Desm&Phen&Etho+Lorsban-WG	0.5+1	18
C.V. %		31
LSD 5%		6
LSD 1%		8
# OF REPS		4

Summary

Sugarbeet injury from herbicides was less when Lorsban-WG was tank-mixed with the herbicides than when the herbicides were used alone.

Grass control herbicides, Crookston, 1996. 'Foster' barley at 72 lb/A, 'NewDak' oats at 44 lb/A, 'Agri I' navy bean at 69 lb/A, 'Beta 3712' sugarbeet, 'Interstate 3311' sunflower at 27 lb/A and 'Manta' Siberian foxtail millet at 11 lb/A were seeded in 4 foot strips across the herbicide plots May 14. Single application treatments and the first half of split application treatments were at 12:30 PM June 7 when the air temperature was 79F, relative humidity was 44%, wind velocity was 3 mph, cloud cover was 25%, soil temperature at six inches was 60F, soil moisture was good, barley was in the 4 leaf stage (7 inches tall), oats was in the 4 leaf stage (5 inches tall), foxtail species was in the 3 to 4 leaf stage (2 to 4 inches tall), sugarbeet was in the 2 leaf stage, navy bean was in the 2 leaf to 1 trifoliolate stage, redroot pigweed was in the 2 leaf stage, common lambsquarters was in the 4 to 6 leaf stage and sunflower was in the 4 leaf stage. The second half of split application treatments was applied 11:00 AM June 13 when the air temperature was 82F, relative humidity was 28%, wind velocity was 2-5 mph, cloud cover was 5%, soil temperature at six inches was 71F, soil moisture was good, barley was in the 6 leaf stage, oats was in the 6 leaf stage (8 inches tall), foxtail species was 8 inches tall, sugarbeet was in the 4 to 6 leaf stage, navy bean was in the 3 trifoliolate stage, redroot pigweed was in the 6 leaf stage, common lambsquarters was in the 10 leaf stage and sunflower was in the 6 to 8 leaf stage. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center 6.67 feet of 11 foot plots. Barley, oats, navy bean, sugarbeet, foxtail species, redroot pigweed, common lambsquarters and sunflower were evaluated July 3.

Table on next page.

Summary

Grass control was antagonized when desmedipham & phenmedipham, desmedipham & phenmedipham & ehtofumesate or desmedipham & phenmedipham + triflusulfuron were mixed with quizalofop, clethodim or sethoxydim compared to the grass herbicides alone. The inclusion of triflusulfuron or Activator 90 in the tank-mix did not reduce antagonism. Two applications of desmedipham & phenmedipham plus a grass herbicide gave grass control similar to one application of a grass herbicide plus adjuvant. Quizalofop plus Activator 90, Herbimax or Scoil gave similar grass control. Sodium bicarbonate ($NaHCO_3$) at 0.128 lb/A did not antagonize grass control in this experiment. Clopyralid did not antagonize clethodim. Lorsban antagonized foxtail control from quizalofop but not clethodim.

Grass control herbicides, Crookston, 1996. (continued)

Treatment*	Rate	Sgbt inj	Rrpw cntl	Colq cntl	Oats cntl	Barl cntl	Fxtl spp. cntl	Nabe cntl	Sufl cntl
	(lb/A)	%	%	%	%	%	%	%	%
Quizalofop+Activator 90	0.048+0.25%	0	0	0	100	100	96	0	0
Quizalofop+Herbimax	0.048+1%	0	0	0	99	99	85	0	0
Quizalofop+Scoil	0.048+1%	0	0	0	100	100	92	0	0
Quizalofop+Activator 90	0.096+0.25%	0	0	0	98	100	89	0	0
Quizalofop+Herbimax	0.096+1%	0	0	0	97	100	92	0	0
Sethoxydim-U+Scoil	0.2+1.5%	0	0	0	99	100	98	0	0
Clethodim-P+Scoil	0.073+1%	0	0	0	100	99	97	0	0
Clethodim-P+Scoil	0.094+1%	0	0	0	100	100	96	0	0
Quizalofop+Des&Phen	0.048+0.33	0	31	48	49	74	41	1	3
Quizalofop+Des&Phen	0.062+0.33	3	28	63	68	79	53	0	0
Quizalofop+Des&Phen+Activat90	0.048+0.33+0.25%	3	55	81	39	63	31	4	5
Quizalofop+Des&Phen+Activat90	0.062+0.33+0.25%	0	28	50	69	76	44	1	6
Quizalofop+Des&Phen+Tfsu	0.048+0.33+0.0156	0	53	69	63	76	45	12	30
Quizalofop+Des&Phen+Tfsu	0.062+0.33+0.0156	0	40	73	58	73	41	11	25
Qufp+De&Ph+Tfsu+Activ90	0.048+0.33+0.0156+0.25%	0	51	64	53	74	49	18	39
Qufp+De&Ph+Tfsu+Activ90	0.062+0.33+0.0156+0.25%	0	50	79	45	59	63	15	38
Qufp+Des&Phen&Etho	0.062+0.33	3	28	50	84	90	66	2	5
Sethoxydim-U+Des&Phen	0.3+0.33	0	31	41	92	94	86	0	4
Sethoxydim-U+Des&Phen&Etho	0.3+0.33	0	34	75	70	74	68	3	5
Clethodim-P+Des&Phen	0.094+0.33	0	40	41	83	88	74	3	10
Clethodim-P+Des&Phen	0.125+0.33	0	39	60	80	89	83	0	5
Clethodim-P+Des&Phen&Etho	0.094+0.33	0	26	54	72	83	71	2	4
Clethodim-P+Des&Phen&Etho	0.125+0.33	0	10	13	92	97	81	1	5
Clethodim-P+Des&Phen+Tfsu	0.125+0.33+0.0156	0	55	64	98	98	85	19	35
Clethodim-P+Clopyralid+Scoil	0.094+0.09+1%	0	13	35	99	100	86	80	89
Clethodim-P+Lorsban 4E+Scoil	0.094+1+1%	0	0	0	98	100	89	0	0
Quizalofop+Lorsban 4E+Scoil	0.048+1+1%	0	0	0	91	95	49	0	0
Qufp+De&Ph/Qufp+De&Ph	0.048+0.33/0.048+0.33	0	66	89	84	94	81	11	21
Qufp+De&Ph/Qufp+De&Ph	0.062+0.33/0.062+0.33	0	50	81	87	91	86	13	24
Seth-U+De&Ph/Seth-U+De&Ph	0.2+0.33/0.2+0.33	0	73	89	90	93	96	14	26
Seth-U+De&Ph/Seth-U+De&Ph	0.3+0.33/0.3+0.33	0	69	95	100	100	96	14	31
Clet-P+De&Ph/Clet-P+De&Ph	0.073+0.33/0.073+0.33	0	84	91	95	95	88	26	28
Clet-P+De&Ph/Clet-P+De&Ph	0.094+0.33/0.094+0.33	0	83	93	100	100	97	21	36
Qufp+Herbimax+$NaHCO_3$	0.048+1%+0.128	0	0	0	97	99	84	0	0
Clet-P+Scoil+$NaHCO_3$	0.073+1%+0.128	0	0	0	100	100	92	0	0
Seth-U+Scoil+$NaHCO_3$	0.2+1%+0.128	0	0	0	99	99	90	0	0
Qufp+Herbimax+AMS+$NaHCO_3$	0.048+1%+2.5+0.128	0	0	0	97	98	84	0	0
Clet-P+Scoil+AMS+$NaHCO_3$	0.073+1%+2.5+0.128	0	0	0	98	99	91	0	0
Seth-U+Scoil+AMS+$NaHCO_3$	0.2+1%+2.5+0.128	0	0	0	99	99	87	0	0
Qufp+Herbimax+Choice+$NaHCO_3$	0.048+1%+.0625G+.128	0	0	0	98	99	82	1	0
Clet-P+Scoil+Choice+$NaHCO_3$	0.073+1%+.0625G+.128	0	0	0	99	100	97	0	0
Seth-U+Scoil+Choice+$NaHCO_3$	0.2+1%+0.0625G+0.128	0	8	8	97	98	93	0	0
C.V. %		730	42	50	11	8	16	119	61
LSD 5%		NS	15	25	14	11	18	11	10
LSD 1%		NS	19	33	18	14	23	14	13
# OF REPS		4	4	4	4	4	4	4	4

* Scoil = methylated seed oil from Agsco; Activator 90 = non-ionic surfactant from Loveland; AMS = ammonium sulfate; Choice = water conditioning agent from Loveland; Herbimax = petroleum oil from Loveland; $NaHCO_3$ = sodium bicarbonate; Sethoxydim-U = Ultima 160, 1.3 lb ai/gal formulation from BASF; Clethodim-P = Prism, 0.94 lb ai/gal formulation from Valent.

Grass control herbicides, Fargo, 1996. 'Foster' barley at 65 lb/A, 'Valley' oats at 50 lb/A, 'Othello' pinto bean at 70 lb/A, 'Beta 3712' sugarbeet, 'Interstate 3311' sunflower at 27 lb/A and 'Manta' Siberian foxtail millet at 11 lb/A were seeded in 4 foot strips across the herbicide plots May 15. Single application treatments and the first half of split application treatments were at 1:00 PM June 12 when the air temperature was 78F, relative humidity was 53%, wind velocity was 15 mph, cloud cover was 90%, soil temperature at six inches was 70F, soil moisture was good, oats and barley were in the 5 leaf stage, foxtail species was in the 4 leaf stage, sugarbeet was in the 4 leaf stage, pinto bean was in the 1 trifoliolate stage, redroot pigweed was in the 4 leaf stage and sunflower was in the 4 leaf stage. The second half of split application treatments was applied 7:00 PM June 17 when the air temperature was 84F, relative humidity was 41%, wind velocity was 8 mph, cloud cover was 10%, soil temperature at six inches was 72F and soil moisture was fair. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzlesto the center 6.67 feet of 11 foot plots. Barley, oats, pinto bean, sugarbeet, foxtail species, redroot pigweed and sunflower were evaluated July 2.

Table on next page.

Summary

Grass control was antagonized when desmedipham & phenmedipham, desmedipham & phenmedipham & ethofumesate or desmedipham & phenmedipham + triflusulfuron were mixed with quizalofop, clethodim or sethoxydim compared to the grass herbicides alone. The inclusion of triflusulfuron or Activator 90 in the tank-mix did not reduce antagonism. Two applications of desmedipham & phenmedipham plus a grass herbicide gave grass control similar to one application of a grass herbicide plus adjuvant. Quizalofop plus Activator 90, Herbimax or Scoil gave similar grass control. Sodium bicarbonate ($NaHCO_3$) at 0.128 lb/A did not antagonize grass control in this experiment. Clopyralid did not antagonize clethodim. Losrban antagonized foxtail control from quizalofop but not clethodim.

Grass control herbicides, Fargo, 1996. (continued)

Treatment*	Rate	Rrpw cntl	Sgbt inj	Barl cntl	Oats cntl	Sufl cntl	Pibe cntl	Fxtl spp. cntl
	lb/A	%	%	%	%	%	%	%
Quizalofop+Activator 90	0.048+0.25%	1	0	100	99	19	3	97
Quizalofop+Herbimax	0.048+1%	0	0	100	100	9	5	95
Quizalofop+Scoil	0.048+1%	0	0	100	100	24	13	97
Quizalofop+Activator 90	0.096+0.25%	0	0	100	100	13	4	95
Quizalofop+Herbimax	0.096+1%	0	0	100	100	23	5	98
Sethoxydim-U+Scoil	0.2+1.5%	0	0	100	100	15	4	100
Clethodim-P+Scoil	0.073+1%	0	0	100	100	13	6	95
Clethodim-P+Scoil	0.094+1%	0	0	100	100	21	1	98
Quizalofop+Desmedipham&Phenmedipham	0.048+0.33	19	0	85	64	23	5	75
Quizalofop+Desmedipham&Phenmedipham	0.062+0.33	29	0	94	81	38	6	78
Quizalofop+Des&Phen+Activator90	0.048+0.33+0.25%	14	0	89	61	34	13	58
Quizalofop+Des&Phen+Activator90	0.062+0.33+0.25%	26	0	91	79	41	9	68
Quizalofop+Des&Phen+Tfsu	0.048+0.33+0.0156	59	4	89	73	88	73	61
Quizalofop+Des&Phen+Tfsu	0.062+0.33+0.0156	68	8	93	78	88	75	68
Qufp+De&Ph+Tfsu+Activ90	0.048+0.33+0.0156+0.25%	60	8	84	69	84	71	69
Qufp+De&Ph+Tfsu+Activ90	0.062+0.33+0.0156+0.25%	64	5	91	80	85	68	73
Qufp+Des&Phen&Etho	0.062+0.33	29	0	97	94	35	11	87
Sethoxydim-U+Des&Phen	0.3+0.33	24	3	79	78	21	6	97
Sethoxydim-U+Des&Phen&Etho	0.3+0.33	18	3	85	77	24	11	88
Clethodim-P+Desmedipham&Phenmedipham	0.094+0.33	24	0	79	76	23	11	86
Clethodim-P+Desmedipham&Phenmedipham	0.125+0.33	14	0	93	94	41	15	93
Clethodim-P+Des&Phen&Etho	0.094+0.33	11	3	88	82	31	9	87
Clethodim-P+Des&Phen&Etho	0.125+0.33	20	3	94	93	34	8	96
Clethodim-P+Des&Phen+Tfsu	0.125+0.33+0.0156	71	10	91	95	88	80	89
Clethodim-P+Clopyralid+Scoil	0.094+0.09+1%	8	0	99	100	86	87	95
Clethodim-P+Lorsban 4E+Scoil	0.094+1+1%	0	0	100	100	10	1	99
Quizalofop+Lorsban 4E+Scoil	0.048+1+1%	18	0	100	100	43	19	81
Qufp+Des&Phen/Qufp+De&Ph	0.048+0.33/0.048+0.33	50	5	100	92	41	24	91
Qufp+Des&Phen/Qufp+De&Ph	0.062+0.33/0.062+0.33	49	3	100	95	43	20	93
Seth-U+Des&Phen/Seth-U+De&Ph	0.2+0.33/0.2+0.33	44	3	95	94	33	20	97
Seth-U+Des&Phen/Seth-U+De&Ph	0.3+0.33/0.3+0.33	49	9	98	97	49	45	99
Clet-P+De&Ph/Clet-P+De&Ph	0.073+0.33/0.073+0.33	66	10	96	95	44	19	99
Clet-P+De&Ph/Clet-P+De&Ph	0.094+0.33/0.094+0.33	70	11	97	96	56	46	99
Qufp+Herbimax+$NaHCO_3$	0.048+1%+0.128	0	0	100	99	10	8	97
Clet-P+Scoil+$NaHCO_3$	0.073+1%+0.128	3	0	98	99	11	3	99
Seth-U+Scoil+$NaHCO_3$	0.2+1%+0.128	0	0	100	98	19	4	100
Qufp+Herbimax+AMS+$NaHCO_3$	0.048+1%+2.5+0.128	0	0	100	100	18	6	98
Clet-P+Scoil+AMS+$NaHCO_3$	0.073+1%+2.5+0.128	0	0	100	100	9	3	99
Seth-U+Scoil+AMS+$NaHCO_3$	0.2+1%+2.5+0.128	0	0	100	100	10	6	100
Qufp+Herbimax+Choice+$NaHCO_3$	0.048+1%+0.0625G+0.128	0	0	100	99	14	6	96
Clet-P+Scoil+Choice+$NaHCO_3$	0.073+1%+0.0625G+0.128	0	0	100	100	11	3	100
Seth-U+Scoil+Choice+$NaHCO_3$	0.2+1%+0.0625G+0.128	0	0	100	99	8	8	99
C.V. %		49	187	5	6	32	42	10
LSD 5%		15	5	7	8	15	12	13
LSD 1%		19	7	9	10	20	15	17
# OF REPS		4	4	4	4	4	4	4

* Scoil = methylated seed oil from Agsco; Activator 90 = non-ionic surfactant from Loveland; AMS = ammonium sulfate; Choice = water conditioning agent from Loveland; Herbimax = petroleum oil from Loveland; $NaHCO_3$ = sodium bicarbonate; Sethoxydim-U = Ultima 160, 1.3 lb ai/gal formulation from BASF; Clethodim-P = Prism, 0.94 lb ai/gal formulation from Valent.

Sugarbeet variety and herbicide interaction, Fargo, 1996. Seven sugarbeet varieties were seeded 1.25 inches deep in 22 inch rows May 3. Counter 15G insecticide at 11 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots May 29, June 4 and June 11. Herbicide treatments were desmedipham & phenmedipham & ethofumesate at 0.33, 0.4 and 0.5 lb ai/A, desmedipham + clopyralid at 0.33 + 0.12, 0.4 + 0.12 and 0.5 + 0.12 lb ai/A, desmedipham + triflusulfuron at 0.33 + 0.02, 0.4 + 0.02 and 0.5 + 0.02 lb ai/A, desmedipham at 0.33, 0.4 and 0.5 lb ai/A and an untreated check. The first portion of each split application herbicide treatment was the lowest of the three listed rates and was applied 7:00 PM May 29 when the air temperature was 75F, soil temperature at six inches was 60F, relative humidity was 22%, wind velocity was 10-15 mph, sky was clear, soil moisture was good and sugarbeet was in the cotyledon to 2 leaf stage. The second portion of each herbicide treatment (middle rate) was applied 3:00 PM June 4 when the air temperature was 71F, soil temperature at six inches was 58F, relative humidity was 38%, wind velocity was 3 mph, cloud cover was 10%, soil moisture was good and sugarbeet was in the 2 to 4 leaf stage. The third portion of each herbicide treatment (high rate) was applied 4:15 PM June 11 when the air temperature was 91F, soil temperature at six inches was 71F, relative humidity was 37%, wind velocity was 5 mph, cloud cover was 25%, soil moisture was fair and sugarbeet was in the 4 leaf stage. Sugarbeet injury was evaluated June 17. All plots were cultivated June 21 and June 28 and were hand weeded throughout the growing season. The entire plot area was sprayed with sethoxydim + Dash HC at 0.3 lb ai/A + 1 pint/A June 17. Super Tin fungicide at 5 oz. product/A was applied to all plots August 8 and August 22. The center two rows from each 30 foot long plot were counted and harvested September 24.

Summary

Averaged over all herbicide treatments, Van der Have 66168 yielded more extractable sucrose per acre than the other tested varieties except Maribo 9363 had similar extractable sucrose (Table 1). Monohikari was injured by herbicides more than other varieties and had the lowest % sucrose. Averaged over all varieties, all herbicide treatments reduced yield in tons per acre (Table 2). Only desmedipham + clopyralid and desmedipham & phenmedipham & ethofumesate reduced extractable sucrose per acre. They also caused the most sugarbeet injury as evaluated visually.

In the variety by herbicide interaction data, all herbicide treatments reduced tons per acre of Glacier (Table 3). Desmedipham + clopyralid reduced tons per acre of Maribo 875 and Horizon. Desmedipham & phenmedipham & ethofumesate reduced tons per acre of Monohikari and Van der Have 66168. Monohikari had the greatest visible injury from herbicides but none of the treatments caused a significant loss in extractable sucrose per acre.

The data for sugarbeet population, sucrose content, root yield and extractable sucrose were converted into percent of untreated check by dividing the data from the untreated check for each variety into the data from each treatment on the same variety. Percent of untreated check is presented in Tables 4, 5 and 6.

Experiment continued on next page.

Sugarbeet variety and herbicide interaction, Fargo, 1996. (continued)

Averaged over herbicide treatment, the sugarbeet plant population as a percent of untreated check was less with HM Glacier than with the other tested varieties suggesting that herbicides reduced the population of Glacier (Table 4). However, please note that the actual harvested population of Glacier (Table 1) was higher than with other varieties. Sucrose content as a % of the untreated check was similar to or greater than 100 % with all varieties (Table 4). Glacier, Maribo 875 and VDH 66168 had sucrose content greater than 100% suggesting that herbicide treatment increased sucrose content. Root yield as % of the untreated check was less with Glacier than the other varieties. Also, Maribo 9363, Horizon, Maribo 875 and VDH 66168 yielded less than the untreated check. Extractable sucrose as a % of the untreated check was significantly less than 100% with Maribo 9363 and Horizon.

As a percent of the untreated check averaged over all varieties, herbicides were similar to one another in effect on sugarbeet plant population, root yield and extractable sucrose (Table 5). Sucrose content was similar to or greater than the untreated check with all herbicides. The variety by herbicide interaction expressed as percent of untreated check had no significant differences among means (Table 6).

Experiment continued on next page.

Sugarbeet variety and herbicide interaction, Fargo, 1996. (continued)

Table 1. Variety averaged over all herbicide treatments.

Variety	Sgbt inj	Sept.24 Sgbt Popl	Sucrose	Loss to Mol	Root Yield	Impur Index	Extract Sucrose
	%	plt/60'	%	%	ton/A		lb/A
Maribo 9363	11	85	18.8	1.6	22.8	640	7772
Beta 3712	19	77	18.7	1.6	22.5	635	7601
HM Glacier	19	104	18.3	1.9	22.6	754	7333
HM Horizon	12	92	18.1	1.8	22.9	717	7381
Maribo 875	9	90	18.3	1.9	22.4	755	7287
Monohikari	25	87	17.5	1.6	24.3	678	7635
VDH 66168	10	92	18.4	1.8	24.5	701	8088
C.V. %	38	8	5.3	11.9	7.0	16	9
LSD 5%	3	4	0.5	0.1	0.8	56	355
LSD 1%	4	5	0.7	0.1	1.1	74	469
# OF REPS	30	30	30	30	30	30	30

Table 2. Herbicide treatment averaged over all varieties.

Herbicide Treatment	Sgbt inj	Sept.24 Sgbt Popl	Sucrose	Loss to Mol	Root Yield	Impur Index	Extract Sucrose
	%	plt/60'	%	%	ton/A		lb/A
Desmedipham	13	90	18.4	1.8	23.2	710	7644
Untreated Check	0	89	18.2	1.7	24.1	693	7841
Desmedipham+Clopyralid	24	89	18.2	1.8	22.5	720	7320
Desm&Phen&Etho	21	90	18.4	1.7	22.6	680	7487
Desmedipham+Triflusulfuron	17	90	18.3	1.7	23.2	683	7635
C.V. %	35	8	4.9	10.9	6.5	14	9
LSD 5%	2	NS	NS	NS	0.6	NS	282
LSD 1%	3	NS	NS	NS	0.9	NS	372
# OF REPS	42	42	42	42	42	42	42

Experiment continued on next page.

Sugarbeet variety and herbicide interaction, Fargo, 1996. (continued)

Table 3.

Variety	Herbicide Treatment	Sgbt inj	Sept.24 Sgbt Popl	Sucrose	Loss to Mol	Root Yield	Impur Index	Extract Sucrose
		%	plt/60'	%	%	ton/A		lb/A
Monohikari	Desm&Phen&Etho	34	89	17.5	1.6	23.0	685	7198
Monohikari	Desm+Clpy	37	86	17.2	1.6	24.3	710	7449
Monohikari	Desm+Tfsu	31	88	17.3	1.6	25.2	692	7830
Monohikari	Desmedipham	25	87	18.2	1.5	24.0	615	7925
Monohikari	Untreated Check	0	85	17.4	1.6	24.8	686	7770
HM Glacier	Desm&Phen&Etho	28	104	18.7	1.8	21.8	711	7304
HM Glacier	Desm+Clpy	28	100	18.0	2.0	21.5	803	6802
HM Glacier	Desm+Tfsu	21	105	18.5	1.8	22.1	724	7285
HM Glacier	Desmedipham	16	103	18.4	1.9	22.6	745	7380
HM Glacier	Untreated Check	0	108	18.0	1.9	24.9	788	7892
Maribo 875	Desm&Phen&Etho	14	93	19.0	1.8	22.5	691	7634
Maribo 875	Desm+Clpy	17	90	18.4	1.9	21.5	770	6993
Maribo 875	Desm+Tfsu	8	85	18.4	1.8	22.8	701	7528
Maribo 875	Desmedipham	8	95	17.6	2.0	22.1	847	6796
Maribo 875	Untreated Check	0	89	18.1	1.9	23.3	765	7486
Maribo 9363	Desm&Phen&Etho	16	84	18.9	1.6	22.9	595	7901
Maribo 9363	Desm+Clpy	21	87	19.2	1.6	22.0	605	7675
Maribo 9363	Desm+Tfsu	12	88	18.0	1.8	22.7	716	7279
Maribo 9363	Desmedipham	7	83	19.0	1.8	22.7	697	7765
Maribo 9363	Untreated Check	0	85	19.1	1.5	23.6	586	8240
Beta 3712	Desm&Phen&Etho	28	77	18.6	1.7	22.5	651	7550
Beta 3712	Desm+Clpy	25	77	18.4	1.7	22.3	671	7373
Beta 3712	Desm+Tfsu	27	74	19.0	1.6	22.7	601	7836
Beta 3712	Desmedipham	16	80	18.7	1.6	22.3	639	7527
Beta 3712	Untreated Check	0	76	18.7	1.6	22.7	614	7719
VDH 66168	Desm&Phen&Etho	15	92	18.2	1.8	23.7	708	7751
VDH 66168	Desm+Clpy	17	92	18.5	1.8	24.5	719	8124
VDH 66168	Desm+Tfsu	10	95	18.8	1.7	24.0	677	8100
VDH 66168	Desmedipham	8	91	18.6	1.7	24.8	687	8288
VDH 66168	Untreated Check	0	88	18.0	1.8	25.5	717	8177
HM Horizon	Desm&Phen&Etho	15	93	18.1	1.8	22.0	722	7069
HM Horizon	Desm+Clpy	26	92	17.7	1.8	21.7	759	6827
HM Horizon	Desm+Tfsu	12	96	18.2	1.7	23.2	668	7585
HM Horizon	Desmedipham	9	89	18.5	1.9	23.9	738	7826
HM Horizon	Untreated Check	0	91	18.0	1.7	23.6	695	7601
C.V. %		32	8	5.2	11.9	6.9	16	9
LSD 5%		5	8	1.1	0.2	1.8	124	776
LSD 1%		7	11	1.4	0.3	2.4	163	1023
# OF REPS		6	6	6	6	6	6	6

Experiment continued on next page.

Sugarbeet variety and herbicide interaction, Fargo, 1996. (continued)

Table 4. Sugarbeet plant population, sucrose content, root yield and extractable sucrose as percent of untreated check averaged over herbicide treatments.

Variety	Sugarbeet Population	Sucrose	Root Yield	Extractable Sucrose
	------------- percent of untreated check -------------			
Maribo 9363	101	99	96	94
Beta 3712	102	100	99	99
HM Glacier	95	103	88	91
HM Horizon	102	101	96	97
Maribo 875	102	102	96	98
Monohikari	103	101	98	99
VDH 66168	106	103	96	99
C.V. %	9	3	8	9
LSD 5%	5	2	4	5
LSD 1%	7	3	6	NS
# OF REPS	24	24	24	24

Table 5. Sugarbeet plant population, sucrose content, root yield and extractable sucrose as percent of untreated check averaged over variety.

Herbicide	Sugarbeet Population	Sucrose	Root Yield	Extractable Sucrose
	-------- percent of untreated check --------			
Desmedipham	102	102	97	98
Desmedipham+Clopyralid	101	100	94	94
Desm&Phen&Etho	102	102	94	96
Desmedipham+Triflusulfuron	101	101	97	98
C.V. %	10	1	8	8
LSD 5%	NS	1	NS	NS
LSD 1%	NS	1	NS	NS
# OF REPS	42	42	42	42

Experiment continued on next page.

Sugarbeet variety and herbicide interaction, Fargo, 1996. (continued)

Table 6. Sugarbeet plant population, sucrose content, root yield and extractable sucrose as percent of untreated check.

Variety	Herbicide Treatment	Sugarbeet Population	Sucrose	Root Yield	Extractable Sucrose
		-------- percent of	untreated check	--------	
Monohikari	Desm&Phen&Etho	105	100	93	93
Monohikari	Desm+Clpy	100	99	98	97
Monohikari	Desm+Tfsu	103	100	102	103
Monohikari	Desmedipham	102	105	97	103
HM Glacier	Desm&Phen&Etho	96	104	88	93
HM Glacier	Desm+Clpy	93	100	86	86
HM Glacier	Desm+Tfsu	97	103	89	92
HM Glacier	Desmedipham	96	103	91	94
Maribo 875	Desm&Phen&Etho	105	105	97	103
Maribo 875	Desm+Clpy	101	102	92	94
Maribo 875	Desm+Tfsu	95	102	98	102
Maribo 875	Desmedipham	107	98	95	91
Maribo 9363	Desm&Phen&Etho	99	99	97	96
Maribo 9363	Desm+Clpy	104	101	93	94
Maribo 9363	Desm+Tfsu	103	94	96	89
Maribo 9363	Desmedipham	98	100	96	95
Beta 3712	Desm&Phen&Etho	102	100	99	98
Beta 3712	Desm+Clpy	103	99	99	96
Beta 3712	Desm+Tfsu	98	102	100	102
Beta 3712	Desmedipham	105	100	98	98
VDH 66168	Desm&Phen&Etho	105	101	94	95
VDH 66168	Desm+Clpy	106	103	97	99
VDH 66168	Desm+Tfsu	109	105	95	100
VDH 66168	Desmedipham	105	104	98	102
HM Horizon	Desm&Phen&Etho	102	101	93	93
HM Horizon	Desm+Clpy	101	99	92	90
HM Horizon	Desm+Tfsu	105	101	98	100
HM Horizon	Desmedipham	98	103	101	103
C.V. %		11	7	8	12
LSD 5%		NS	NS	NS	NS
LSD 1%		NS	NS	NS	NS
# OF REPS		6	6	6	6

Lay-by herbicides, Fargo, 1996. 'ACH 196' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 2. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting for sugarbeet root maggot control. The first and second herbicide applications were 2:30 PM and 4:40 PM respectively May 23 when the air temperature was 66F, relative humidity was 45%, soil temperature at six inches was 55F, wind velocity was 15 mph, cloud cover was 95%, soil moisture was good and sugarbeet and redroot pigweed were in the cotyledon stage. The third herbicide application was 2:00 PM May 25 when the air temperature was 70F, relative humidity was 33%, soil temperature at six inches was 52F, wind velocity was 11 mph, cloud cover was 50%, soil moisture was good and sugarbeet and redroot pigweed were in the cotyledon stage. The fourth herbicide application was 5:30 PM May 30 when the air temperature was 74F, relative humidity was 44%, soil temperature at six inches was 60F, wind velocity was 30 mph, cloud cover was 75%, soil moisture was good, sugarbeet was in the 2 leaf stage and redroot pigweed was in the cotyledon to 2 leaf stage. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. The entire plot area was treated with sethoxydim + Dash HC at 0.3 lb ai/A + 1 pint/A June 17. All plots were cultivated May 30, June 21 and June 28. Sugarbeet injury was evaluated June 18. Redroot pigweed control was evaluated July 14.

Treatment	Rate	Date of Applic.	Time	Rrpw cntl	Sgbt inj
	lb/A		PM	%	%
Desm+Triflusulfuron+Clopyralid/	0.16+0.01+0.06	May 23	2:30		
Metolachlor-II/	4	May 25	2:00		
Desm+Triflusulfuron+Clopyralid	0.25+0.015+0.09	May 30	5:30	100	25
Desm+Triflusulfuron+Clopyralid/	0.16+0.01+0.06	May 23	2:30		
Acetochlor(Harness)/	2.5	May 25	2:00		
Desm+Triflusulfuron+Clopyralid	0.25+0.015+0.09	May 30	5:30	100	15
Desm+Triflusulfuron+Clopyralid/	0.16+0.01+0.06	May 23	2:30		
Dimethenamid/	1.46	May 25	2:00		
Desm+Triflusulfuron+Clopyralid	0.25+0.015+0.09	May 30	5:30	100	4
Desm+Triflusulfuron+Clopyralid/	0.16+0.01+0.06	May 23	2:30		
Metolachlor-II/	4	May 23	4:40		
Desm+Triflusulfuron+Clopyralid	0.25+0.015+0.09	May 30	5:30	100	18
Desm+Triflusulfuron+Clopyralid/	0.16+0.01+0.06	May 23	2:30		
Acetochlor(Harness)/	2.5	May 23	4:40		
Desm+Triflusulfuron+Clopyralid	0.25+0.015+0.09	May 30	5:30	100	24
Desm+Triflusulfuron+Clopyralid/	0.16+0.01+0.06	May 23	2:30		
Dimethenamid/	1.46	May 23	4:40		
Desm+Triflusulfuron+Clopyralid	0.25+0.015+0.09	May 30	5:30	100	6
Desm+Triflusulfuron+Clopyralid/	0.16+0.01+0.06	May 23	2:30		
Desm+Tfsu+Clpy+Metolachlor-II/	0.25+0.015+0.09+4	May 30	5:30	100	8
Desm+Triflusulfuron+Clopyralid/	0.16+0.01+0.06	May 23	2:30		
Desm+Tfsu+Clpy+Acet(Harness)	0.25+0.015+0.09+2.5	May 30	5:30	100	9
Desm+Triflusulfuron+Clopyralid/	0.16+0.01+0.06	May 23	2:30		
Desm+Tfsu+Clpy+Dimethenamid/	0.25+0.015+0.09+1.46	May 30	5:30	100	3
C.V. %				0	52
LSD 5%				NS	9
LSD 1%				NS	13
# OF REPS				4	4

Experiment continued on next page.

Summary

Treatments including dimethenamid injured sugarbeet less than treatments including acetochlor and metolachlor. Treatments with metolachlor or acetochlor applied on May 30 caused less sugarbeet injury than treatments with metolachlor or acetochlor applied on May 23 or May 25. Possibly, larger sugarbeet plants were more tolerant. These plots stayed nearly weed free while other plots nearby had late-emerging redroot pigweed.

Glufosinate on sugarbeet, Fargo, 1996. Glufosinate resistant sugarbeet supplied by AgrEvo was seeded 1.25 inches deep in 22 inch rows May 10. Herbicide applications were made June 11, June 17, June 25, July 1 and July 8. All herbicide applications were in 8.5 gpa water at 40 psi through 8001

Date	June 11	June 17	June 25	July 1	July 8
Time of Day	4:15 PM	7:00 PM	8:30 AM	2:45 PM	9:50 AM
Air Temp.	91 F	84 F	57 F	86 F	67 F
Soil Temp.(6 in.)	71 F	72 F	62 F	72 F	70 F
Relative Humidity	37%	41%	88%	54%	76%
Wind Velocity	5 mph	8 mph	7 mph	12 mph	16 mph
Cloud Cover	20%	10%	100%	40%	80%
Soil Moisture	fair	fair	good	good	fair
Sugarbeet Stage	2-4 lf	4-6 lf	6-10 lf	8-10 lf	10-12 lf
Redroot Pigweed	4-8 lf	6 lf-2 in	2-6 in	6-12 in	8-16 in
Commom Lambsquarters	6 lf-2 in	2-4 in	4-8 in	7-12 in	10-16 in
Kochia	1-2 in	2-4 in	4-6 in	8-14 in	10-16 in

nozzles to all four rows of four row plots. Sethoxydim + Dash HC at 0.3 lb ai/A + 1 pint/A was applied to the entire plot area June 17 to control grass in the untreated plots. Redroot pigweed, common lambsquarters and kochia control and sugarbeet injury were evaluated July 14. Plots were not harvested because sugarbeet stand was variable.

Experiment continued on next page.

Glufosinate on sugarbeet, Fargo, 1996. (continued)

Herbicide	Rate	Date of Application	Rrpw cntl	Colq cntl	Kocz cntl	Sgbt inj
	lb/A		%	%	%	%
Weedy Check	--	--	0	0	0	0
Glufosinate	0.27	June 11				
	0.27	June 17				
	0.27	June 25	97	98	99	0
Glufosinate	0.36	June 11				
	0.36	June 17				
	0.36	June 25	98	99	100	0
Glufosinate	0.45	June 11				
	0.45	June 17				
	0.45	June 25	96	99	100	0
Glufosinate	0.27	June 17				
	0.27	July 1				
	0.27	July 8	99	100	100	0
Glufosinate	0.36	June 17				
	0.36	July 1				
	0.36	July 8	100	100	100	0
Glufosinate	0.45	June 17				
	0.45	July 1				
	0.45	July 8	100	100	100	0
Desm&Phen&Etho	0.25	June 11				
Desm&Phen&Etho	0.33	June 17				
Des&Phen&Eth+Seth-U	0.33+0.25	June 25	39	95	31	0
Glufosinate	0.45	June 25	35	35	30	0
Glufosinate	0.27	June 25				
	0.27	July 1	89	90	92	0
D&P+Tfsu+Clpy	0.25+0.0156+0.09	June 11				
	0.33+0.0156+0.09	June 17				
	0.33+0.0156+0.09	June 25	84	98	93	0
C.V. %			8	6	8	0
LSD 5%			9	8	8	NS
LSD 1%			12	10	11	NS
# OF REPS			4	4	4	4

Summary

Glufosinate generally gave better weed control with three applications than with two. One application of glufosinate on June 25 gave poor weed control. Glufosinate applied three times at 0.27 lb/A gave weed control similar to 0.45 lb/A applied three times. Both timings of three applications of glufosinate gave excellent weed control. Glufosinate generally gave better weed control than desmedipham & phenmedipham & ethofumesate and desmedipham & phenmedipham + triflusulfuron + clopyralid.

Carryover of soybean herbicides, Fargo (NW section 22), 1993-1996. 'McCall' soybean was seeded in 30 inch rows May 18, 1993. Flumetsulam & metolachlor treatments were applied in 17 gpa water at 40 psi through 8002 nozzles to the center 13.33 feet of 25 foot wide and 50 feet long plots May 19, 1993 when the air temperature was 72F, soil temperature at six inches was 50F, wind velocity was 8 mph, and soil moisture was fair. Sethoxydim + Acifluorfen + Bentazon at 0.3 + 0.17 + 0.75 lb ai/A was applied to the entire experiment June 28, 1993. Acifluorfen + Bentazon at 0.17 + 0.75 lb ai/A was applied to the entire experiment July 12, 1993. Postemergence treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles 1:00 pm July 8, 1993 when the air temperature was 70F, relative humidity was 81%, wind velocity was 4 mph, soil temperature at six inches was 65F, soil moisture was good, and soybean was in the four to six trifoliolate stage. Fall tillage was one pass with a chisel plow operated parallel to the herbicide plots. Spring tillage was one pass with a field cultivator. Six 22 inch rows of 'Interstate 7000' sunflower at a 9.5 inch spacing, six 14 inch rows of 'Crusher' canola, six 22 inch rows of 'Maribo 875' sugarbeet, a four foot strip of 'Marshall' wheat at 100 lb/A, and a four foot strip of 'Starter' oats at 65 lb/A were seeded across herbicide plots May 18, 1994. Sugarbeet and sunflower were cultivated June 7. Canola was cultivated June 23. Desmedipham&phenmedipham at 0.25 lb ai/A was applied to sugarbeet strips June 2 and June 9, 1994. Bromoxynil&MCPA ester at 0.5 lb ai/A was applied to wheat and oats strips June 2 and June 22, 1994. Sethoxydim+Dash HC at 0.3 lb ai/A+1 pt/A was applied to sugarbeet and sunflower strips June 15, 1994. Asana XL insecticide at 0.05 lb ai/A was applied to the sunflower strips June 9, 1994. Sugarbeet, sunflower, wheat, oats and canola injury was evaluated June 25 and July 18, 1994. 'ACH 196' sugarbeet was seeded in the entire plot area May 26, 1995. Counter insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. Desmedipham & phenmedipham, sethoxydim and preemergence glyphosate was applied to plot area to control weeds. Sugarbeet injury and redroot pigweed control were evaluated July 18, 1995. 'Beta 2010' sugarbeet was seeded in the entire plot area June 12, 1996. Counter insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Desmedipham + triflusulfuron + sethoxydim at 0.33 + 0.0156 + 0.4 lb ai/A and at 0.33 + 0.011 + 0.33 was applied to the entire plot area July 5 and July 9 respectively for weed control. Desmedipham + clopyralid at 1 + 0.19 lb ai/A was applied to all plots July 25. Sugarbeet injury was evaluated July 28, 1996.

Experiment continued on next page.

Carryover of soybean herbicides, Fargo (NW section 22), 1993-1996. (continued)

Treatment*	Rate	June 25, 1994 Sgbt inj	June 25, 1994 Sunf inj	June 25, 1994 Wht inj	June 25, 1994 Oats inj	June 25, 1994 Cano inj	July 18, 1994 Sgbt inj	July 18, 1994 Sunf inj	July 18, 1994 Wht inj	July 18, 1994 Oats inj	July 18, 1994 Cano inj	7-18-95 Sgbt inj	7-18-95 Rrpw cntl	7-28-96 Sgbt inj
	lb/A	%	%	%	%	%	%	%	%	%	%	%	%	%
Untreated Check	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imep+Sun-ItII + 28%N	0.047	85	3	0	0	30	85	0	0	0	45	0	0	0
Imep+Sun-ItII + 28%N	0.063	96	5	0	0	53	95	0	0	0	65	3	23	0
Imep+Sun-ItII + 28%N	0.125	99	18	0	5	81	99	19	5	8	84	13	18	0
AC299263+Sun-ItII + 28%	0.032	0	0	0	0	0	0	0	0	0	0	0	10	0
AC299263+Sun-ItII + 28%	0.063	0	0	0	0	0	0	0	0	0	0	0	4	0
AC299263+Sun-ItII + 28%	0.125	0	0	0	0	0	0	0	0	0	0	0	0	0
Flum+Meto (pre)	0.10+3.76	0	0	0	0	0	0	0	0	0	0	0	0	0
Flum+Meto (pre)	0.03+0.93	0	0	0	0	0	0	0	0	0	0	0	0	0
Flum+Meto (pre)	0.05+1.88	0	0	0	0	0	0	0	0	0	0	0	0	0
C.V. %		15	282	0	632	84	14	295	632	404	53	541	304	0
LSD 5%		6	10	NS	NS	20	6	8	NS	4	15	NS	NS	NS
LSD 1%		8	NS	NS	NS	27	7	11	NS	NS	20	NS	NS	NS
# OF REPS		4	4	4	4	4	4	4	4	4	4	4	4	4

* Sun-It II = methylated seed oil from Agsco applied at 1.5 pints/A
28%N = 28% nitrogen solution containing urea and NH_4NO_3 applied at 1 quart/A

Summary

Imazethapyr applied in 1993 caused sugarbeet and canola injury in 1994 while AC 299,263 and flumetsulam caused no injury. None of the treatments caused significant sugarbeet injury in 1995 or 1996. Sugarbeet injury from imazethapyr was absent one year earlier than with other experiments conducted at Section 22. Rainfall was adequate to excessive in 1993 through 1995 on this experiment which may have hastened the degradation of imazethapyr.

Carryover of corn herbicides, Fargo, 1995-96. 'Interstate Payco 359SG' corn was seeded 2 inches deep with a 6 inch spacing in 22 inch rows May 31, 1995. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied 8:00 AM June 21, 1995 when the air temperature was 77F, soil temperature at six inches was 76F, relative humidity was 67%, wind velocity was 6 mph, cloud cover was 10%, soil moisture was fair and corn was in the 4 leaf stage (5 inches tall) to the 6 leaf stage (10 inches tall). Treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to 20 feet wide and 40 feet long plots. All plots were row-cultivated June 22. Mature corn was chopped down in late fall of 1995 and plots were tilled one time with a conser-till chisel plow. Spring tillage was twice with an 'Alloway Seed Better' field cultivator. All tillage operations were in the direction of herbicide application to minimize movement of treated soil into other plots. 'ACH 196' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 3, 1996. Sugarbeet was row-cultivated May 30, June 21 and June 28. Sugarbeet was hand weeded June 4 and maintained weed free throughout the growing season. Sugarbeet was hand thinned to an 8 inch spacing June 21. Sugarbeet injury was evaluated June 13 and July 1. Desmedipham & phenmedipham at 0.25 lb ai/A was applied to the entire plot area May 22 and May 29. Sethoxydim + Dash HC at 0.3 lb ai/A + 1 pint/A was applied to sugarbeet June 17. Super Tin 80 WP fungicide at 5 ounces product per acre was applied to sugarbeet August 8 and August 22. The center two rows of 40 foot long plots were counted and harvested September 24, 1996.

Treatment	Rate	6-13 Sgbt inj	7-1 Sgbt inj	9-24 Sgbt Popl	Sucrose	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	%	%	plt/80'	%	%	ton/A		lb/A
Rimsulf&Thifensulf	0.0156	0	10	97	17.3	1.6	17.9	689	5498
Rimsulf&Thifensulf	0.031	3	14	102	17.8	1.6	21.6	676	6864
Rimsulf&Thifensulf	0.06	29	39	95	17.6	1.5	17.8	623	5524
Untreated Check	0	0	13	96	17.3	1.4	19.1	619	6010
MON-12000	0.032	79	79	52	16.0	1.8	13.6	859	3723
C.V. %		21	38	13	6.2	18.2	20.3	26	20
LSD 5%		7	18	18	NS	NS	NS	NS	1732
LSD 1%		10	25	25	NS	NS	NS	NS	NS
# OF REPS		4	4	4	4	4	4	4	4

Summary

Rimsulfuron + thifensulfuron at 0.06 lb/A applied in 1995 caused significant visible sugarbeet injury in 1996 but no significant loss in yield. MON-1200 at 0.032 lb/A applied in 1995 caused severe visible sugarbeet injury, reduced sugarbeet populations and reduced extractable sucrose per acre compared to the untreated check.

Wild oat control in wheat, Fargo 1996. '2375' hard red spring wheat was seeded May 16. Treatments were applied to 4-leaf wheat, 3- to 4-leaf wild oat, 4- to 7- leaf wild mustard, and 4- to 6-leaf common lambsquarters on June 10 with 83 F, 33% RH, clear sky, and 5- to 12-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

		6/24				7/19			8/15
Treatment	Rate	Wht	Wioa	Wimu	Colq	Wht	Wioa	Colq	Yield
	oz/A				%				bu/A
Diclofop+PO	16+0.12G	0	84	20	0	0	72	0	16
Diclofop+Bromoxynil+PO	16+4+0.12G	0	84	46	84	0	81	80	15
Diclofop+F8426+PO	16+0.25+0.12G	0	88	69	98	0	81	99	21
Imazamethabenz-SG+X-77	5+0.25%	3	95	96	50	3	92	25	18
Immb-SG+Thif&Trib+X-77	5+0.22+0.25%	1	93	99	47	0	90	75	28
Imazamethabenz-SG+Dife	3.75+8	4	91	98	0	2	91	0	22
Difenzoquat	12	7	90	13	0	1	90	0	15
Difenzoquat+Thif&Trib	12+0.22	6	95	98	99	1	84	92	22
Tralkoxydim+TF8035+AMS	2.9+0.5%+24	0	83	23	0	0	77	0	21
Tral+Brox&MCPA+TF8035+AMS	2.9+8+0.5%+24	0	94	96	99	3	94	97	25
MON-37536+ND-72	0.37+1%	6	98	99	25	1	94	10	29
HOE-1102	1.9	5	90	31	8	0	91	0	25
HOE-1102+Thif&Trib	1.9+0.22	10	96	99	99	0	90	99	23
Tiller	9.3	5	94	99	99	1	84	99	19
Cheyenne+Thif&Trib	7.3+0.22	6	91	99	99	0	77	99	21
Untreated	0	0	0	0	0	0	0	0	11
C.V. %		185	8	26	39	236	8	19	30
LSD 5%		NS	9	25	28	NS	9	13	9
# OF REPS		4	4	4	4	4	4	4	4

Summary

The various herbicides for broadleaf weed control did not influence wild oat control and with certain herbicides enhanced wild oat control. None of the treatments injured wheat. Wild oat control increased wheat yield, but yields were low because of a sparse stand from soil crusts that prevented emergence. Wild oat infestation exceeded 300 plants/yd^2 and wild mustard and common lambsquarters 10 plants/yd^2. Pre-harvest wild oat control exceeded 80%, except for diclofop and tralkoxydim without broadleaf weed control herbicides and Cheyenne.

Wild oat control in wheat, Hettinger 1996. 'Kulm' hard red spring wheat was seeded May 1. Treatments were applied to 2.5-leaf wheat and 2- to 2.5-leaf wild oat on May 31 with 56 F, cloudy sky, and 3-mph wind. Treatments were applied with a tractor-mounted plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 5 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on August 16.

		6/28		7/10		7/24	8/16
Treatment	Rate	Wht	Wioa	Wht	Wioa	Wioa	Yield
	oz/A			%			bu/A
Diclofop+PO	16+.12G	0	93	1	98	96	26
Diclofop+Brox+PO	16+4+.12G	0	89	0	89	88	23
Diclofop+F8426+PO	16+.25+.12G	0	91	0	92	95	24
Imazemethabenz-SG+X-77	5+.25%	0	89	3	89	87	20
Immb-SG+Thif&Trib+X-77	5+.22+.25%	0	85	3	93	92	20
Immb-SG+Dife	3.75+8	0	74	2	93	85	24
Difenzoquat	12	0	46	3	58	52	19
Dife+Thif&Trib	12+.22	0	45	1	72	76	18
Tralkoxydim+TF8035+AMS	2.9+.5%+24	0	83	4	98	87	25
Tral+Brox&MCPA+TF8035+AMS	2.9+8+.5%+24	0	90	2	96	96	27
MON-37536+ND-72	.37+1%	0	89	4	98	98	24
HOE-1102	1.9	1	95	0	98	96	25
HOE-1102+Thif&Trib	1.9+.22	0	93	1	96	96	30
Tiller	9.3	0	65	0	88	83	28
Cheyenne+Thif&Trib	7.3+.22	0	44	1	64	69	22
Untreated	0	0	0	0	0	0	16
C.V. %		800	30	153	10	17	21
LSD 5%		NS	31	NS	11	19	7
# OF REPS		4	4	4	4	4	4

Summary

Herbicide treatments did not injure wheat. Wheat yield generally related to wild oat control and were often increased more than 10 bu/A with effective wild oat control. Pre-harvest control of wild oat exceeded 80% for all herbicide treatments, except for difenzoquat and Cheyenne. Wild oat density was about 100 plants/yd^2. Broadleaf control herbicides in solution did not reduce efficacy of wild oats control herbicides.

Wild oat control in wheat, Minot 1996. 'Norm' hard red spring wheat was seeded May 15. Treatments were applied to 3-leaf wheat, wild oats, and pigeongrass, and 1- to 2-inch common lambsquarters on June 11 with 61 F, 63% RH, clear sky, and 4-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on September 9.

Treatment	Rate	7/11 Wht	7/11 Wioa	7/11 Colq	Test weight	9/09 Yield
	oz/A	%	%	%	lb/bu	bu/A
Diclofop+PO	16+.12G	0	31	0	53	4
Diclofop+Brox+PO	16+.25+.12G	0	55	11	57	6
Diclofop+F8426+PO	16+.25+.12G	0	62	61	58	9
Imazamethabenz-SG+X-77	5+.25%	3	83	0	57	4
Immb-SG+Thif&Trib+X-77	5+.22+.25%	4	83	48	58	7
Imazamethabenz-SG+Dife	3.75+8	8	77	0	57	4
Difenzoquat	12	4	87	8	54	7
Dife+Thif&Trib	12+.22	5	86	73	58	8
Tralkoxydim+TF8035+AMS	2.9+.5%+24	5	34	8	40	3
Tral+Brox&MCPA+TF8035+AMS	2.9+8+.5%+24	0	75	98	59	7
MON-37532+ND-72	.37+1%	9	77	13	56	6
HOE-1102	1.9	6	84	14	57	5
HOE-1102+Thif&Trib	1.9+.22	8	24	72	49	3
Tiller	9.3	9	68	97	58	6
Cheyenne+Thif&Trib	7.3+.22	9	81	98	58	7
Untreated	0	0	0	0	49	3
C.V. %		150	20	56	16	51
LSD 5%		NS	18	30	NS	NS
# OF REPS		4	4	4	4	4

Summary

Wild oat densities were more than 500 plants/yd^2 and had emerged prior to wheat. Wild oat control was poor either because of high density or dry conditions at treatment. Even though wild oat control was less at Minot than at other locations relative herbicide effectiveness related to other locations. Broadleaf control herbicides did not antagonize wild oat control herbicides, except for thifensulfuron&tribenuron with HOE-1102. Bromoxynil and F8426 with diclofop and bromoxynil&MCPA with tralkoxydim enhanced wild oat control.

Wild oat control in wheat, Williston 1996. 'Trenton' hard red spring wheat was seeded May 7. Treatments were applied to 4- to 5-leaf wheat and 3- to 4-leaf wild oat on June 3 with 70 F, 44% RH, clear sky, and 4-mph wind. Treatments were applied with a tractor mounted bicycle wheel type plot sprayer with wind shield delivering 8.5 gpa at 32 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 24 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on August 26.

Treatment	Rate	7/11 Wht	7/11 Wioa	Tstw	8/26 Yield
	oz/A	— %	—	lb/bu	bu/A
Diclofop+PO	16+.12G	0	95	62	46
Diclofop+Brox+PO	16+4+.12G	0	94	62	42
Diclofop+F8426+PO	16+.25+.12G	1	97	62	44
Imazamethabenz-SG+X-77	5+.25%	0	85	62	44
Immb-SG+Thif&Trib+X-77	5+.22+.25%	0	87	62	43
Imazamethabenz-SG+Dife	3.75+8	1	82	63	41
Difenzoquat	12	11	43	62	31
Dife+Thif&Trib	12+.22	9	70	62	33
Tralkoxydim+TF8035+AMS	2.9+.5%+24	1	94	62	43
Tral+Brox&MCPA+TF8035+AMS	2.9+8+.5%+24	10	99	62	43
MON-37536+ND-72	.37+1%	0	95	63	42
HOE-1102	1.9	0	99	62	47
HOE-1102+Thif&Trib	1.9+.22	0	99	62	48
Tiller	9.3	0	92	62	40
Cheyenne+Thif&Trib	7.3+.22	1	91	62	42
Untreated	0	0	0	62	31
C.V. %		80	8		11
LSD 5%		2	9		6.5
# OF REPS		4	4	1	4

Summary

Herbicides that gave wild oat control increased wheat yield more than 10 bu/A even though wild oat density was less than 100 plants/yd^2. All herbicide treatments, except difenzoquat gave more than 80% wild oat control. The inclusion of broadleaf control herbicides in the spray did not antagonize wild oat control herbicides and enhanced wild oat control from difenzoquat.

Tralkoxydim for wild oat control in wheat, Fargo 1996. '2375' hard red spring wheat was seeded May 16. Treatments were applied to 4-leaf wheat, 3- to 4-leaf wild oats, and 4- to 7-leaf wild mustard on June 10 with 83 F, 33% RH, clear sky, and 5- to 12-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat exceeded 300 plants/yd^2 and common lambsquarters and wild mustard 20 plants/yd^2.

Treatment	Rate	Wht	Wioa	Wimu	Colq	Wibu
		7/19				
	oz/A			%		
Tralkoxydim+TF8035	2.9+.5%	0	86	0	0	0
Trakoxydim+TF8035+AMS	2.9+.5%+24	0	86	0	0	0
Tralkoxydim+Brox+TF8035	2.9+4+.5%	0	90	40	58	0
Tralkoxydim+Brox&MCPA+TF8035	2.9+6+0.5%	0	74	80	65	0
Tral+Brox&MCPA+TF8035+AMS	2.9+6+.5%+24	0	89	94	55	0
Tralkoxydim+Brox&MCPA+TF8035	2.9+8+.5%	3	89	93	48	0
Tralkoxydim+F8426+TF8035	2.9+.37+.5%	0	59	97	40	0
Tralkoxydim+MCPA-ioe+TF8035	2.9+8+.5%	0	88	99	0	0
Tralkoxydim+2,4-Dioe+TF8035	2.9+8+.5%	0	38	99	63	0
Tral+F8426+2,4-Dsvg+TF835+28N	2.9+.37+4+.5%+1%:	0	4	99	55	1
Tral+F8426+2,4-Dsavage+TF8035	2.9+.37+4+.5%	0	5	99	73	1
Tral+F8426+2,4-Dioe+TF8035+28N	2.9+.37+4+.5%+1%	1	86	99	28	1
Untreated	0	0	0	0	0	1
C.V. %		358	12	15	43	0
LSD 5%		1	11	15	34	0
# OF REPS		4	4	4	2	4

Summary

Tralkoxydim control of wild oat was reduced by bromoxynil&MCPA, but not when the mixture also contained ammonium sulfate (AMS). Tralkoxydim control of wild oat was antagonized by F8426, 2,4-Dioe, and 2,4-Dioe dry formulation (Savage). 28% liquid nitrogen fertilizer overcame antagonism from 2,4-Dioe, but not the 2,4-Dioe dry formulation. The antagonism from the dry 2,4-Dioe was from incompatibility in solution. These solutions contained precipitates regardless of the order of mixing.

Tralkoxydim with adjuvants for wild oat control, Fargo 1996. '2375' hard red spring wheat was seeded May 16. Treatments were applied to 4-leaf wheat and 4- to 5-leaf wild oat on June 11 with 88 F, 42% RH, partly cloudy sky, and 7-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The water carrier used was from rural Valley City which contains 309 ppm sodium, 333 calcium, 193 magnesium, 785 bicarbonate, 515 chlorine, and 927 sulfate. The experiment was a randomized complete block design with four replicates. Wild oat density varied from 50 to 20 plants/yd^2.

Treatment	Rate	7/16 Wht	7/16 Wioa
	oz/A	%	%
Tralkoxydim+TF8035+AMS	2+0.5%+24	5	91
Tralkoxydim+TF8035	2+0.5%	0	87
Tralkoxydim+Scoil+AMS	2+0.5%+24	0	83
Tralkoxydim+MC-191b	2+1%	5	96
Tralkoxydim+ND-98	2+1%	0	75
Tralkoxydim+Choice	2+0.5%	0	20
Tralkoxydim+Choice+ND-130	2+0.5%+0.5%	0	58
Tralkoxydim+Dispatch-AMS	2+1%	0	30
Untreated	0	0	0
C.V. %		388	22
LSD 5%		NS	19
# of Reps		4	4

Summary

Tralkoxydim was at two thirds the normal use rate to prevent complete control and to provide differences in response to adjuvants. Surfactants greatly influenced tralkoxydims control of wild oats. Ammonium suflate (AMS) did not enhance tralkoxydim efficacy indicating that the minerals in Valley City water were not antagonistic.

Interaction of adjuvants with MON 37536 and HM-9625 for wild oat control in wheat, 1996. '2375' hard red spring wheat was seeded May 16. Treatments were applied to 4-leaf wheat, 3- to 4-leaf wild oat, 4- to 7-leaf wild mustard, 4- to 6-leaf common lambsquarters, and 2- to 3-leaf wild buckwheat on June 10 with 83 F, 33% RH, clear sky, and 5- to 12-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density was more than 200 plants/yd^2 and common lambsquarters and wild buckwheat 2 to 10 plants/yd^2.

Treatment	Rate	6/26					7/22			
		Wht	Wioa	Wimu	Colq	Wibu	Wht	Wioa	Colq	Wibu
	oz/A	%								
MON-37536	0.25	0	75	97	5	23	0	21	5	8
MON-37536+HM9327-A	0.25+.08%	3	87	99	18	25	0	67	0	3
MON-37536+HM9327-A+28%N	0.25+0.08%+0.5%	4	68	99	21	25	1	49	0	0
MON-37536+HM8802-A	0.25+.08%	4	88	99	23	40	1	70	0	0
MON-37536+HM8802-A+28%N	0.25+0.5%+0.5%	3	89	99	28	43	6	84	8	0
MON-37536+HM9625	0.25+2	1	74	99	75	44	0	41	99	0
MON-37536+HM9625+HM9327-A	0.25+2+0.08%	1	73	99	84	51	3	68	99	0
MON-37536+HM9625+HM9127	0.25+2+0.25G	6	88	99	76	59	4	74	97	5
MON-37536+HM9625-A	0.25+2	1	75	99	79	50	0	41	99	0
MON-37536+HM9625-A+HM9327-A	0.25+2+0.08%	3	84	99	81	52	1	61	97	0
MON-37536+HM9625-A+HM9127	0.25+2+0.25G	3	88	99	75	71	3	76	99	0
MON-37536+ND71	0.25+1%	1	85	99	25	31	4	88	0	0
Untreated	0	0	0	0	0	0	0	0	0	0
C.V. %		120	11	1	28	38	127	16	11	449
LSD 5%		NS	12	2	18	21	3	13	7	NS
# of Reps		4	4	4	4	4	4	4	4	4

Summary

MON 37536 gave greater wild oat control at the early (6/26) than late (7/22) evaluation. Injured plants began recovery late in the season. Wheat stand was sparse because of a soil crust after seeding. Wild oat recovery from MON 37536 injury may have been less with a competitive wheat stand. Wild oat control from MON 37536 exceeded 80% at the late evaluation only when applied with HM8802-A+28%N and ND-71.

Imazamethabenz with adjuvants in Valley City water for wild oat control in wheat, 1996. '2375' hard red spring wheat was seeded May 16. Treatments were applied to 4-leaf wheat, 4- to 5-leaf wild oat, 4- to 8-leaf wild mustard, 4- to 6-leaf common lambsquarters, and 2- to 5-leaf wild buckwheat on June 11 with 88 F, 42% RH, partly cloudy sky, and 7-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density exceeded 200 plants/yd^2. Valley City water contained 300 ppm sodium, 333 calcium, 193 magnesium, 785 bicarbonates, 515 chlorine, and 977 sulfate.

Treatment	Rate	6/24				7/19			
		Wht	Wioa	Wimu	Colq	Wht	Wioa	Colq	Wibu
	oz/A				%				
Imazamethabenz-LC	5	0	63	91	0	0	10	8	5
Imazamethabenz-SG	5	0	71	93	0	0	20	0	0
Immb-SG+ActivatePlus+Combine	5+.25%+.125%	0	95	99	0	4	95	14	45
Immb-SG+ActivatePlus+Hcl	5+.25%+3.25%	0	86	95	0	0	68	0	23
Immb-SG+ActivatePlus+Li700	5+.25%+.125%	0	88	95	0	0	85	15	21
Immb-SG+ActivatePlus+TRA0051	5+.25%+.5%	3	91	98	0	2	93	38	53
Imazamethabenz-Li700	5+.5%	0	80	97	13	0	76	0	10
Imazamethabenz-SG+TRA0051	5+.5%	0	88	95	0	0	89	28	44
Imazamethabenz-SG+Scoil	5+1%	1	92	98	0	0	91	36	63
Imazamethabenz-SG+DASH-HC	5+1%	1	85	95	0	1	94	30	69
Immb-SG+F8426+2,4D-Savage+28N	5+0.35+4+.25G	0	48	95	70	0	8	96	15
Immb-SG+F8426+2,4D-Savage	5+0.35+4	0	46	93	55	0	8	95	8
Immb-SG+F8426+2,4-Dioe+28N	5+0.35+4+.25G	0	87	99	99	0	77	99	65
Untreated	0	0	0	0	0	0	0	0	0
C.V. %		336	12	4	102	264	12	47	48
LSD 5%		NS	12	5	25	2	10	22	21
# OF REPS		4	4	4	4	4	4	4	4

Summary

Imazamethabenz LC or SG applied without surfactants did not control wild oat, 7/19 evaluation. Imazamethabenz gave 89% or more wild oat control when applied with Activate plus+Combine, Activate Plus+TRA0051, TRA0051, Scoil, and DASH-HC. Dry 2,4-D+F8426, with or without 28%N, caused a solution precipitate that antagonized wild oat control from imazamethabenz. Hydrochloric acid+Activate Plus with imazamethabenz reduced wild oat control compared to Activate Plus+Combine or + Li700.

HOE-1102 for wild oat control, Fargo 1996. '2375' hard red spring wheat was seeded May 16. Treatments were applied to 4-to 5-leaf wheat and wild oat, 4- to 8-leaf wild mustard, 4- to 7-leaf common lambsquarters, and 2- to 5-leaf wild buckwheat on June 12 with 82 F, 43% RH, partly cloudy sky, and 10- to 20- mph wind. Treatments were applied with a shielded bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density at more than 100 plants/yd^2, wild mustard at 20 and wild buckwheat at 10 plants/yd^2.

Treatment	Rate	7/27					7/22		
		Wht	Wioa	Wimu	Colq	Wibu	Wht	Wioa	Wibu
	oz/A	%							
HOE-1102	1.9	0	94	23	0	0	1	95	0
HOE-1102+Thif&Trib	1.9+.22	3	91	94	99	98	0	96	91
HOE-1102+Brox&MCPA	1.9+6	3	88	88	99	84	0	89	61
HOE-1102+Brox&MCPA	1.9+8	0	93	97	99	91	1	93	83
HOE-1102+Brox	1.9+4	1	95	69	98	91	1	91	71
HOE-1102+MCPA-ioe	1.9+6	3	94	91	99	11	0	96	0
HOE-1102+F8426+24D-Savage+28N	1.9+.37+4+1%	1	91	99	99	81	2	78	41
HOE-1102+F8426	1.9+0.37	1	89	83	99	38	0	95	25
Tiller+F8426	9.3+0.37	8	95	99	99	73	4	91	61
Tiller+Brox	9.3+2	5	88	90	99	66	1	87	61
Tiller+Brox	9.3+3	6	90	94	99	62	2	84	69
Tiller+Brox	9.3+4	5	92	91	99	62	0	82	71
Tiller+Brox&MCPA	9.3+4	4	86	92	99	60	1	86	70
Tiller+Brox&MCPA	9.3+6	1	88	92	99	55	0	86	71
Tiller+Brox&MCPA	9.3+8	1	89	93	97	73	0	80	66
Immb-SG+Brox&MCPA+Scoil	6+8+1%	6	93	98	99	95	2	93	91
Tral+TF8035+Brox	2.9+.5%+4	1	92	80	97	87	1	88	87
Untreated	0	0	0	0	0	0	0	0	0
C.V. %		270	5	15	2	27	188	5	24
LSD 5%		NS	7	18	2	24	2	6	19
# OF REPS		4	4	4	4	4	4	4	4

Summary

Wild oat control generally was greater from HOE-1102 than Tiller plus bromoxyil or bromoxynil&MCPA while they generally were not antagonistic to wild oat control. Wild oat control (7/22) was reduced when HOE-1102 was applied with F8426+2,4-D Savage(a dry formulation)+28% liquid nitrogen fertilizer. However, F8426 applied with HOE-1102 did not antagonize wild oat control. Thifensulfuron&tribenuron with HOE-1102 and bromoxynil&MCPA+Scoil with imazamethabenz provided the greatest wild buckwheat control.

MON 37536 plus 2,4-Ddma for wild oat control in wheat. '2375' hard red spring wheat was seeded May 16. Treatments were applied to 4-leaf wheat, 5- to 6-leaf wild oat, 4- to 7-leaf wild mustard, 4- to 6-leaf common lambsquarters, and 2- to 3-leaf wild buckwheat on June 10 with 83 F, 33% RH, clear sky, and 5- to 12-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density at 100 to 300 plants/yd^2 and wild mustard, common lambsquarters, and wild buckhwheat 5- to 10-plants/yd^2.

Treatment	Rate	6/27 Wht	Wioa	Wimu	Colq	Wibu	7/22 Wht	Wioa	Colq	Wibu
	oz/A	%								
MON-37536+X-77	0.2+.25%	3	74	97	5	10	0	69	0	0
MON-37536+X-77+28N	0.2+.25%+2%	5	85	99	14	31	1	85	0	8
MON-37536+2,4-Ddma+X-77	0.2+8+0.25%	3	74	99	99	60	0	43	99	10
MON-37536+2,4-D+X-77+AMS	0.2+8+.25%+24	3	73	99	99	66	0	35	99	24
MON-37536+2,4-D+X-77+28N	0.2+8+.25%+2%	1	86	99	99	81	0	45	99	28
MON-37536+ND-72	0.2+1%	6	92	99	29	39	4	87	0	6
MON-37536+2,4-Ddma+ND-72	0.2+8+0.5%	1	71	99	99	64	0	45	99	38
MON-37536+2,4-Ddma+ND-72	0.2+8+1%	3	76	99	99	66	1	51	98	44
Untreated	9	0	0	0	0	0	0	0	0	0
C.V. %		113	14	2	12	25	205	17	1	73
LSD 5%		NS	15	2	10	17	2	13	1	18
# OF REPS		4	4	4	4	4	4	4	4	4

Summary

Wild oat control from MON 37536 was enhanced from 74 to 92% when applied with ND-72 compared to X-77. At the 7/22 evaluation MON 37536 was equally effective for wild oat control when applied with ND-72 or X-77+28%N. 2,4-D was antagonistic to wild oat control from MON-37536 regardless of adjuvants, (7/22). Early (6/27) evaluations indicated small differences in MON-37536 control of wild oat, but differences were large at the late evaluation. These results indicate that MON 37536 in small amounts is injurious and long-term wild oat control depends on the ability of the plant to metabolize the amount absorbed. In these experiments wild oat recovery was not inhibited by competition from the wheat. Soil crusts after seeding prevented wheat emergence and stand was sparse.

~~N~~ew herbicides for wild oat control in wheat, Fargo 1996. '2375' hard red spring wheat was seeded on May 16. Treatments (3-4 LF) were applied to 4 leaf wheat, 4- to 5-leaf wild oat, 4- to 8-leaf wild mustard, 4- to 6-leaf common lambsquarters, and 2- to 5-leaf wild buckwheat on June 11 with 88 F, 42% RH, partly cloudy sky, and 7-mph wind. Treatment (boot stage) was applied to late boot to heading wheat on July 1 with 80 F, 50% RH, clear sky, and 5- to 10-mph wind. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities on July 22 were wild oat variable at 20- to 200-/yd^2 wild oats, 2/ft^2 wild buckwheat, and less than 2/yd^2 common lambsquarters.

Treatment	Rate	6/27					7/22			
		Wht	Wioa	Wimu	Colq	Wibu	Wht	Wioa	Colq	Wibu
	oz/A	%								
Imazamethabenz-SG+X-77	5+.25%	6	91	95	25	46	3	91	5	36
Tralkoxydim+TF8035+AMS	2.9+.5%+24	1	75	18	0	0	0	51	0	0
MSMA-6	16	3	75	81	26	25	1	36	13	10
MSMA-6	32	8	83	93	6	30	4	70	33	13
MSMA-6/MSMA-6(BOOT)	16/16	3	75	90	5	5	6	98	28	68
Difenzoquat	12	2	90	0	0	0	0	90	0	0
Dife+F8426+2,4-D-Savage+28N	12+0.37+4+1%	10	95	98	95	85	6	85	94	40
Diclofop	16	1	84	0	0	0	0	71	0	0
Difp+F8426+2,4-D-Savage+28N	16+0.37+4+1%	4	82	99	99	92	3	39	99	39
Diclofop+F8426+28N	16+0.37+1%	6	91	86	99	79	2	71	97	25
Untreated	0	0	0	0	0	0	0	0	0	0
.V. %		89	9	18	47	36	98	10	29	66
LSD 5%		5	10	16	22	17	3	9	14	20
# OF REPS		4	4	4	4	4	4	4	4	4

Summary

F8426+2,4-D Savage (dry formulation) +28%N gave wild mustard and common lambsquarters control without a loss in wild oat control from difenzoquat, but reduced wild oat control from diclofop. However, F8426+28%N with diclofop did not reduce wild oat control, MSMA and split application greatley increased wild oat control.

Tralkoxydim with surfactants for wild oat control in wheat, Fargo 1996. '2375' hard red spring wheat was seeded on May 16. Treatments were applied to 4-leaf wheat and 4- to 5-leaf wild oats on June 11 with 88 F, 42% RH, partly cloudy sky, and 7-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density was 100 to 200 plants/yd^{21}.

Treatment	Rate	6/26 Wht	6/26 Wioa	7/24 Wioa
	oz/A		%	
Tralkoxydim+TF8035	1.4+0.5%	0	80	5
Tralkoxydim+TF8035+AMS	1.4+0.5%+20	0	78	51
Tralkoxydim+TF8035	2.9+0.5%	0	84	61
Tralkoxydim+TF8035+AMS	2.9+0.5%+20	0	86	61
Tralkoxydim+A-Damic	1.5+0.5%	0	83	34
Tralkoxydim+A-Damic+Quest	1.4+0.5%+0.5%	0	79	28
Tralkoxydim+A-Damic	2.9+0.5%	0	83	71
Tralkoxydim+A-Damic+Quest	2.9+0.5%+0.5%	0	64	34
Tralkoxydim+MC192c	1.4+0.5%	0	63	10
Untreated	0	0	20	0
C.V. %		0	21	27
LSD 5%		NS	22	14
# OF REPS		4	4	4

Summary

Differences in tralkoxydim control of wild oat was quite variable so that differences among adjuvants were not easily discernable. Wild oat recovered from control observed at the early evaluation. Wheat stand was sparse from a soil crust that prevented wheat emergence. The lack of competition may have contributed to the wild oat recovery.

Broadleaf weed control in small grain, Fargo 1996. '2375' hard red spring wheat was seeded May 3. Treatments were applied to 4-leaf wheat, 1- to 2-leaf wild buckwheat, and 0.25- to 0.75 inch (diameter) kochia on June 4 with 71 F, 32% RH, partly cloudy sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The entire experiment was treated with MCPA at 2 oz/A to control a dense wild mustard infestation when wheat had 1 to 2 leaves. Wild mustard ratings are from a small spray skip. The experiment was a randomized complete block design with four replicates. Harvest for yield was on August 13.

Treatment	Rate	6/12 Wht	6/12 Wibu	6/12 Wimu	6/12 KOCZ	8/2 Wibu	8/2 KOCZ	8/13 Yield
	oz/A	%						bu/A
2,4-Ddma	6	0	57	85	35	25	10	40
MCPA-dma	6	0	0	99	0	0	0	42
Dicamba-dma+MCPA-dma	1.5+4	4	81	98	96	89	93	43
Bromoxynil&MCPA	8	0	99	99	97	98	97	38
Triasulfuron+2,4-Dioe	0.2+4	0	94	99	99	97	99	44
Trsu+Dica-dma+2,4-Dioe	0.2+1.5+4	9	96	99	99	96	99	37
CGA 152005+2,4-Dioe	0.2+4	1	84	99	99	88	83	40
CGA 152005+Dica-dma+2,4-Dioe	0.2+1.5+4	12	93	99	99	92	99	38
CGA 152005+Brox&MCPA	0.2+4	0	99	99	99	99	99	42
Clsu&Mets+2,4-Dioe	0.22+4	2	97	99	99	94	99	42
Metsulfuron+2,4-Dioe	0.06+4	2	94	99	99	91	99	39
F8426+2,4-D-Savage+28N	0.36+4+2%	2	97	99	99	86	85	42
F8426+Brox&MCPA+28N	0.36+4+2%	12	99	99	99	93	99	39
F8426+Brox&MCPA+28N	0.36+8+2%	11	99	99	99	99	99	42
Thif&Trib+2,4-Dioe	0.2+4	0	94	99	87	89	99	41
Tribenuron+2,4-Dioe	0.2+4	2	88	99	74	83	99	44
Clopyralid&2,4-D	7.5	0	72	99	18	94	20	39
Propanil+MCPA-ioe	16+4	1	99	99	99	96	81	41
Untreated	0	0	0	0	0	0	0	41
C.V. %		67	10	6	19	8	12	12
LSD 5%		3	11	8	21	9	13	NS
# OF REPS		4	4	4	4	4	4	4

Summary

Wheat yield was not increased from weed control or reduced from herbicide injury observed after treatment. Kochia density was sparse and wild mustard was only a 6 inch strip missed when the entire experiment was treated with MCPA. The wild buckwheat was dense, but normally is not competitive with wheat. Wild buckwheat control was acceptible at 85% with nearly all treatments except 2,4-D or MCPA applied alone. Pre-harvest wild buckwheat and kochia control was greater with F8426 when with bromoxynil&MCPA than 2,4-D dry formulation (Savage) and 28%N.

Broadleaf weed control in small grain, Carrington, 1996. 'Kulm' hard red spring wheat was planted May 20. Treatments were applied to 2-leaf wheat, 1- to 2-leaf wild buckwheat, and 1- to 3-inch common lambsquarters on June 7 with 58 F and clear sky. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities on June 20 were 4 wild buckwheat plants/ft^2, 2 common lambquarters plants/yd^2, variable redroot and prostrate pigweed, and 1 Russian thistle plant/yd^2. Harvest for yield was on August 15.

Treatment	Rate	6/20/96 Wht	Wibu	Colq	KOCZ	Test Tswt	8/15 Yield
	oz/A	%				(lb/bu)	(bu/A)
2,4-Ddma	6	0	29	94	15	58	26
MCPA-dma	6	0	0	73	0	57	25
Dica-dma+MCPA-dma	1.5+4	3	78	99	48	57	28
Brox&MCPA	8	2	84	99	65	57	32
Triasulfuron+2,4-Dioe	0.2+4	1	98	99	99	58	31
Trsu+Dica-dma+2,4-Dioe	0.2+1.5+4	5	99	99	99	58	31
CGA 152005+2,4-Dioe	0.2+4	1	98	99	99	58	31
CGA 152005+Dica-dma+2,4-Dioe	0.2+1.5+4	5	99	99	99	58	30
CGA 152005+Brox&MCPA	0.2+4	1	99	99	99	57	29
Clsu&Mets+2,4-Dioe	0.22+4	1	99	99	98	59	35
Metsulfuron+2,4-Dioe	0.06+4	1	98	99	99	58	34
F8426+2,4-D-Savage+28N	0.36+4+2%	0	98	98	70	57	30
F8426+Brox&MCPA+28N	0.36+4+2%	2	99	99	99	56	28
F8426+Brox&MCPA+28N	0.36+8+2%	1	99	99	99	58	32
Thif&Trib+2,4-Dioe	0.2+4	2	93	98	75	58	29
Tribenuron+2,4-Dioe	0.2+4	1	97	99	99	59	36
Clopyralid&2,4-D	7.5	1	90	99	40	57	29
Propanil+MCPA-ioe	16+4	2	75	99	80	58	35
Untreated	0	0	0	0	0	57	30
C.V. %		121	16	12	34		12
LSD 5%		2	18	16	52		5
# OF REPS		4	4	4	2	1	4

Summary

None of the herbicide treatments injured wheat and yield of wheat was not increased by weed control. The lack of yield increase from weed control was because of a healthy crop and the primary weed was wild buckwheat which is a weak competitor. Wild buckwheat control exceeded 90% with all treatments except 2,4-D, MCPA, dicamba + MCPA, bromoxynil&MCPA, and propanil+MCPA.

Broadleaf weed control in small grain, Dickinson, 1996. 'Stoa' hard red spring wheat was seeded May 17. Treatments were applied to 5-leaf wheat on June 14 with 50 F. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 730154 nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Wild buckwheat density was more than one plant/ft^2 and redroot pigweed three plants/yd^2. Harvest for yield was taken August 20.

Treatment	Rate	7/10 Wht	7/10 Rrpw	7/10 Wibu	Test weight	8/20 Wheat yield
	oz/A	%	%	%	lb/bu	bu/A
2,4-Ddma	6	0	75	24	60	34
MCPA-dma	6	0	40	36	60	35
Dica-dma+MCPA-dma	1.5+4	1	98	96	60	39
Brox&MCPA	8	1	99	99	60	33
Triasulfuron+2,4-Dioe	0.2+4	0	97	93	60	36
Trsu+Dica-dma+2,4-Dioe	0.2+1.5+4	1	99	99	59	34
CGA 152005+2,4-Dioe	0.2+4	1	92	99	59	40
CGA 152005+Dica-dma+2,4-Dioe	0.2+1.5+4	3	97	96	60	36
CGA 152005+Brox&MCPA	0.2+4	1	94	99	60	38
Chlorsulfuron&Mets+2,4-Dioe	0.22+4	1	99	99	60	40
Metsulfuron+2,4-Dioe	0.06+4	0	99	95	60	39
F8426+2,4D-Savage+28N	0.36+4+2%	0	99	99	60	34
F8426+Brox&MCPA+28N	0.36+4+2%	6	99	99	59	44
F8426+Brox&MCPA+28N	0.36+8+2%	5	99	99	60	36
Thif&Trib+2,4-Dioe	0.2+4	3	99	97	60	38
Tribenuron+2,4-Dioe	0.2+4	0	97	95	60	38
Clopyralind&2,4-D	7.5	0	87	97	60	35
Propanil+MCPA-ioe	16+4	3	90	88	60	37
Untreated	0	0	0	0	61	37
C.V. %		127	9	13	1	16
LSD 5%		2	11	15	NS	NS
# OF REPS		4	4	4	4	4

Summary

None of the herbicide treatments injured wheat, redroot pigweed and wild buckwheat control exceeded 90% with all herbicide treatments except 2,4-D, MCPA, and propanil+MCPA, and clopyralid&2,4-D for redroot pigweed.

Broadleaf weed control in small grain, Hettinger, 1996. 'Kulm' hard red spring wheat was seeded May 1. Treatments were applied to 5-leaf wheat, 4-lf redroot pigweed, 1- to 4-inch wild buckwheat, and 4- to 8-inch (vining) field bindweed on June 11 with 61 F, clear sky, 0- to 1-mph wind and 0.1" precipitation 14 h after application. Treatments were applied with tractor mounted plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 5 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Field bindweed and wild buckwheat populations were variable at 1 to 10 plants/yd^2. Harvest for yield was on August 16.

Treatment	Rate	6/28 Wht	7/02 Brlf[a]	7/12 Wht	7/12 Fibw	7/12 Wibu	7/31 Brlf[a]	8/16 Yield
	oz/A	%						bu/A
2,4-Ddma	6	0	45	1	85	60	91	9
MCPA-dma	6	0	60	0	96	50	94	9
Dicamba-dma+MCPA-dma	1.5+4	0	68	0	93	96	91	9
Bromoxynil&MCPA	8	0	98	0	91	94	83	9
Triasulfuron+2,4-Dioe	0.2+4	0	61	0	97	80	93	10
Trsu+Dica-dma+2,4-Dioe	0.2+1.5+4	0	76	1	93	75	94	11
CGA 152005+2,4-Dioe	0.2+4	0	78	0	87	72	94	10
CGA 152005+Dica-dma+2,4-Dioe	0.2+1.5+4	0	93	0	95	95	94	7
CGA 152005+Bromoxynil&MCPA	0.2+4	0	92	1	88	90	80	8
Chlorsulfuron&Mets+2,4-Dioe	0.22+4	0	82	3	79	79	91	9
Metsulfuorn+2,4-Dioe	0.06+4	0	92	1	92	77	91	9
F8426+2,4-D-Savage+28N	0.36+4+2%	0	96	0	73	67	70	9
F8426+Brox&MCPA+28N	0.36+4+2%	0	87	4	92	90	93	9
F8426+Brox&MCPA+28N	0.36+8+2%	0	93	0	89	98	80	10
Thif&Trib+2,4-Dioe	0.2+4	0	60	0	95	83	93	11
Tribenuron+2,4-Dioe	0.2+4	0	79	1	93	80	93	9
Clopyralid&2,4-D	7.5	0	80	0	97	94	74	11
Propanil+MCPA-ioe	16+4	0	68	0	89	47	79	11
Untreated	0	0	0	0	8	5	0	8
C.V. %		0	29	274	19	26	17	29
LSD 5%		NS	31	NS	23	28	20	NS
# OF REPS		4	4	4	4	4	4	4

[a]Brlf=broadleaf weeds.

Summary

None of the herbicide treatments injured wheat and wheat yield was not influenced by weed control. The lack of a yield response to weed control reflects the variable weed populations and wild buckwheat which is a weak competitor. The pre-harvest general broadleaf weed control indicated more weed control than earlier evaluations, probably reflecting poor growth of wild buckwheat with dry conditions that prevailed. F-8426 was less effective when with 2,4-D, dry formulation (Savage), than with bromoxynil&MCPA.

Broadleaf weed control in small grain, Minot 1996. 'Norm' hard red spring wheat was seeded May 15. Treatments were applied to 5-leaf wheat, 2.5-inch common lambsquarters, and 2-inch wild buckwheat on June 21 with 56 F, 67% RH, and 7-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were 5 common lambsquarters plants/ft^2, 2 wild buckwheat plants/yd^2, and 1 redroot pigweed plant/yd^2. Harvest for yield was on September 9.

Treatment	Rate	Wht 7/11	Colq 7/11	Wibu 7/11	Rrpw 7/11	Tswt 9/09	Yield 9/09
	oz/A	%	%	%	%	lb/bu	bu/A
2,4-Ddma	6	0	68	29	30	60	20
MCPA-dma	6	0	67	13	28	59	23
Dicamba-dma+MCPA-dma	1.5+4	3	74	46	34	60	25
Bromoxynil&MCPA	8	0	98	50	43	60	25
Triasulfuron+2,4-Dioe	0.2+4	2	88	85	66	61	22
Triasulfuron+Dica-dma+2,4-Dioe	0.2+1.5+4	5	89	70	78	60	23
CGA 152005+2,4-Dioe	0.2+4	0	92	74	77	60	27
CGA 152005+Dica-dma+2,4-Dioe	0.2+1.5+4	6	98	78	85	60	25
CGA 152005+Brox&MCPA	0.2+4	0	83	70	54	60	21
Chlorsulfuron&Mets+2,4-Dioe	0.22+4	0	99	89	98	60	27
Metsulfuron+2,4-Dioe	0.06+4	0	97	41	56	60	27
F8426+2,4-D-Savage+28N	0.36+4+2%	0	39	15	41	56	16
F8426+Brox&MCPA+28N	0.36+4+2%	1	92	15	31	59	22
F8426+Brox&MCPA+28N	0.36+8+2%	1	98	23	29	59	21
Thif&Trib+2,4-Dioe	0.2+4	0	98	86	91	60	25
Tribenuron+2,4-Dioe	0.2+4	1	99	19	52	60	30
Clopyralid&2,4-D	7.5	0	73	50	4	60	23
Propanil+MCPA-ioe	16+4	0	96	16	21	59	27
Untreated	0	0	0	0	0	57	12
C.V. %		270	8	40	49	2	20
LSD 5%		NS	10	26	33	2	6
# OF REPS		4	4	4	4	4	4

Summary

None of the herbicide treatments injured wheat and wheat yield was often doubled by effective weed control. The most effective treatment for control of common lambsquarters, wild buckwheat, and redroot pigweed were chlorsulfuron & metsulfuron +2,4-D and thifensulfuron and tribenuron + 2,4-D. The less control of weeds at Minot than at the other location probably is from the dryer environment at the Minot station in 1996.

Broadleaf weed control in small grain, Williston 1996. 'Munich' Durum wheat was seeded May 14. Treatments were applied to 4- to 5-leaf wheat, 1- to 2-inch Russian thistle and kochia, and 3- to 5-inch common lambsquarters on June 8 with 60 F, 35% RH, clear sky and 4-mph wind. Treatments were applied with a shielded tractor-mounted bicycle wheel type plot sprayer delivering 8.5 gpa at 32 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 24 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were more than 6 Russian thistle plants/ft^2, 2 common lambsquarters plants/ft^2, and 1 kochia plant/yd^2. Harvest for yield was on August 26.

Treatment	Rate	7/11 Wht	7/11 Ruth	7/11 Colq	7/11 Kocz	Tswt	8/26 Yield
	oz/A	%				(lb/bu)	(bu/A)
2,4-Ddma	6	1	93	97	40	61	14
MCPA-dma	6	0	35	92	31	61	15
Dica-dma+MCPA-dma	1.5+4	1	96	99	98	61	12
Brox&MCPA	8	0	93	99	44	62	14
Trsu+2,4-Dioe	0.2+4	0	99	99	83	61	15
Trsu+Dica-dma+2,4-Dioe	0.2+1.5+4	1	99	99	99	61	12
CGA 152005+2,4-Dioe	0.2+4	1	94	99	64	61	11
CGA 152005+Dica-dma+2,4-Dioe	0.2+1.5+4	1	99	99	99	61	14
CGA 152005+Brox&MCPA	0.2+4	0	95	99	83	61	17
Clsu&Mets+2,4-Dioe	0.22+4	0	95	99	97	60	11
Mets+2,4-Dioe	0.06+4	0	99	99	95	62	16
F8426+2,4D-Savage+28N	0.36+4+2%	0	82	99	71	61	12
F8426+Brox&MCPA+28N	0.36+4+2%	0	89	98	78	61	12
F8426+Brox&MCPA+28N	0.36+8+2%	0	95	97	96	61	14
Thif&Trib+2,4-Dioe	0.2+4	0	99	99	99	62	20
Tribenuron+2,4-Dioe	0.2+4	0	94	99	92	61	12
Clopyralid&2,4-D	7.5	0	88	97	26	61	14
Propanil+MCPA-ioe	16+4	0	16	98	27	60	10
Untreated	0	0	0	0	0	58	6
C.V. %		369	8	2	26		33
LSD 5%		NS	9	3	25		6
# OF REPS		4	4	4	4	1	4

Summary

None of the herbicide treatments injured wheat. Wheat yield was low because of drought conditions and were increased two to three fold by effective weed control. Russian thistle control exceeded 90% with all treatments except MCPA, F8426+2,4-D, dry formulation (Savage), F-8426+bromoxynil&MCPA (4 oz/A), clopyralid&2,4-D, and propanil+MCPA. Common lambsquarters was controlled by all treatments. Kochia control was variable, but significantly less with 2,4-D, MCPA, CGA 152005+2,4-D, clopyralid&2,4-D, and propanil+MCPA than with the other treatments.

J tank mixes for weed control in wheat, Fargo 1996. '2375' hard red spring wheat was seeded May 23. Treatments were applied to 4- to 5-leaf wheat, 4- to 6-leaf wild mustard, 0.5 to 2-inch kochia, and 2- to 4-leaf redroot pigweed on June 18 with 76 F, 60% RH, partly cloudy sky, and 10- to 15-mph wind. Treatments were applied with a shielded bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities on July 2 were uniform wild mustard and variable redroot pigweed both at 1 plant/yd^2, variable kochia at 3 plants/yd^2 (mainly in reps 3 and 4), and 40 foxtail plants/ft^2. Harvest for yield was on August 27.

		7/02					8/21				9/27
Treatment	Rate	Wht	Wimu	Fxtl	KOCZ	Rrpw	Wht	Fxtl	Colq	KOCZ	Yield
	oz/A	%					%				bu/A
Thif&Trib+Brox&MCPA	0.225+6.0	0	99	25	99	99	3	25	99	99	32
Thif&Trib+Brox&MCPA	0.225+7.0	1	99	36	99	99	0	46	99	99	40
Thif&Trib+Brox&MCPA	0.225+8.0	2	99	43	99	99	3	35	99	99	41
Thif&Trib+2,4-Dioe+Dica	0.225+4+1.0	1	99	33	99	99	0	24	99	99	35
Thif&Trib+MCPA-ioe+Dica	0.225+4+1.0	1	99	31	99	99	3	18	99	99	35
Thif&Trib+2,4-Dioe	0.3+6.0	3	99	56	99	99	3	24	99	99	36
Tribenuron+2,4-Dioe+Dica	0.09375+4.0+1.0	4	99	13	99	99	3	21	99	99	31
Tribenuron+MCPA-ioe+Dica	0.09375+4.0+1.0	6	99	23	99	99	5	20	99	99	37
Tribenuron+2,4-Dioe	0.125+6.0	0	99	48	99	99	0	30	99	99	37
2,4-Dioe+Dica	4.0+1.0	4	99	8	99	99	5	0	99	99	38
MCPA-ioe+Dicamba	4.0+1.0	3	99	6	99	99	5	10	99	99	35
Brox&MCPA	8	2	99	13	99	99	3	14	99	97	36
Untreated	0	0	0	0	0	0	0	0	0	0	27
C.V. %		114	0	45	0	0	138	67	14	1	17
LSD 5%		3	0	16	0	0	NS	20	18	2	NS
# OF REPS		4	4	4	3	3	4	4	4	4	4

Summary

All herbicide treatments effectively controlled all broadleaf weeds without injury to wheat. The area had a severe foxtail infestation that appeared suppressed by certain treatments so control ratings were taken. However, none of the herbicide gave acceptable foxtail control. Wheat yield did not differ significantly even though the untreated wheat had the lowest yield, because of a variable weed population.

SU tank mixes for weed control in wheat, Carrington 1996. 'Kulm' hard red spring wheat was seeded May 20. Treatments were applied to 2-to 3-leaf wheat, 1- to 3-leaf wild buckwheat, and 2-inch common lambsquarters on June 10 with 85 F, 41% RH, clear sky, and 14-mph wind. Treatments were applied with a shielded bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Wild buckwheat and common lambsquarters density were from 5 to 40 plants/yd^2.

Treatment	Rate	Wht	Wibu	Colq	Test weight	Yield
	oz/A		%		lb/bu	bu/A
Thif&Trib+Brox&MCPA	0.225+6.0	0	91	99	57	32
Thif&Trib+Brox&MCPA	0.225+7.0	0	96	99	58	36
Thif&Trib+Brox&MCPA	0.225+8.0	0	98	99	57	36
Thif&Trib+2,4-Dioe+Dica	0.225+4+1.0	0	91	99	57	27
Thif&Trib+MCPA-ioe+Dica	0.225+4+1.0	0	84	99	57	36
Thif&Trib+2,4-Dioe	0.3+6.0	0	90	99	57	35
Trib+2,4-Dioe+Dica	0.09375+4.0+1.0	0	79	95	58	39
Trib+MCPA-ioe+Dica	0.09375+4.0+1.0	0	54	97	57	43
Trib+2,4-Dioe	0.125+6.0	0	80	99	57	33
2,4-Dioe+Dica	4.0+1.0	0	64	93	55	35
MCPA-ioe+Dicamba	4.0+1.0	0	36	93	56	33
Bromoxynil&MCPA	8	0	74	99	57	42
Untreated	0	0	0	0	56	28
C.V. %		0	18	3	2.5	15
LSD 5%		NS	19	4	NS	NS
# OF REPS		4	4	3	4	4

Summary

None of the herbicide treatments injured wheat. Wild buckwheat control was greatest when thifensulfuron&tribenuron were applied with bromoxynil&MCPA and tended to increase with rate. However, bromoxynil&MCPA alone only gave equal control of tribenuron+2,4-Dioe or 2,4-Dioe+dicamba. Common lambsquarters control exceeded 90% with all treatments. Wheat yield was not significantly increased by herbicides because of variation in common lambsquarters density. Wild buckwheat was more uniform, but is not a strong competitor with wheat. Thus, explaining the trend for high yield for certain treatments giving poor wild buckwheat control. None of the herbicides injured wheat.

F8426 for broadleaf weed control in wheat, Fargo 1996. '2375' hard red spring wheat was seeded May 3. Treatments were applied to 4-leaf wheat, 1- to 2-leaf wild buckwheat, and 0.25- to 0.75-inch (diameter) kochia on June 4 with 71 F, 32% RH, partly cloudy sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities on June 12 were greater than 3 wild buckwheat plants/ft^2, less than 1 kochia plant/3 yd^2, and wild mustard that emerged after general treatment or skipped during treatment of the entire experiment with MCPA at 2 oz/A when wheat was in 2-leaf stage, on August 2 wild buckwheat was 1 plant/ft^2, and kochia 1 plant/yd^2. Harvest for yield was on August 15.

		6/12				8/2		8/15
Treatment	Rate	Wht	Wibu	Wimu	KOCZ	Wibu	KOCZ	Yield
	oz/A	%						bu/A
F8426+28N	0.37+.25G	0	96	94	97	74	96	47
F8426+ND-4	0.37+.5%	10	98	98	99	90	99	41
F8426+ND-72	0.37+.5%	7	95	92	99	65	99	50
F8426+24D-Savage+28N	0.37+4+.25G	2	98	97	99	91	97	45
F8426+24D-Savage+Dica-dma+28N	0.37+4+1.5+.25G	5	99	99	99	99	99	36
F8426+Brox&MCPA+28N	0.37+4+.25G	15	99	99	99	95	99	43
F8426+Brox&MCPA+28N	0.37+6+.25G	16	99	99	99	96	99	43
Brox&MCPA	8	2	99	99	99	99	99	45
Brox&MCPA	12	1	99	99	99	99	99	35
Brox&MCPA+CGA 152005	4+0.2	0	98	99	99	99	99	40
Brox&MCPA+CGA 152005	8+0.2	0	99	99	99	99	99	37
CGA 152005+X-77	0.2+.25%	0	58	97	98	75	98	46
Tribenuron+X-77	0.12+.25%	0	33	97	99	28	99	46
Untreated	0	0	0	0	0	0	0	43
C.V. %		51	5	2	1	11	2	15
LSD 5%		3	6	3	2	12	2	NS
# OF REPS		4	4	4	4	4	4	4

Summary

F8426+bromoxynil&MCPA+28%N injured wheat, but did not reduce wheat yield. Wheat yield was not increased by weed control as wild buckwheat that normally does not reduce yield was the major weed specie. Kochia was controlled by all herbicide treatments. F8426 gave greater wild buckwheat control when applied with ND-4 than 28N or ND-72.

Dicamba-NA mixtures for broadleaf weed control in wheat, Fargo 1996. '2371' hard red spring wheat was seeded May 23. Treatments were applied to 3- to 3.5-leaf wheat, 0.5- to 1.5-inch kochia, 3- to 6-leaf wild mustard, and 2- to 4-leaf foxtail on June 13 with 78 F, 29% RH, clear sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Broadleaf densities were variable at 1 to 10 plants/yd^2 and foxtail was dense at less than 5 plants/ft^2.

Treatment	Rate	7/1 Wht	7/1 KOCZ	7/1 Wimu	7/1 Fxtl
	oz/A	%	%	%	%
Dicamba-Na+Triasulfuron	1.5+.2	2	64	99	19
Dica-Na+Triasulfuron+ND-4	1.5+.2+.5%	3	99	99	18
Dica-Na+CGA 152005	1.5+2	0	44	99	20
Dica-Na+CGA 152005+ND-4	1.5+.2+.5%	1	99	99	3
Dica-Na+Pyridate	1.5+7.5	7	99	98	19
Dica-Na+Tral+TF8035	1.5+2.9+.5%	5	99	93	93
Dica-Na+Tral+TF8035+AMS	1.5+2.9+.5%+24	6	99	97	90
Pyridate	7.5	1	70	65	30
Pyridate+Scoil	4+1%	3	49	15	18
Pyridate+ND-4	4+1%	2	66	5	9
Bromoxynil&MCPA	8	0	91	99	10
Untreated	0	0	0	0	0
C.V. %		87	16	14	56
LSD 5%		3	17	14	22
# OF REPS		4	4	4	4

Summary

None of the herbicide treatments caused important injury to wheat. Wild mustard was controlled by all herbicide treatments except for pyridate applied without dicamba. Adjuvants generally reduced pyridate efficacy. Tralkoxydim applied with dicamba controlled foxtail. However, tralkoxydim was not applied alone so any antagonism from the dicamba could not be determined. ND-4 adjuvant greatly increased kochia control from dicamba sodium applied with either triasulfuron or CGA 152005.

Foxtail control with HOE-1102 in durum wheat, Fargo 1996. 'Renville' durum wheat was seeded May 23. Treatments were applied to 2.5- to 3-leaf wheat, 3- to 5-leaf green and yellow foxtail, and cotyledon- to 5-leaf redroot pigweed on June 13 with 79 F, 30% RH, partly cloudy sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities on August 20 were 5- to 30- green and yellow foxtail (mostly yellow) plants/ft^2 and variable 5 redroot pigweed plants/yd^2.

		7/01			8/20			9/27
Treatment	Rate	Wht	Fxtl	Rrpw	Wht	Fxtl	Rrpw	Yield
	oz/A			%				bu/A
HOE-1102	.83	0	93	0	5	93	0	34
HOE-1102	1.0	0	96	0	1	95	0	39
HOE-1102+Thif&Trib+MCPA-ioe	.83+.22+4	2	74	98	5	64	98	48
HOE-1102+Thif&Trib+MCPA-ioe	1.0+.22+4	0	83	99	0	61	99	50
HOE-1102+Trib+MCPA-ioe	.83+.13+4	0	71	94	0	73	87	49
HOE-1102+Trib+MCPA-ioe	1.0+.13+4	0	86	90	1	73	81	49
HOE-1102+Brox&MCPA	.83+4	4	78	28	0	61	28	50
HOE-1102+Brox&MCPA	.83+8	0	76	50	0	41	50	44
HOE-1102+Brox&MCPA	1.0+8	0	76	69	1	50	68	49
HOE-1102+Dica-Na+MCPA-ioe	.83+1+4	0	95	91	1	86	76	46
HOE-1102+Dica-Na+MCPA-ioe	1.0+1+4	3	91	91	1	84	75	45
HOE-1102+MCPA-ioe	.83+4	1	94	19	3	93	0	44
HOE-1102+MCPA-ioe	1+4	1	92	21	0	91	9	45
Tiller+Dicamba-Na	5.4+1	44	95	93	14	81	80	40
Tiller+Bromoxynil	5.4+4	70	85	84	66	36	29	21
Tiller+Brox&MCPA	5.4+8	54	82	75	61	50	24	31
Dakota+Dicamba-Na	6.5+1	29	91	89	5	75	87	42
Tral+TF8035+Brox+AMS	2.9+.5%+4+24	0	95	61	0	92	28	45
MON-37536+ND-72	.25+1%	2	83	78	1	86	75	45
Untreated	0	0	0	0	0	0	0	33
		49	10	18	108	15	28	11
C.V. %		7	11	16	13	15	20	7
LSD 5%		4	4	4	4	4	4	4
# OF REPS								

Summary

HOE-1102 control of yellow and green foxtail was antagonized by tank mixture with broadleaf control herbicides, except MCPA-ioe and possibly dicamba-NA+MCPA-ioe. MCPA was not antagonistic to foxtail control, but did not provide adequate redroot pigweed control. Tiller and Dakota severely injured durum wheat. The most severe injury was from Tiller applied with bromoxynil or bromoxynil&MCPA. Wheat yield was increased 10 to 15 bu/A from effective weed control without injury to the durum wheat. Wheat yield may not accurately represent the injury to durum as some of the yield was from volunteer HRS wheat.

Foxtail control in durum wheat, Fargo. 'Renville' durum wheat was seeded May 23. Treatments were applied to 4.5- to 5-leaf wheat, 3- to 5-leaf yellow and green foxtail, 4- to 6-leaf redroot pigweed, 4- to 8-leaf common lambsquarters, and 2- to 5-leaf wild mustard on June 18 with 76 F, 60% RH, partly cloudy sky, and 10- to 15-mph wind. Treatment (/) was applied to 5-leaf wheat on July 1 with 81 F, 50% RH, clear sky and 5- to 10-mph wind. All treatments were applied with a shielded bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densitities on August 21 were 10 green and yellow foxtail plants/ft^2.

		7/1					8/21			8/15
Treatment	Rate	Wht	Fxtl	Rrpw	Colq	Wimu	Wht	Fxtl	Colq	Yield
	oz/A	%								bu/A
MSMA-6	16	1	70	83	0	98	0	76	0	34
MSMA-6	32	5	88	77	16	99	0	90	0	36
MSMA-6/MSMA-6	16/16	0	70	69	0	96	3	95	26	32
HXB+X-77	0.25+0.25%	43	93	99	24	99	13	88	0	27
HXB+Scoil	0.25+1%	23	89	99	20	99	5	83	11	29
HXB+ND-4	0.25+1%	28	92	99	44	82	3	86	35	32
HXB+ND-71	0.25+1%	36	94	99	44	99	6	83	25	33
Propanil+MCPA-ioe	16+8	8	60	99	99	99	1	46	99	33
HOE-1102	0.83	1	98	5	5	25	3	95	20	41
Untreated	0	0	0	0	0	0	0	0	0	30
C.V. %		40	11	25	32	20	93	6	76	12
LSD 5%		8	11	27	12	24	4	7	24	6
# OF REPS		4	4	4	4	4	4	4	4	4

Summary

HXB injured 'Renville' durum, but yield was not reduced nor was injury evident at the pre-harvest evaluation. Two MSMA applications at 16 oz/A tended to give greater foxtail control than one application at 32 oz/A. Foxtail control pre-harvest was the greatest in wheat treated with HOE 1102, and two applications of MSMA at 16 oz/A.

Hard red spring wheat cultivar response to Avenge, Casselton and Prosper, 1996. Zollinger, Richard K. and LeRoy A. Spilde. Avenge is an important herbicide for wild oat control. Avenge has not been labeled on several hard red spring wheat (HRSW) cultivars because tolerance has been inadequate or has not been determined. HRSW cultivars soon to be released have not been tested for response to Avenge. An experiment was conducted to determine HRSW cultivar response to Avenge in North Dakota.

Wheat cultivars were seeded at Casselton, ND on May 13, 1996 and Prosper, ND on May 28, 1996 at 28 seeds/sq ft. At Casselton, treatments were applied to 4.5- to 5.5-leaf wheat on June 11, 1996 with 89 F air temperature, 114 F at one inch above soil surface, 32% relative humidity, 20% cloudy sky, and 0 to 2 mph wind. At Prosper, treatments were applied to 5- to 6-leaf wheat on July 2, 1996 with 72 F air temperature, 81 F at one above soil surface, 88% relative humidity, 0% cloudy sky, and 2 to 4 mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles to the entire plot area of 4 by 8 ft plots. The experiment had a randomized complete block design with four replicates per treatment.

Planting was delayed approximately one month due to wet soil conditions. Consequently, soil moisture conditions at seeding were near or at field capacity. Very hot conditions followed application which may have caused greater injury at the later seeded Prosper location. Precipitation totalled 4.08 inches after planting, which was 50% of normal. Visible injury was evaluated July 5 at Casselton and July 25 at Prosper. Radiometer data was taken (not shown) at 650 and 800 nm on June 12 and June 28 at Casselton and Prosper, respectively, in an attempt to detect differences in green matter accumulation. Data detected cultivar differences but no treatment differences.

Wheat cultivars exhibiting little or no response from Avenge were: GluPro, 2375, and Marshall. Many cultivars showed greater phytotoxicity and yield loss at Prosper than Casselton. This may have resulted from the later seeding at Prosper and hot conditions during the early growth to mid stages of wheat development. Keene, Russ, Oxen, Sharpe, MN91309, Backup, and ND690 exhibited little or no response to Avenge at Cassleton but was negatively affected at Prosper. SBF0402 and SC3156 were negatively affected by Avenge. Some cultivars showed less injury and yield loss from the Avenge and imazamethabenz combination that from Avenge applied alone. Seed test weight was not reduced in some varieties where injury or yield reduction occurred.

Hard red spring wheat cultivar response to Avenge and Avenge plus Assert combinbation, 1996.

HRSW cultivar	Rate[1] (lb/A)	Casselton Injury (%)	Casselton Yield (bu/A)	Casselton Test wt (lb/bu)	Prosper Injury (%)	Prosper Yield (bu/A)	Prosper Twt (lb/bu)
Keene	0	0	56	61.1	0	50	56.7
	1	1	56	60.9	10	45	57.7
	1.5	0	62	60.1	22	44	56.5
	0.5+0.23	1	61	60.4	7	48	56.5
Russ	0	0	61	60.2	0	53	56.0
	1	2	62	59.3	15	44	55.9
	1.5	2	66	59.5	37	38	54.3
	0.5+0.23	12	58	60.9	8	48	55.2
Oxen	0	0	65	59.3	0	49	53.5
	1	0	66	60.2	3	45	54.6
	1.5	1	60	60.1	4	42	54.3
	0.5+0.23	1	63	60.0	3	48	54.7
GluPro	0	0	45	57.7	0	39	54.2
	1	0	47	57.3	3	38	54.5
	1.5	0	53	58.4	2	45	54.6
	0.5+0.23	2	52	58.0	2	45	55.7
Sharp	0	0	47	60.9	0	52	57.3
	1	1	58	61.0	5	50	57.1
	1.5	3	57	60.9	10	44	56.6
	0.5+0.23	3	55	61.5	1	54	57.9
MN91309	0	0	63	59.7	0	55	56.2
	1	1	60	59.9	16	40	55.0
	1.5	2	62	60.2	14	46	55.9
	0.5+0.23	6	56	59.3	12	44	55.3
BackUp	0	0	51	61.8	0	47	60.4
	1	5	44	61.9	15	35	59.7
	1.5	5	54	61.0	20	35	59.5
	0.5+0.23	8	42	61.5	11	41	60.2
2375	0	0	56	61.2	0	38	58.7
	1	5	63	60.9	12	44	55.4
	1.5	7	62	61.1	20	47	57.4
	0.5+0.23	9	59	60.8	7	47	57.4
Marshall	0	0	57	60.6	0	36	56.5
	1	4	60	60.2	17	42	56.2
	1.5	11	64	58.9	9	40	54.1
	0.5+0.23	5	54	59.0	7	45	56.2
ND690	0	6	52	60.4	0	43	56.8
	1	2	58	60.6	21	34	55.9
	1.5	11	57	59.9	33	34	56.2
	0.5+0.23	4	51	59.7	10	40	57.1
SBF0402	0	0	68	60.1	0	52	54.7
	1	0	62	60.6	3	48	56.8
	1.5	2	64	60.3	5	50	55.7
	0.5+0.23	4	64	59.8	0	55	55.0
SD3156	0	0	59	59.8	0	48	55.8
	1	3	54	61.8	7	39	57.1
	1.5	3	58	61.3	16	35	56.5
	0.5+0.23	1	56	61.1	3	45	57.1
LSD (0.05)		7	3	0.6	7	3	0.6

[1]0, 1, 1.5 = lb/A Avenge, 0.5+0.23 = 0.5 lb/A Avenge + 0.23 lb/A imazamethabenz.

Post-harvest hairy nightshade control, Sheyenne 1996. (Endres and Mehlhoff) The experiment was conducted to evaluate hairy nightshade control with herbicides after small grain harvest. Treatments were applied September 13, 1996 with 65-66 F, 40-44% RH, overcast sky, and 14 mph wind (McHenry weather data) to 4-6 inch tall hairy nightshade (with flowers and initial berries present) located in barley stubble. Treatments were applied to a 6.67 ft wide area the length of 10 by 25 ft plots with a hooded bicycle-wheel-type plot sprayer delivering 20 gal/A at 35 psi through 8002 flat fan nozzles, with the exception of treatments containing glyphosate. Glyphosate treatments were applied with a spray volume of 10.5 gal/A at 35 psi through 8001 nozzles. Visual estimates of percentage nightshade control were taken September 23 and 30. The experiment was a randomized complete block design with four replications.

Treatment[a]	Rate	Hairy nightshade control 9/23	9/30
	lb/A	---- %	----
Untreated		0	0
Dicamba	0.5	57	67
Aciflourfen	0.25	55	82
Bromoxynil	0.38	88	97
Imazethapyr + MVO	0.031	35	71
Glyphosate + NIS + AMS	0.75	67	82
Glyphosate + 2,4-D ester + NIS + AMS	0.38 + 0.5	69	70
Paraquat + NIS	0.25	94	99
Paraquat + NIS	0.5	99	99
Paraquat + dicamba + NIS	0.25 + 0.25	96	99
Paraquat + 2,4-D ester + NIS	0.25 + 0.5	97	98
Glufosinate	1.25	98	99
LSD (0.05)		18	17
C.V. %		17	15

[a]MVO=Scoil applied at 1.5 pt/A; NIS=Purity 100 applied at 0.25% v/v with glyphosate and 0.125% v/v with paraquat; AMS=ammonium sulfate applied at 2% v/v.

Bromoxynil, glufosinate, and treatments containing paraquat provided the greatest (88-99%) and most rapid control of hairy nightshade plants. These treatments generally appeared to stop production of new berries, but no treatment completely destroyed existing berries and seed. Frost (28 F) that occurred on September 29 hastened the burndown of herbicide-treated nightshade compared to untreated plants when evaluated on September 30.

Oat cultivar response to Harmony Extra, Casselton, 1996. Zollinger, Richard K., Michael McMullen, and Frank A. Manthey. An experiment was conducted to evaluate oat cultivar response to Harmony Extra at labeled and twice labeled rate. Oat cultivars were seeded at Casselton, ND on May 31, 1996. Herbicide treatments were applied to 3- to 3.5-leaf oat on June 21 with 86 F, 60% RH, 50% cloudy sky, and 2-5 mph wind. Treatments were applied to plots 4 ft wide by 8 ft long with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment was a randomized complete block design with three replicates per treatment. Visable injury ratings were taken July 5, 1995.

Long season maturing cultivars: Bay, Paul, Troy, Valley, and Whitestone. Medium season maturing cultivars: Milton and ND880107. Short season maturing cultivars: Jerry. Paul is a naked or hull-less cultivar. The Harmony Extra label indicates that injury can occur with Ogle, Porter, and Premier oat cultivars. North and South Dakota are the largest oat growing region in the U.S. and their oat breeding programs release many new cultivars. Testing popular and new oat variety response to Harmony Extra is important. General tolerance or sensitivity is not consistent amoung oat cultivat maturity class. In summary, the following oat cultivars exhibited little or no affect from thifensulfuron + tribenuron: Bay, Paul, Troy and ND880107. The following oat cultivars exhibited a negative response at the 1X field rate: Jerry, Milton, and Whitestone. Valley exhibited a negative response at the 1X and 2X field rate.

Oat cultivar	Trt[1]	Injury	Heading	Height	Test wt	Yield
		(%)	(DAP)	(cm)	(lb/bu)	(bu/A)
Bay	0	0	52.7	95	32.7	144
	1X	3	52.0	88	31.9	133
	2X	5	52.7	94	32.9	144
Paul	0	0	51.3	113	42.0	114
	1X	1	51.0	106	42.8	116
	2X	2	51.3	115	42.6	134
Jerry	0	0	47.0	110	38.2	143
	1X	3	46.0	99	38.7	129
	2X	6	48.0	106	37.7	141
Milton	0	0	45.7	86	36.1	129
	1X	3	45.3	84	34.9	117
	2X	1	46.0	87	34.0	141
Troy	0	0	49.3	114	35.1	132
	1X	0	49.7	103	33.9	128
	2X	6	51.0	116	33.7	130
Whitestone	0	0	52.0	101	32.4	133
	1X	7	52.0	91	32.2	120
	2X	5	52.0	93	33.2	132
Valley	0	0	50.7	99	34.2	128
	1X	2	50.7	94	33.6	123
	2X	3	50.3	95	32.5	120
ND880107	0	0	50.3	114	37.6	146
	1X	2	50.3	116	37.5	154
	2X	1	51.7	115	37.5	158
LSD (0.05)		3	0.7	4	1.2	9

[1]0 = untreated, 1X = Harmony Extra + MCPA ester + X-77 at 0.225 oz product/A + 0.5 pt/A + 0.125% v/v, and 2X = Harmony Extra + MCPA ester + X-77 at 0.45 oz product/A + 1 pt/A + 0.125% v/v. DAP = Heading days after planting.

Velpar in established alfalfa, Fargo, 1996. (Zollinger and Meyer) An experiment was conducted to evaluate weed control from Velpar applied to dormant alfalfa. 'Algonquin' alfalfa was seeded in 1993 and Velpar was applied April 23, 1996 at 11:00am with 45 F air, 70% RH, 100% clouds, dry surface, moist below surface, and 10 to 15 mph wind to dormant alfalfa dormant green and rosette dandelion and PRE to all annual weeds and new growth of perennial weeds.

Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	May 16					June 13	
		Dali	Colq	Fipc	Wibw	Coma	Dali	Fibw
	lb ai/A	% control						
Velpar 75DF	1	28	97	99	98	95	53	33
Velpar 75DF	2	38	99	99	98	97	81	36
Velpar 90SP	1	30	94	98	97	97	61	39
Velpar 90SP	2	58	98	99	99	97	84	44
Untreated		0	0	0	0	0	0	0
LSD (0.05)		12	4	1	2	3	14	5

[a]Refer to 'List of Herbicides Tested' for herbicide information.

May 24 evaluation
No rain occurred from application to May 17. All plots were harvested previously and there were no signs of visible injury.

June 13 evaluation
Evaluations were taken from established dandelion plants since all treatments gave 99% control of seedling dandelion.

All treatments gave 99% control wild buckwheat, common mallow, common lambsquarters and quackgrass. All treatments gave complete seedling dandelion control.

Velpar in established alfalfa, Absaraka, 1996. (Zollinger and Meyer) An experiment was conducted to evaluate weed control from Velpar applied to dormant alfalfa. 'Dart' alfalfa was seeded in 1990 and Velpar was applied April 23, 1996 at 2:30am with 55 F air, 90% RH, 70% clouds, with light scattered showers, and 15 to 20 mph wind to dormant alfalfa, 0.5 inch tall and heavy alfalfa and weed residue estimated at 0.5 to 0.75 ton/A and dormant quackgrass and Canada thistle. Treatments were applied PRE to annual weeds and new growth from perennial weeds. Evidence of brome, kochia, redroot pigweed, dandelion, green and yellow foxtail were observed.

Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

		May 24					June 20	
Treatment[a]	Rate	Dali	Kocz	Colq	Cath	Qugr	Dali	Cath
	lb ai/A	----------	% control	------------				
Velpar 75DF	1	40	98	99	10	30	99	99
Velpar 75DF	2	45	99	99	16	51	99	87
Velpar 90SP	1	49	98	99	11	41	99	99
Velpar 90SP	2	51	99	99	14	45	96	99
Untreated		0	0	0	0	0	0	0
LSD (0.05)		5	2	0	6	9	4	5

[a]Refer to 'List of Herbicides Tested' for herbicide information.

May 24 evaluation
Up to 60% perennial sowthistle control was observed but population was not consistent enough to evaluate. Velpar 75DF at 2 lb/A produced slight alfalfa chlorosis but was not apparent at the June 20 evaluation.

June 20 evaluation
All treatments gave 99% control of common mallow, common lambsquarters, kochia, wild mustard, quackgrass, cockle, and biennial wormwood.

Brome grass was present only in rep 3 and was evaluated at 99% control. All treatments gave poor control of eastern black nightshade.

Velpar in established alfalfa, Streeter, 1996. (Zollinger and Meyer) An experiment was conducted to evaluate weed control from Velpar applied to dormant alfalfa. Alfalfa was seeded in late June, 1995 and Velpar was applied April 19, 1996 at 11:00 am with 45 F air, 70% RH, 100% clouds, dry surface, moist below surface, and 10 to 15 mph wind to dormant alfalfa, 0.5 inch tall, overwintering dormant quackgrass and dandelion, and PRE to all annual weeds and other new growth of perennial weeds.

Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

		May 29		June 20
Treatment[a]	Rate	Alfalfa	Qugr	Qugr
	lb ai/A	----------	% control	------------
Velpar 75DF	1	4	61	92
Velpar 75DF	2	31	68	96
Velpar 90SP	1	3	58	96
Velpar 90SP	2	30	56	97
Untreated		0	0	0
LSD (0.05)		16	14	10

[a]Refer to 'List of Herbicides Tested' for herbicide information.

May 29 evaluation
Soil type at Streeter was a loam soil. Applications were made to dormant alfalfa.
All treatments gave 99% control of redroot pigweed, common lambsquarters, wild buckwheat, common mallow, tansy mustard, field pennycress, sulfur cinquefoil, fairy candlebra, seedling dandelion, kochia, Russian thistle, cutleaf nightshade, biennial wormwood and yellow whitlowwort. Injury was observed as slight chlorosis and leaf burn of established plants and dead small plants.

June 20 evaluation
All treatments gave 99% control of wild buckwheat, kochia, Russian thistle, biennial wormwood, common lambsquarters, cutleaf nightshade, flix and tansy mustard, redroot pigweed, fairy candlebra, goldenrod, sulfur cinquefoil and curly dock.
No alfalfa injury was observed at the final evaluation.

Weed control in canola, Carrington 1996. (Endres, Peterson, and Schatz) The experiment was conducted to evaluate canola injury and weed control with the currently-labeled herbicides Treflan, Stinger, and Ultima 160, and with Sonalan. Herbicide treatments were applied to a 6.67 ft wide area the length of 10 by 25 ft plots with a hooded bicycle-wheel-type plot sprayer through 8001 flat-fan nozzles delivering 17 gal/A at 32 psi for PPI treatments and 8.5 gal/A at 35 psi for POST treatments. PPI treatments were applied May 14 with 63 F, 65% RH, sunny sky, and 9 mph wind. PPI treatments were immediately incorporated after application with a small tractor mounted roto-tiller set to till at a 3-4 inch depth. 'Sponsor' canola was seeded in 7-inch rows at a rate to establish 17 plants/ft^2 on May 15, 1996. POST treatments were applied June 10 with 78 F, 45% RH, sunny sky, and 10 mph wind to 4-leaf canola, 1-2 inch common lambsquarters, and 4-5 leaf yellow foxtail. Visual estimates of percentage canola injury were taken June 18 and July 10. Visual estimates of percentage weed control were taken June 18 and July 22. The experiment was a randomized complete block design with four replications.

				Weed control			
	Herbicide	Canola injury		Yellow foxtail		Common lambsquarters	
Treatment	Rate	6/18	7/10	6/18	7/22	6/18	7/22
	lb/A	%					
Untreated		0	0	0	0	0	0
PPI							
Sonalan EC	0.77	11	8	97	95	97	94
Sonalan EC	1.54	30	27	99	96	99	95
Treflan EC	0.75	0	0	95	89	85	80
Treflan EC	1.50	11	11	97	96	97	92
PPI/POST							
Treflan EC/Stinger	0.75/0.12	0	0	95	90	93	94
Treflan EC/Stinger	1.50/0.25	1	5	94	87	87	94
POST							
Ultima 160 + Stinger + MVO	0.2 + 0.12 + 2 pt	7	4	91	94	82	75
Ultima 160 + Stinger + MVO	0.4 + 0.25 + 2 pt	10	7	96	94	88	89
LSD (0.05)		11	11	2	5	7	8
C.V. %		100	123	1	4	6	7

Canola injury occurred with the low rate of Sonalan early in the season and with the high rates of Sonalan and Treflan. Injury was greatest with Sonalan at 1.54 lb/A. The high rates of Sonalan and Treflan generally improved yellow foxtail control compared to the low rates, but control generally was excellent (87-99%) with all herbicide treatments. Common lambsquarters control was excellent with Sonalan (94-99%) and good-to-excellent with Treflan treatments (80-97%). Stinger + Ultima 160 generally provided good control (75-89%) of common lambsquarters.

Roundup-Ultra® with adjuvants, Fargo 1996. 'Valley' oat, 'Foster' barley, and 'Siberian' foxtail millet were seeded in adjacent strips as bioassay species on May 28. Treatments were applied to 5- to 6-leaf oat and barley, and 4- to 6-leaf foxtail millet on July 2 with 78 F, 42% RH, partly cloudy sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/17 Oat	Barley	Fomi
	oz/A	%		
Glyphosate-Ultra+AMS	1+2%	92	93	98
Scythe	(5%of 80 gpa)	11	13	16
Glyphosate-Ultra+DispatchAMS	1+.2.5%	90	88	96
Glyphosate-Ultra+Dispatch2N	1+.5G	93	92	98
Glyphosate-Ultra+Flame	1+.5%	91	89	98
Glyphosate-Ultra+Flame+Choice	1+.5%+.5%	93	91	97
Glyphosate-Ultra+AR375	1+.5%	91	92	97
Glyphosate-Ultra+AR375	1+1%	93	91	99
Glyphosate-Ultra+Class Act	1+2%	96	96	96
Glyphosate-Ultra+Surfate	1+1.5%	94	94	97
Glyphosate-Ultra+Array	1+1%	93	94	97
Glyphosate-Ultra+TRA0051	1+.5%	87	72	92
Glyphosate-Ultra+TRA0098	1+.5%	87	80	92
Glyphosate-Ultra+PX-710	1+.75%	90	91	97
Glyphosate-Ultra+PX-127	1+.5%	93	91	97
Glyphosate-Ultra+PX-3240	1+2%	87	80	94
Glyphosate-Ultra+PX-126	1+5%	95	94	97
C.V. %		4	4	5
LSD 5%		5	5	6
# OF REPS		4	4	4

Summary

Glyphosate, Roundup Ultra®,at 1 oz/A (2.66 fluid oz/A) was highly phytotoxic to the species present. The only glyphosate treatments that gave less than 90% control of one or more grass species were Dispatch AMS, Flame, TRA0051, TRA0098, and PX-3240. Scythe at 5% of an 80 gpa solution delivered with 8004 nozzles was not effective herbicidally. These data indicate that with the condition of this experiment, glyphosate at 3 times less than the minimum label rate (0.5 pt/A), only with cultivation, effectively controlled oats, barley, and foxtial millet.

Roundup-Ultra® with various commercial adjuvants, Fargo 1996. 'Valley' oat, 'Foster' barley, and 'Siberian' foxtail millet were seeded in adjacent plots as bioassay species on May 28. Treatments were applied to 5- to 6-leaf oat, and 6- to 7-leaf barley and foxtail millet on July 1 with 82 F, 50% RH, clear sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/17 Oat	Barley	Fomi
	oz/A		%	
Glyphosate-Ultra	1	85	83	94
Glyt-Ultra+Activator90	1+.5%	89	80	92
Glyt-Ultra+ActivatorPlus	1+.5%	91	84	94
Glyphosate-Ultra+Amway80	1+.5%	89	85	91
Glyphosate-Ultra+Li700	1+.5%	89	87	93
Glyt-Ultra+Preference	1+.5%	93	87	93
Glyt-Ultra+SprayBoosterS	1+.5%	90	84	96
Glyphosate-Ultra+X-77	1+.5%	87	86	94
Glyphosate-Ultra+AMSPlus	1+.5%	93	93	98
Glyphosate-Ultra+Cayuse	1+.5%	94	92	98
Glyphosate-Ultra+Surfate	1+1%	96	96	99
Glyphosate-Ultra+Scythe	1+3%	79	75	88
Untreated	0	0	0	0
C.V. %		3	4	3
LSD 5%		4	5	4
# OF REPS		4	4	4

Summary

Glyphosate (Roundup-Ultra®) at 1 oz/A (2.66 fluid oz/A) was enhanced in phytotoxicity to barley when applied with AMS Plus, Cayuse, or Surfate, but phytotoxicity was antagonized by Scythe. Most adjuvants increased glyphosate phytotoxicity to oats, except X-77 and Scythe which was antagonistic. Differences in glyphosate phytotoxicity from adjuvants was small as control level was high with all treatments.

Roundup-Ultra® with various commercial adjuvants, Carrington 1996. 'Azure' barley and 'Whitestone' oats were seeded in adjacent strips as bioassay species on May 20. Treatments were applied to 3- to 4-leaf barley and 2- to 3-leaf oat on June 11 with 73 F. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

		6/20/96			
Treatment	Rate	Barley	Oat	Colq	KOCZ
	oz/A	%			
Glyphosate-Ultra	1	9	6	0	0
Glyphosate-Ultra+Activator90	1+.5%	15	13	0	0
Glyphosate-Ultra+ActivatorPlus	1+.5%	9	11	0	0
Glyphosate-Ultra+Amway80	1+.5%	40	35	30	30
Glyphosate-Ultra+Li700	1+.5%	8	6	0	10
Glyphosate-Ultra+Preference	1+.5%	16	20	0	0
Glyphosate-Ultra+SprayBoosterS	1+.5%	28	24	25	0
Glyphosate-Ultra+X-77	1+.5%	29	28	30	20
Glyphosate-Ultra+AMSPlus	1+.5%	73	70	40	30
Glyphosate-Ultra+Cayuse	1+.5%	68	65	30	10
Glyphosate-Ultra+Surfate	1+1%	97	94	65	50
Glyphosate-Ultra+Scythe	1+3%	36	34	30	20
Untreated	0	0	0	0	0
C.V. %		41	42		
LSD 5%		19	19		
# OF REPS		4	4	1	1

Summary

Glyphosate (Roundup-Ultra®) phytotoxicity was enhanced greatly when applied with AMS Plus, Cayuse, and Surfate, with the greatest enhancement from Surfate. Most surfactants also enhanced glyphosate phytotoxicity compared to Roundup-Ultra® alone, but less than the salt containing adjuvants. Glyphosate was applied at 1 oz/A which is 2.6 fluid oz/A of product or three times less than the lowest label rate that also requires tillage.

Roundup-Ultra® with various commercial adjuvants, Dickinson 1996. 'Stoa' hard red sping wheat was seeded on May 17. Treatments were applied to 5-leaf wheat on June 14 with 50 F. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 730154 nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/10 Wht
	oz/A	%
Glyphosate-Ultra	1	44
Glyphosate-Ultra+Activator90	1+.5%	14
Glyphosate-Ultra+ActivatorPlus	1+.5%	23
Glyphosate-Ultra+Amway80	1+.5%	66
Glyphosate-Ultra+Li700	1+.5%	16
Glyphosate-Ultra+Preference	1+.5%	28
Glyphosate-Ultra+SprayBoosterS	1+.5%	31
Glyphosate-Ultra+X-77	1+.5%	38
Glyphosate-Ultra+AMSPlus	1+.5%	60
Glyphosate-Ultra+Cayuse	1+.5%	55
Glyphosate-Ultra+Surfate	1+1%	89
Glyphosate-Ultra+Scythe	1+3%	15
Untreated	0	0
C.V. %		38
LSD 5%		20
# OF REPS		4

Summary

Glyphosate (Roundup-Ultra®) phytotoxicity to wheat was enhanced by surfactant Amway 80, and salt adjuvants AMS Plus and Surfate. Other surfactant adjuvants or Scythe did not influence or were antagonistic to glyphosate phytotoxicity to wheat.

Roundup-Ultra® with various commercial adjuvants, Hettinger 1996. 'Kulm' hard red spring wheat was seeded May 1. Treatments were applied to 5-leaf wheat, 4- to 6-inch field bindweed, 1- to 4-inch wild buckwheat, and 4-leaf redroot pigweed on June 11 with 69 F, clear sky, and no wind. Treatments were applied with a tractor-mounted plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 5 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/09 Wioa
	oz/A	%
Glyphosate-Ultra	0.75	4
Glyphosate-Ultra+Activator90	0.75+.5%	20
Glyphosate-Ultra+ActivatorPlus	0.75+.25%	13
Glyphosate-Ultra+Amway80	0.75+.25%	26
Glyphosate-Ultra+Li700	0.75+.25%	8
Glyphosate-Ultra+Preference	0.75+.5%	23
Glyphosate-Ultra+SprayBoosterS	0.75+.5%	31
Glyphosate-Ultra+AMS	0.75+2%	70
Glyphosate-Ultra+AMSPlus	0.75+.25%	16
Glyphosate-Ultra+Cayuse	0.75+.25%	14
Glyphosate-Ultra+Surfate	0.75+.5%	60
Glyphosate-Ultra+Scythe	0.75+1.5%	13
Ultra+Kenetic	0.75+.25%	15
Ultra+EV Conc.	0.75+.5%	13
Ultra+APM 28	0.75+.5%	68
Ultra+Optima	0.75+.75%	66
Ultra+ Class Act	0.75+2%	89
Untreated	0	0
C.V. %		43
LSD 5%		18
# OF REPS		4

Summary

Glyphosate (Roundup-Ultra®) phytotoxicity to wild oats was enhanced the most by ammonium sulfate (AMS), Surfate, APM 28, Optima, and Class Act, all salt type adjuvants. Surfactants only tended to enhance glyphosate phytotoxicity.

Roundup-Ultra® with various commercial adjuvants, Minot 1996. 'Indianhead' lentils were seeded June 1. Treatments were applied to 6- to 8-inch lentils and 3- to 4-inch broadleaf weeds on July 24 with 57 F, 97% RH, and partly cloudy sky. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/11 Broadleaf weeds
	oz/A	%
Glyphosate-Ultra	1	35
Glyphosate-Ultra+Activator90	1+.5%	30
Glyphosate-Ultra+ActivatorPlus	1+.5%	38
Glyphosate-Ultra+Amway80	1+.5%	38
Glyphosate-Ultra+Li700	1+.5%	29
Glyphosate-Ultra+Preference	1+.5%	33
Glyphosate-Ultra+SprayBoosterS	1+.5%	33
Glyphosate-Ultra+X-77	1+.5%	46
Glyphosate-Ultra+AMSPlus	1+.5%	38
Glyphosate-Ultra+Cayuse	1+.5%	46
Glyphosate-Ultra+Surfate	1+1%	51
Glyphosate-Ultra+Scythe	1+3%	35
Untreated	0	0
C.V. %		19
LSD 5%		9
# OF REPS		4

Summary

Glyphosate phytotoxicty to lentils and broadleaf annual weeds was only enhanced by surfactant adjuvant X-77 and salt adjuvants Cayuse and Surfate.

Roundup-Ultra® with various commercial adjuvants, Williston 1996. 'Indianhead' lentils, 'Otana' oats, and white proso millet were seeded in adjacent strips as bioassay species on May 28. Treatments were applied to 2- to 3-inch lentils, 5- to 6-leaf oats, and 5.5- to 6.5-leaf proso millet on June 27 with 84 F, 50- to 60-% RH, clear sky, and 5- to 8-mph wind. Treatments were applied with a tractor mounted bicycle wheel type plot sprayer delivering 8.5 gpa at 32 psi to a 7 ft wide area the length of 10 by 24 ft plots. The experiment was a randomized complete block design with four replicates.

		7/11		
Treatment	Rate	Oat	Lint	Prmi
	oz/A		%	
Glyphosate-Ultra	1	85	60	88
Glyphosate-Ultra+Activator90	1+.5%	92	76	84
Glyphosate-Ultra+ActivatorPlus	1+.5%	87	87	80
Glyphosate-Ultra+Amway80	1+.5%	95	82	90
Glyphosate-Ultra+Li700	1+.5%	83	74	84
Glyphosate-Ultra+Preference	1+.5%	92	64	92
Glyphosate-Ultra+SprayBoosterS	1+.5%	91	89	92
Glyphosate-Ultra+X-77	1+.5%	90	93	89
Glyphosate-Ultra+AMSPlus	1+.5%	97	84	95
Glyphosate-Ultra+Cayuse	1+.5%	92	78	95
Glyphosate-Ultra+Surfate	1+1%	97	82	99
Glyphosate-Ultra+Scythe	1+3%	72	66	65
Untreated	0	0	0	0
C.V. %		5	8	7
LSD 5%		6	9	8
# OF REPS		4	4	4

Summary

Glyphosate, Roundup-Ultra®, phytotoxicity was enhanced by all adjuvants, except Scythe The greatest enhancement of phtotoxicity was from the salt type adjuvants, AMS Plus, Cayuse, and Surfate.

Species response to Roundup-Ultra® with adjuvants, Fargo 1996. 'Valley' oat, 'Foster' barley, and Siberian foxtail millet were seeded in adjacent strips as bioassay species on May 28. Treatments were applied to 5- to 6-leaf oats and 6- to 7-leaf barley and foxtail millet on July 1 with 83 F, 52% RH, clear sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through a 8001 flat fan nozzle to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/17 Oat	Barley	Fomi
	oz/A	%		
Glyphosate-Ultra	4.5	99	99	99
Glyphosate-Ultra+R-11	4.5+.5%	99	99	99
Glyphosate-Ultra+AMS	4.5+2%	99	99	99
Glyphosate-Ultra+AMS+R-11	4.5+2%+.5%	99	99	99
Glyphosate-Ultra	3	99	99	99
Glyphosate-Ultra+R-11	3+.5%	99	99	99
Glyphosate-Ultra+AMS	3+2%	99	99	99
Glyphosate-Ultra+AMS+R-11	3+2%+.5%	99	99	99
Glyphosate-Ultra	1.5	93	93	98
Glyphosate-Ultra+R-11	1.5+.5%	97	95	99
Glyphosate-Ultra+AMS	1.5+2%	97	97	98
Glyphosate-Ultra+AMS+R-11	1.5+2%+.5%	98	96	99
Glyphosate-Ultra	0.75	80	75	96
Glyphosate-Ultra+R-11	0.75+.5%	93	84	95
Glyphosate-Ultra+AMS	0.75+2%	88	85	97
Glyphosate-Ultra+AMS+R-11	0.75+2%+.5%	93	91	98
C.V. %		4	4	1
LSD 5%		5	6	2
# OF REPS		4	4	4

Summary

Glyphosate (Roundup-Ultra®) was highly phytotoxic in the Fargo experiment. Glyphosate at 0.75 oz/A applied with R-11 and ammonium sulfate gave nearly equal grass species control as glyphosate at 4.5 oz/A. Thus, the use of adjuvants in certain environments would allow for a six fold reduction in glyphosate from the lowest label rate that requires associated tillage.

Species response to Roundup-Ultra® with adjuvants, Carrington 1996. 'Azure' barley and 'Whitestone' oats were seeded in adjacent strips as bioassay species on May 20. Treatments were applied to 2- to 3-leaf oats and 3- to 4-leaf barley on June 11 with 73 F. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

		6/20		
Treatment	Rate	Barley	Oat	Colq
	oz/A		%	
Glyphosate-Ultra	4.5	94	91	79
Glyphosate-Ultra+R-11	4.5+.5%	99	97	95
Glyphosate-Ultra+AMS	4.5+2%	99	99	96
Glyphosate-Ultra+AMS+R-11	4.5+2%+.5%	99	99	97
Glyphosate-Ultra	3	89	81	63
Glyphosate-Ultra+R-11	3+.5%	96	94	81
Glyphosate-Ultra+AMS	3+2%	98	98	84
Glyphosate-Ultra+AMS+R-11	3+2%+.5%	99	96	85
Glyphosate-Ultra	1.5	40	33	16
Glyphosate-Ultra+R-11	1.5+.5%	74	68	35
Glyphosate-Ultra+AMS	1.5+2%	88	78	53
Glyphosate-Ultra+AMS+R-11	1.5+2%+.5%	96	93	73
Glyphosate-Ultra	0.75	3	0	0
Glyphosate-Ultra+R-11	0.75+.5%	5	6	4
Glyphosate-Ultra+AMS	0.75+2%	75	64	39
Glyphosate-Ultra+AMS+R-11	0.75+2%+.5%	85	85	48
C.V. %		7	10	17
LSD 5%		8	10	14
# OF REPS		4	4	4

Summary

Glyphosate, Roundup-Ultra®, phytotoxicity was enhanced progressively more by surfactant R-11, ammonium sulfate, and R-11 plus ammonium sulfate. The minimum rate for effective plant control varied with the species. Glyphosate at 4.5 oz/A plus any of the adjuvants was required for common lambsquarters control, but 1.5 oz/A was required for barley and oat control when with ammonium sulfate plus R-11. These data indicate that with ammonium sulfate and surfactant R-11, the amount of glyphosate for weed control could be reduced for some species and increase control of others.

Species response to Roundup-Ultra® with adjuvants, Dickinson 1996. 'Stoa' hard red spring wheat was seeded May 17. Treatments were applied to 5-leaf wheat on June 14 with 50 F. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 730154 nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

		7/10	
			Total
Treatment	Rate	Wht	Vegetation
	oz/A	%	
Glyphosate-Ultra	4.5	99	87
Glyphosate-Ultra+R-11	4.5+.5%	99	92
Glyphosate-Ultra+AMS	4.5+2%	99	91
Glyphosate-Ultra+AMS+R-11	4.5+2%+.5%	99	89
Glyphosate-Ultra	3	98	87
Glyphosate-Ultra+R-11	3+.5%	98	84
Glyphosate-Ultra+AMS	3+2%	99	87
Glyphosate-Ultra+AMS+R-11	3+2%+.5%	99	85
Glyphosate-Ultra	1.5	89	82
Glyphosate-Ultra+R-11	1.5+.5%	67	65
Glyphosate-Ultra+AMS	1.5+2%	97	86
Glyphosate-Ultra+AMS+R-11	1.5+2%+.5%	97	84
Glyphosate-Ultra	0.75	19	19
Glyphosate-Ultra+R-11	0.75+.5%	14	14
Glyphosate-Ultra+AMS	0.75+2%	69	69
Glyphosate-Ultra+AMS+R-11	0.75+2%+.5%	83	81
C.V. %		7	9
LSD 5%		9	10
# OF REPS		4	4

Summary

Glyphosate (Roundup-Ultra®) phytotoxicity was often reduced from the inclusion of surfactant R-11 in the spray solution. These results are contrary to data from the other experiments and maybe a chance response or misapplication. Glyphosate at 0.75 oz/A, the lowest rate, increased in phytotoxicity when applied with ammonium sulfate or ammonium sulfate plus R-11.

Species response to Roundup-Ultra® with adjuvants, Hettinger 1996. 'Kulm' hard red spring wheat was seeded May 1. Treatments were applied to 5-leaf wheat and 4.5-leaf wild oats on June 11 with 76 F, sunny sky, and no wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 5 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/9 Wht/Wioa
	oz/A	%
Glyphosate-Ultra	1.7	48
Glyphosate-Ultra+R-11	1.7+.5%	76
Glyphosate-Ultra+AMS	1.7+2%	91
Glyphosate-Ultra+AMS+R-11	1.7+2%+.5%	95
Glyphosate-Ultra	1.1	13
Glyphosate-Ultra+R-11	1.1+.5%	51
Glyphosate-Ultra+AMS	1.1+2%	83
Glyphosate-Ultra+AMS+R-11	1.1+2%+.5%	92
Glyphosate-Ultra	0.6	1
Glyphosate-Ultra+R-11	0.6+.5%	38
Glyphosate-Ultra+AMS	0.6+2%	40
Glyphosate-Ultra+AMS+R-11	0.6+2%+.5%	74
Glyphosate-Ultra	0.3	0
Glyphosate-Ultra+R-11	0.3+.5%	1
Glyphosate-Ultra+AMS	0.3+2%	9
Glyphosate-Ultra+AMS+R-11	0.3+2%+.5%	36
C.V. %		30
LSD 5%		20
# OF REPS		4

Summary

Glyphosate (Roundup-Ultra®) at 1.1 and 1.7 oz/A gave more than 90% wild oat control when with applied ammonium sulfate and nonionic surfactant R-11. All adjuvants enhanced glyphosate phytotoxicity to wild oat, except when at 0.3 oz/A when control was poor. These results indicate that adjuvants enhance glyphosate phytotoxicity when at lower than label rates. The highest glyphosate rate, 1.7 oz/A, was 2.7 times less than the lowest label rate.

Species response to Roundup-Ultra® with adjuvants, Minot 1996. No crop was seeded. Treatments were applied to 6- to 8-inch pigeongrass on July 23 with 60 F, 89% RH, and partly cloudy sky. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/10 Grass weeds	7/10 Broadleaf weeds
	oz/A		
Glyphosate-Ultra	4.5	84	79
Glyphosate-Ultra+R-11	4.5+.5%	95	80
Glyphosate-Ultra+AMS	4.5+2%	93	85
Glyphosate-Ultra+AMS+R-11	4.5+2%+.5%	93	81
Glyphosate-Ultra	3	93	83
Glyphosate-Ultra+R-11	3+.5%	91	81
Glyphosate-Ultra+AMS	3+2%	90	83
Glyphosate-Ultra+AMS+R-11	3+2%+.5%	93	81
Glyphosate-Ultra	1.5	73	64
Glyphosate-Ultra+R-11	1.5+.5%	69	65
Glyphosate-Ultra+AMS	1.5+2%	81	75
Glyphosate-Ultra+AMS+R-11	1.5+2%+.5%	74	65
Glyphosate-Ultra	0.75	44	33
Glyphosate-Ultra+R-11	0.75+.5%	44	36
Glyphosate-Ultra+AMS	0.75+2%	45	33
Glyphosate-Ultra+AMS+R-11	0.75+2%+.5%	50	38
C.V. %		9	13
LSD 5%		10	12
# OF REPS		4	4

Summary

Glyphosate phytotoxicity increased with rate, but adjuvants did not greatly influence efficacy.

Species response to Roundup-Ultra® with adjuvants, Williston 1996. 'Indianhead' lentils, 'Otana' oats, and white proso millet were seeded in adjacent strips as bioassay species on May 28. Treatments were applied to 2- to 3-inch lentils, 5- to 6-leaf oats, and 5.5- to 6.5-leaf proso millet on June 27 with 89 F, 50-60% RH, clear sky, and 5- to 8-mph wind. Treatments were applied with a tractor mounted bicycle wheel type plot sprayer delivering 8.5 gpa at 32 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/11 Oat	Lint	Prmi
	oz/A	%		
Glyphosate-Ultra	4.5	99	94	99
Glyphosate-Ultra+R-11	4.5+.5%	99	96	99
Glyphosate-Ultra+AMS	4.5+2%	97	96	99
Glyphosate-Ultra+AMS+R-11	4.5+2%+.5%	99	95	99
Glyphosate-Ultra	3	99	88	99
Glyphosate-Ultra+R-11	3+.5%	99	90	98
Glyphosate-Ultra+AMS	3+2%	99	89	99
Glyphosate-Ultra+AMS+R-11	3+2%+.5%	99	95	99
Glyphosate-Ultra	1.5	87	80	96
Glyphosate-Ultra+R-11	1.5+.5%	97	81	97
Glyphosate-Ultra+AMS	1.5+2%	94	79	98
Glyphosate-Ultra+AMS+R-11	1.5+2%+.5%	95	83	97
Glyphosate-Ultra	0.75	60	55	63
Glyphosate-Ultra+R-11	0.75+.5%	78	71	83
Glyphosate-Ultra+AMS	0.75+2%	77	72	86
Glyphosate-Ultra+AMS+R-11	0.75+2%+.5	92	73	91
C.V. %		4	4	3
LSD 5%		5	5	5
# OF REPS		4	4	4

Summary

Glyphosate (Roundup-Ultra®) was highly phytotoxic at Williston and adjuvant enhancement was most evident at the lowest glyphosate rate, 0.75 oz/A. Ammonium sulfate plus R-11 was the most effective adjuvant when considering all glyphosate rates and plant species.

Sethoxydim (Ultima 160) with adjuvants, Fargo 1996. 'Valley' oat, 'Foster' barley, and Siberian foxtail millet were seeded in adjacent strips as bioassay species on May 28. Treatments were applied to 5- to 6-leaf oat and barley and 4- to 6-leaf foxtail millet on July 2 with 78 F, 42% RH, partly cloudy sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

		7/18			8/7		
Treatment	Rate	Oat	Barley	Fomi	Oat	Barley	Fomi
	oz/A			%			
Sethoxydim-U+Activator90	1.5+.25%	71	55	84	39	19	71
Sethoxydim-U+PO	1.5+.25G	89	83	91	80	49	91
Sethoxydim-U+Scoil	1.5+.25G	93	86	97	96	78	99
Sethoxydim-U+DASH-HC	1.5+.12G	91	86	96	98	79	99
Sethoxydim-U+Activator90	1+.25%	63	53	81	21	15	65
Sethoxydim-U+PO	1+.25G	76	73	88	36	20	85
Sethoxydim-U+Scoil	1+.25G	90	86	95	84	49	91
Sethoxydim-U+DASH-HC	1+.12G	90	84	92	79	40	92
Sethoxydim-U+Activator90	0.5+.25%	14	10	49	3	3	24
Sethoxydim-U+PO	0.5+.25G	34	21	73	10	8	48
Sethoxydim-U+Scoil	0.5+.25G	81	63	87	43	24	73
Sethoxydim-U+DASH-HC	0.5+.12G	70	60	78	30	15	68
C.V. %		7	13	6	14	19	7
LSD 5%		7	12	8	10	9	7
# OF REPS		4	4	4	4	4	4

Summary

Adjuvant efficacy with sethoxydim (Ultima 160) was: Scoil greater than or equal to DASH-HC greater than surfactant Activator 90. Sethoxydim at one third the highest rate (0.5 oz/A) applied with Scoil or DASH-HC was equally as effective at the highest rate (1.5 oz/A) applied with Activator 90. Scoil and DASH-HC were similar in enhancement of sethoxydim except Scoil tended to or enhanced phytotoxicity more than DASH-HC when with sethoxydim at the lowest rate (0.5 oz/A). However, Scoil was at 0.25 gallons/A while DASH-HC was at 0.12 gallons/A.

Clethodim (Prism) with adjuvants, Fargo 1996. 'Valley' oats, 'Foster' barley, and Siberian foxtail millet were seeded in adjacent strips as bioassay species on May 28. Treatments were applied to 5- to 6-leaf oat and barley and 4- to 6-leaf foxtail millet on July 2 with 78 F, 42% RH, partly cloudy sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

		7/18			8/7		
Treatment	Rate	Oat	Barley	Fomi	Oat	Barley	Fomi
	oz/A	%					
Clethodim+Activator90	1+.25%	90	86	81	97	90	84
Clethodim+PO	1+.25G	94	89	88	99	96	95
Clethodim+Scoil	1+.25G	98	93	94	99	99	99
Clethodim+DASH-HC	1+.12G	97	93	95	99	98	98
Clethodim+Activator90	0.5+.25%	84	77	73	79	60	49
Clethodim+PO	0.5+.25G	89	85	85	97	90	76
Clethodim+Scoil	0.5+.25G	95	90	92	99	96	94
Clethodim+DASH-HC	0.5+.12G	95	89	88	99	96	91
Clethodim+Activator90	0.25+.25%	71	63	61	46	21	34
Clethodim+PO	0.25+.25G	82	78	83	75	48	54
Clethodim+Scoil	0.25+.25G	90	86	84	99	90	85
Clethodim+DASH-HC	0.25+.12G	91	87	88	99	96	81
C.V. %		3	4	6	4	6	6
LSD 5%		4	5	7	5	7	7
# OF REPS		4	4	4	4	4	4

Summary

Scoil or DASH-HC enhanced clethodim phytotoxicity so that control of grass species was similar from clethodim at 1 oz/A applied with nonionic surfactant (Activator 90) or petroleum oil (Mor-act) as clethodim at 0.25 oz/A with Scoil or DASH-HC. These data indicate that the use of the appropriate adjuvant would allow for use of one-fourth the clethodim rate for equal grass species control.

<u>Quizalofop-P (Assure II) with adjuvants, Fargo 1996.</u> 'Valley' oats, 'Foster' barley, and Siberian foxtail millet were seeded in adjacent strips as bioassay species on May 28. Treatments were applied to 5- to 6-leaf oat and barley and 4- to 6-leaf foxtail millet on July 2 with 78 F, 42% RH, partly cloudy sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/18 Oat	7/18 Barley	7/18 Fomi	8/7 Oat	8/7 Barley	8/7 Fomi
	oz/A	%					
Quizalofop-P+Activator90	0.75+.25%	89	88	94	98	99	91
Quizalofop-P+PO	0.75+.25G	93	88	97	99	99	96
Quizalofop-P+Scoil	0.75+.25G	93	90	96	98	98	95
Quizalofop-P+DASH-HC	0.75+.12G	97	92	97	99	99	96
Quizalofop-P+Activator90	0.37+.25%	78	77	79	81	89	46
Quizalofop-P+PO	0.37+.25G	88	85	92	98	97	90
Quizalofop-P+Scoil	0.37+.25G	88	87	91	93	93	73
Quizalofop-P+DASH-HC	0.37+.12G	92	87	90	99	99	91
Quizalofop-P+Activator90	0.18+.25%	69	72	58	70	81	29
Quizalofop-P+PO	0.18+.25G	76	78	78	73	85	38
Quizalofop-P+Scoil	0.18+.25G	76	78	72	69	78	30
Quizalofop-P+DASH-HC	0.18+.12G	87	84	84	91	91	53
C.V. %		4	5	5	5	4	10
LSD 5%		5	6	6	6	6	9
# OF REPS		4	4	4	4	4	4

Summary

DASH-HC was the most effective adjuvant for enhancement of quizalofop-P, followed by petroleum oil and Scoil that were similar, and Activator 90 was least effective. However, differences in adjuvant enhancement of quizalofop-P were less than those observed with sethoxydim or clethodim.

Touchdown with adjuvants in Valley City water. 'Valley' oat, 'Foster' barley, and Siberian foxtail millet were seeded in adjacent strips as bioassay species on May 28. Treatments were applied to 4- to 6-leaf foxtail millet and 5- to 6-leaf oat and barley on July 2 with 78 F, 42% RH, partly cloudy sky, and 5- to 10-mph wind. A second experiment was conducted at a higher sulfosate rate. Treatments were applied to 5- to 7-leaf foxtail millet and 6- to 7-leaf oat and barley on July 9 with 63 F, 35% RH, clear sky, and 6-mph wind. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the lenth of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates.

		7/17			8/01		
Treatment	Rate	Oat	Barley	Fomi+	Oat	Barley	Fomi+
	oz/A	%					
Sulfosate	0.7	39	6	49	48	9	60
Sulfosate+Activator90	0.7+.5%	66	23	75	79	36	61
Sulfosate+Preference	0.7+.5%	73	30	80	84	68	74
Sulfosate+Li700	0.7+.5%	64	15	61	79	30	59
Sulfosate+R-11	0.7+.5%	82	58	90	90	81	87
Sulfosate+ActivatorPlus	0.7+.5%	65	19	78	80	31	69
Sulfosate+SprayBoosterS	0.7+.5%	76	35	81	86	74	72
Sulfosate+SilwetL77	0.7+.25%	71	43	84	85	73	79
Sulfosate+Amway80	0.7+.5%	81	40	88	87	78	84
Sulfosate+AR-375	0.7+1%	89	83	93	93	94	93
Sulfosate+Class Act	0.7+2%	94	90	97	97	97	97
Sulfosate+Surfate	0.7+1.5%	90	84	93	93	94	94
Sulfosate+Cayuse+R-11	0.7+.5%+.5%	91	76	93	92	90	93
Sulfosate+DispatchAMS	0.7+2.5%	73	33	79	85	72	75
Sulfosate+Dispatch2N	0.7+.5G	92	86	96	94	95	97
Sulfosate+Flame	0.7+.5%	67	20	76	76	41	63
Sulfosate+Flame+Choice	0.7+.5%+.5%	87	71	94	88	86	89
C.V. %		7	14	7	4	8	8
LSD 5%		8	10	8	5	7	9

Experiment 2

		7/23			8/07		
Treatment	Rate	Oat	Fomi	Prmi	Oat	Fomi	Prmi
	oz/A	%					
Sulfosate+Activator90	1+.5%	55	70	60	68	60	46
Sulfosate+Surfate	1+1.5%	91	94	88	96	84	78
Sulfosate+Cayuse+R-11	1+.5%+.5%	86	94	89	92	84	79
Sulfosate+DispatchAMS	1+2.5%	48	66	53	69	64	49
Sulfosate+Dispatch2N	1+.5G	91	97	93	98	93	89
Sulfosate+Flame	1+.5%	48	60	58	69	64	54
Sulfosate+Flame+Choice	1+.5%+.5%	76	88	83	84	75	64
Sulfosate	1	21	36	35	31	38	34
C.V. %		12	8	11	9	10	10
LSD 5%		11	9	12	10	10	9

Summary

Adjuvants varied greatly in enhancement of sulfosate phytotoxicity. The most effective adjuvants were: Class Act, Surfate, Cayuse+R-11, and Dispatch 2N.

Comparison of weed control from Roundup Ultra and Touchdown, NW-22, 1996. (Zollinger) An experiment was conducted to evaluate weed control from glyphosate as Roundup Ultra and Touchdown herbicides applied at the same active ingedient rates not acid equivelent rates. Treatments were applied on May 18 with 82 F air, 86 F soil surface, 60% RH, 20% cloudy sky and 0 to 3 mph wind to 5 to 6 lf, 4 inch green and yellow foxtail, 3 to 4 lf, 8 to 10 inch wild oat, 8 to 14 inch (ave 8 to 10) field pennycress, 5 lf, 3 to 4 inch redroot pigweed, 1 to 12 inch (8 to 10 ave) common lambsquarters, 6 to 7 lf, 4 to 12 inch common cocklebur, 3 to 8 inch (ave 3) kochia, 8 to 10 lf, 6 to 7 inch wild buckwheat, 3 to 4 inch common ragweed, 8 to 14 in prickly lettuce, 8 lf, 2 to 3 inch prostrate spurge, 6 to 10 perennial sowthistle, 8 to 14 inch Canada thistle, and flowering dandelion. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

		July 12							
Treatment[a]	Rate	Rrpw	Colq	Kocz	Wibw	Prle	Pest	Cath	Dali
	lb ai/A	% control							
Roundup Ultra RT+Class Act II	1.5 oz + 4.75% v/v	96	86	98	28	50	38	73	33
Touchdown + Class Act II	1.5 oz + 4.75% v/v	93	90	99	39	50	40	69	45
Roundup Ultra RT + Sensation	1.5 oz + 1.75 lb/A	91	75	96	38	55	33	50	40
Touchdown + Sensation	1.5 oz + 1.75 lb/A	91	35	93	43	38	40	50	23
Roundup Ultra RT + Surfate	1.5 oz + 1.5% v/v	94	89	95	35	50	58	50	30
Touchdown + Surfate	1.5 oz + 1.5% v/v	94	73	98	46	63	43	63	40
Roundup Ultra RT + Array	1.5 oz + 14lb/100gal	88	84	97	39	53	54	48	43
Touchdown + Array	1.5 oz + 14lb/100gal	94	70	93	40	35	40	58	35
Roundup Ultra RT	0.19	94	78	97	30	55	70	53	43
Touchdown + Activator 90	0.19 + 0.5% v/v	92	64	84	45	30	39	48	25
Touchdown + Activator 90	0.25 + 0.5% v/v	94	81	88	51	50	71	61	43
Roundup Ultra RT	0.38	93	93	99	54	81	71	86	58
Touchdown + Activator 90	0.38 + 0.5% v/v	93	87	90	56	81	71	79	51
Roundup Ultra RT + AMS	0.38 + 17 lb/100	93	96	99	74	91	80	79	53
Touchdown + Activator 90	0.5 + 0.5% v/v	94	88	92	56	88	55	80	45
Touchdown + Activator 90+AMS	0.5+0.5%+17lb/100gal	93	89	97	71	85	71	81	61
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		5	16	8	15	12	9	16	16

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information.

Array caused streaking with Roundup Ultra (a 5 to 6 inch band) and Touchdown (a 2"-3" band). Annual grasses and volunteer cereals are good bioassay species that show differences with reduced glyphosate rates and response to adjuvants. However, all treatments gave complete control of foxtail, wild oat, field pennycress, common ragweed, prostrate spurge, and common cocklebur. All treatments gave 0-20% biennial wormwood control. Relative humidity increased in the few days following application.

Roundup at 1.5 oz ai/A gave equal or greater weed control than Touchdown at 1/5 oz ai/A. Indicator species were common lambsquarters, prickly lettuce and perennial sowthistle. Roundup at 0.19 lb ai/A generally gave greater weed control than Touchdown at 0.19 lb ai/A. Roundup at 0.19 lb ai/A provided similar weed control as Touchdown applied at 0.25 lb ai/A. Weed control was similar with both herbicides at rates above 0.38 lb ai/A.

Treatment[a]	Rate	July 30							
		Rrpw	Colq	Kocz	Wibw	Prle	Pest	Cath	Dali
	lb ai/A	% control							
Roundup Ultra RT + Class Act II	1.5 oz + 4.75% v/v	54	53	96	57	67	52	82	75
Touchdown + Class Act II	1.5 oz + 4.75% v/v	56	60	90	63	61	45	80	70
Roundup Ultra RT + Sensation	1.5 oz + 1.75 lb/A	60	40	90	21	48	50	72	45
Touchdown + Sensation	1.5 oz + 1.75 lb/A	67	35	94	15	37	63	68	40
Roundup Ultra RT + Surfate	1.5 oz + 1.5% v/v	65	58	99	52	84	60	70	56
Touchdown + Surfate	1.5 oz + 1.5% v/v	61	54	93	46	76	60	68	64
Roundup Ultra RT + Array	1.5 oz + 14lb/100gal	67	25	33	51	51	41	55	51
Touchdown + Array	1.5 oz + 14lb/100gal	63	24	33	44	44	45	58	43
Roundup Ultra RT	0.19	76	47	23	27	80	75	53	90
Touchdown + Activator 90	0.19 + 0.5% v/v	53	15	24	41	57	55	62	70
Touchdown + Activator 90	0.25 + 0.5% v/v	65	15	50	60	70	72	89	77
Roundup Ultra RT	0.38	87	77	95	95	77	77	60	91
Touchdown + Activator 90	0.38 + 0.5% v/v	80	63	43	80	93	95	86	93
Roundup Ultra RT + AMS	0.38 + 17 lb/100	93	93	99	95	91	80	80	96
Touchdown + Activator 90	0.5 + 0.5% v/v	80	68	78	72	85	94	90	95
Touchdown + Activator 90+AMS	0.5+0.5%+17lb/100gal	81	78	75	81	95	96	89	97
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		9	10	12	13	17	15	10	13

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information.0

Glyphosate in Roundup is formulated as a 4 lb active ingredient (ai)/gal and includes the dimethyl amine salt or as a 3 lb acid equivalent (ae)/gal and does not account for the dimethyl amine salt. For example, glyphosate in Roundup at 0.19 lb ai equals 0.14 lb ae and 0.38 lb ai equals 0.28 lb ae. Glyphosate in Touchdown is formulated as a 6 lb active ingredient/gallon and includes the trimethyl sulfonium salt. The trimethyl sulfonium salt in Touchdown is a heavier salt than the dimethyl amine salt that is in Roundup. Glyphosate in the trimethyl sulfonium salt form that is in Touchdown is a approximately 8% heavier the glyphosate in the dimethyl amine form that is in Roundup. Therefore, if glyphosate in Roundup and Touchdown were used at the same active ingredient rate, there would be approximately 8% less acid equivalent glyphosate in Touchdown than in Roundup. The objective of this study was to determine weed control from glyphosate as Roundup Ultra and Touchdown applied at equivalent active ingredient rates.

At the July 30, 1996 evaluation the weed population had greatly increased. Very little rainfall has occurred between application and the last evaluation.

Roundup at 1.5 oz ai/A gave equal or greater weed control than Touchdown at 1/5 oz ai/A. Roundup at 0.19 b ai/A generally gave greater weed control than Touchdown at 0.19 lb ai/A. Weed control was similar with both herbicides at rates above 0.38 lb ai/A. Addition of AMS generally increases weed control as compared to the same treatments without the addition of AMS.

Spray volume with imazethapyr, Fargo 1996. 'Valley' oats, Siberian foxtail millet, and white proso millet were seeded in adjacent drill strips May 28. Treatments were applied perpendicular to the drill strips so that each plot contained all three species. Treatments were applied at 28 psi with a 4-wheeled all -terrain sprayer equipped with a side mounted boom with four nozzles spaced at 20 inches. This arrangement eliminated wheel tracks within the plot. Treatments were applied to oats 12- to 16-inches tall, 8- to 9-leaf, and jointing; foxtail millet 10- to 14- inches tall, 8- to 9-leaf with 2- to 4-tillers; and proso millet 12- to 16- inches tall, 8- to 10-leaf with 2- to 3-tillers on July 10 with 74 F, 15 mph wind, 25% RH, mostly sunny sky, and dry soil surface. Plot size was 11.5 by 23 feet and the experiment was a randomized complete block design with four replicates. Visual estimates of percentage control were taken August 1 and 8.

Treatment	Rate	Tip	Gpa	Mph	# of pass	8/01/96 Oat	Fxmi	Prmi	8/08/96 Oat	Fxmi	Prmi
	oz/A							%			
Imazethapyr+Act90	0.5+0.25%	8001	5	5	1	15	36	15	10	21	6
Imazethapyr+Act90	0.5+1%	8001	5	5	1	39	44	39	19	33	10
Imazethapyr+SunitII	0.5+0.2G	8001	5	5	1	75	73	74	50	41	31
Imazethapyr+Act90	0.5+0.063%	8001	20	5	4	13	33	13	11	30	3
Imazethapyr+SunitII	0.5+0.2G	8001	20	5	4	51	66	55	21	39	11
Imazethapyr+Act90[a]	0.5+0.25%	8002	5	10	1	4	6	3	0	4	0
Imazethapyr+SunitII	0.5+0.2G	8002	5	10	1	71	69	65	41	41	17
Imazethapyr+Act90	0.5+0.25%	8002	10	5	1	23	41	18	14	26	4
Imazethapyr+SunitII	0.5+0.2G	8002	10	5	1	65	70	59	40	38	15
Imazethapyr+Act90	0.5+0.25%	8004	10	10	1	14	28	9	6	15	3
Imazethapyr+SunitII	0.5+0.2G	8004	10	10	1	79	74	60	60	43	15
Imazethapyr+Act90	0.5+0.25%	8004	20	5	1	16	40	16	11	31	5
Imazethapyr+Act90	0.5+0.063%	8004	20	5	1	15	38	21	13	29	6
Imazethapyr+SunitII	0.5+0.2G	8004	20	5	1	38	50	36	18	38	13
Imazethapyr+Act90	0.5+0.25%	8006	30	5	1	14	48	18	11	34	5
Imazethapyr+SunitII	0.5+0.2G	8006	30	5	1	23	31	18	16	33	10
C.V. %						22	21	24	30	26	57
LSD 5%						11	14	11	9	12	8
# OF REPS						4	4	4	4	4	4

[a]Treatment was misapplied.

Summary

Plant species all responded similarly to spray adjuvants and spray volume obtained using various travel speed and nozzel size, at both evaluations. The discussion will be based upon the response of oat on 8/1/96 where differences among treatments were greatest. Imazethapyr phytotoxicity was nearly always greater when applied with Sun-it II at 0.25 gallons/A than with nonionic surfactnt, Activator 90 at 0.25%. Increasing Activator 90 to 1% increased effectiveness with imazethapyr, but effectiveness did not equal Sun-it II at 0.25 Gal/A, applied in 5 gpa using 8001 nozzles. Low spray volume was more important to efficacy than small droplets. These results indicate that high concentration of the herbicide and Sunit II adjuvants in the solution is positive to efficacy, though 10 gpa. Spray parameters had small effects on imazethapyr efficacy when applied with nonionic, Activator 90. However, imazethapyr was not effective when applied with nonionic surfactant so any differences from spray parameters were not detectable.

Spray volume with sethoxydim, Fargo 1996. 'Valley' oats, Siberian foxtail millet and white proso millet were seeded in adjacent drill strips May 28. Treatments were applied perpendicular to the drill strips so that each plot contained all three species. Treatments were applied at 28 psi with a 4-wheeled all -terrain sprayer equipped with side mounted boom with four nozzles spaced at 20 inches. This arrangement eliminated wheel tracks within the plot. Treatments were applied to oats 16-inches tall and in boot stage; foxtail millet 14-inches tall; and 16-inch tall proso millet on July 12 with 70 F, 7-mph wind, 63% RH, mostly cloudy sky, and damp soil surface. Plot size was 11.5 by 23 feet and the experiment was a randomized complete block design with four replicates.

Treatment	Rate	Tip	Gpa	Mph	Psi	# of pass	7/25/96 Oat	7/25/96 Fomi	7/25/96 Prmi	8/7/96 Oat	8/7/96 Fomi	8/7/96 Prmi
	lb/A						%					
Sethoxydim+POC	0.0625+0.25G	8001	5	5	28	1	30	39	51	31	41	65
Sethoxydim+POC	0.0625+0.25G	8001	5	6	40	1	36	44	46	33	48	65
Sethoxydim+POC	0.125+0.25G	8001	5	5	28	1	56	52	72	68	64	74
Sethoxydim+POC	0.0625+0.25G	8001	20	5	28	4	29	36	41	31	45	56
Sethoxydim+POC	0.0625+1.0G	8001	20	5	28	4	34	44	56	38	49	65
Sethoxydim+POC	0.125+0.25G	8001	20	5	28	4	41	56	70	58	64	73
Sethoxydim+POC	0.0625+0.25G	8002	5	10	28	1	34	37	46	35	44	59
Sethoxydim+POC	0.125+0.25G	8002	5	10	28	1	38	50	64	53	51	69
Sethoxydim+POC	0.0625+0.25G	8002	10	5	28	1	28	41	46	36	50	59
Sethoxydim+POC	0.125+0.25G	8002	10	5	28	1	36	51	61	54	58	66
Sethoxydim+POC	0.0625+0.25G	8004	10	10	28	1	25	35	40	25	39	51
Sethoxydim+POC	0.125+0.25G	8004	10	10	28	1	36	46	56	56	59	70
Sethoxydim+POC	0.0625+0.25G	8004	20	5	28	1	16	26	30	21	40	48
Sethoxydim+POC	0.125+0.25G	8004	20	5	28	1	35	48	61	55	61	69
Sethoxydim+POC	0.0625+0.25G	8006	30	5	28	1	14	24	31	21	31	35
Sethoxydim+POC	0.125+0.25G	8006	30	5	28	1	24	39	51	45	56	69
C.V. %							22	20	16	17	12	10
LSD 5%							10	12	12	10	8	9
# OF REPS							4	4	4	4	4	4

Summary

Sethoxydim at 0.06 lb/A (1 oz/A) generally increased phytotoxicity as spray nozzle orifice opening decreased, but spray volume did not influence efficacy (Proso millet). Sethoxydim was equally effective when applied using 8001 nozzles delivering five gallons or twenty gallons per acre. These data indicate that spray droplet retention by the grasses was more important than the spray droplet deposit. Retention of small droplets is known to be greater than large droplets. Sethoxydim at 0.12 lb/A was similarly effective with most applications.

Spray volume with Roundup-Ultra®, Fargo 1996. 'Valley' oat, Siberian foxtail millet, and white proso millet were seeded in adjacent drill strips on May 28. Treatments were applied perpendicular to these drill strips so that each plot contained all 3 species. Treatments were applied at 28 psi with a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced at 20 inches. This arrangement eliminated wheel tracks within the plot. Treatments were applied to oats and proso millet 16- to 20 inches tall with oats starting to head and foxtail millet 14 to 16 inches- tall on July 15 with 84 F, 7-mph wind, 43% RH, and sunny sky. Plot size was 11.5 by 23 feet and the experiment was a randomized complete block with four replicates. Visual estimates of percentage control were taken July 25 and August 7.

					# of	7/25/96			8/7/96		
Treatment	Rate	Tip	Gpa	Mph	pass	Oat	Fomi	Prmi	Oat	Fomi	Prmi
	oz/A								%		
Glyphosate+12-14-60	1+0.25%	8001	5	5	1	25	89	44	85	70	68
Glyphosate+12-14-60	1+1%	8001	5	5	1	36	88	66	88	74	76
Glyphosate+12-14-80	1+0.25%	8001	5	5	1	34	90	65	91	79	70
Glyphosate+12-14-60	1+0.25%	8001	20	5	4	6	54	14	23	26	21
Glyphosate+12-14-80	1+0.25%	8001	20	5	4	14	51	13	24	30	23
Glyphosate+12-14-60	1+0.25%	8002	5	10	1	26	85	65	89	66	65
Glyphosate+12-14-80	1+0.25%	8002	5	10	1	30	94	72	90	75	75
Glyphosate+12-14-60	1+0.25%	8002	10	5	1	41	88	59	89	68	63
Glyphosate+12-14-80	1+0.25%	8002	10	5	1	35	88	65	89	70	75
Glyphosate+12-14-60	1+0.25%	8004	10	10	1	21	87	35	86	63	66
Glyphosate+12-14-80	1+0.25%	8004	10	10	1	28	87	44	85	66	70
Glyphosate+12-14-60	1+0.25%	8004	20	5	1	23	87	40	80	66	60
Glyphosate+12-14-80	1+0.25%	8004	20	5	1	34	92	43	80	68	61
Glyphosate+12-14-60	1+0.25%	8006	30	5	1	39	94	60	89	79	71
Glyphosate+12-14-80	1+0.25%	8006	30	5	1	24	82	40	76	69	65
C.V. %						33	8	22	8	12	9
LSD 5%						13	10	15	9	11	8
# OF REPS						4	4	4	4	4	4

Summary

Glyphosate phytotoxicity did not differ greatley with spray volume or droplet size, except for reduced phytotoxicity when applied in 20 gpa using 8001 nozzles. Glyphosate was more effective when with the higher HLB linear alcohol ethoxylates (LAE), 12-14-80 than lower HLB 12-14-60, except when applied with 8006 nozzles. LAE 12-14-60 has been shown to increase spray droplet retention, that would account for its effectiveness for large spray droplets from 8006 nozzles. The greater effectiveness of LAE 12-14-80 is probably its reduced spreading of droplet deposits also shown important to glyphosate absorption.

Spray volume with MON 37536, Fargo 1996. 'Pioneer 2375' wheat was planted May 16. Treatments were applied at 28 psi with a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced at 20 inches. This arrangement eliminated wheel tracks within the plot. Treatments were applied to 5-inch tall, 3.5-leaf wheat and 4-inch tall 3-leaf wild oat on June 13 with 73 F, calm wind, 24% RH, mostly sunny sky, and dry soil surface. Plot size was 11.5 by 30 feet and the experiment was a randomized complete block design with four replicates. Visual estimates of wheat injury were taken on July 23 and wild oat control on July 1 and 23.

Treatment	Rate	Tip	Gpa	Mph	# of pass	7/01/96 Wioa	7/23/96 Wht	7/23/96 Wioa
	oz/A					%	%	%
MON 37536+ND-72	0.25+1%	8001	5	5	1	83	4	83
MON 37536+ND-72	0.25+1%	8001	20	5	4	71	1	71
MON 37536+Act90	0.25+0.25%	8002	5	10	1	73	0	65
MON 37536+ND-4	0.25+1%	8002	5	10	1	87	3	85
MON 37536+ND-71	0.25+1%	8002	5	10	1	84	4	86
MON 37536+ND-72	0.25+1%	8002	5	10	1	75	0	73
MON 37536+ND-98	0.25+1%	8002	5	10	1	84	1	82
MON 37536+ND-72	0.25+1%	8002	10	5	1	85	4	76
MON 37536+ND-72	0.25+1%	8004	10	10	1	83	3	73
MON 37536+ND-72	0.25+1%	8004	20	5	1	84	1	80
C.V. %						10	117	10
LSD 5%						NS	NS	11
# OF REPS						4	4	4

Summary

MON 37536 control of wild oats did not differ greatly with application methods or adjuvant. However, at the 7/23/96 evaluation adjuvants ND-4 and ND-71 generally were more effective than Activator 90 in enhancement of MON 37536. Further, MON 37536 phytotoxicity to wild oats tended to be less when applied with 8004 nozzles delivering 10 gpa and 8001 nozzles delivering 20 gpa.

Spray volume with bromoxynil, Fargo 1996. 'Pioneer 2375' wheat was seeded May 3. On May 25 the entire experiment was sprayed with 12 oz ai/A diclofop to control wild oat. Treatments were applied at 28 psi using a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced at 20 inches. This arrangement eliminated wheel tracks within the plot. Treatments were applied to 5- to 6-inch tall, 4-leaf wheat with 1 tiller and 1- to 2-inch tall, 1- to 3-leaf wild buckwheat on June 7 with 74 F, 7-mph wind, 27% RH, sunny sky, and dry soil surface. Plot size was 11.5 by 30 feet and the experiment was a randomized complete block design with four replicates. Visual estimates of wild buckwheat control were taken June 12 and August 2.

Treatment	Rate	Tip	Gpa	Mph	# of pass	6/12 Wht	6/12 Wibu	8/2 Wibu
	lb/A						%	
Bromoxynil	0.188	8001	5	5	1	0	89	95
Bromoxynil	0.188	8001	20	5	4	0	77	75
Bromoxynil	0.188	8002	5	10	1	0	83	91
Bromoxynil	0.188	8002	10	5	1	0	86	87
Bromoxynil	0.188	8004	10	10	1	0	89	93
Bromoxynil	0.188	8004	20	5	1	0	98	98
Bromoxynil	0.188	8006	30	5	1	0	96	98
C.V. %						0	7	6
LSD 5%						NS	9	8
# OF REPS						4	4	4

Summary

Large spray droplets appeared important to bromoxynil phytotoxicity to wild buckwheat. However, small droplets from 8001 nozzles applied at only 5 gpa was equally as effective as from 8004 or 8006 nozzles. Wild buckwheat has large leaves that probably retain large droplets. The reduced effectiveness from 8001 nozzles delivering 20 gpa indicates that bromoxynil concentration in the spray droplet deposit may be important to efficacy. The droplet from 8001 nozzles are small and when in 20 gpa would leave a small bromoxynil deposit over a large area. The number of droplets from 8006 nozzles even at high spray volume would be less than from the 8001 nozzles and leave larger spray deposits for absorption.

Spray volume with imazamethabenz, Fargo 1996. 'Valley' oats, Siberian foxtail millet, and white proso millet were seeded in adjacent drill strips August 12. Treatments were applied perpendicular to the drill strips so that each plot contained all three species. Treatments were applied at 28 psi with a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced at 20 inches. This arrangement eliminated wheel tracks within the plot. Treatments were applied to oats 6-inches tall, 4-leaf with 2 tillers; and foxtail and proso millet 6-inches tall, 5.5-leaf with foxtail millet having 2 tillers on September 4 with 62 F, 3- to 5-mph wind, 73% RH, sunny sky, and dry soil surface. Plot size was 11.5 by 23 feet and the experiment was a randomized complete block design with four replicates. Visual estimates of percentage control of oat and foxtail millet were taken September 17 and 25.

Treatment	Rate	Tip	Gpa	Mph	Pass #	9/17 Oat	9/17 Fomi	9/25 Oat
	oz/A							
Imazamethabenz+SunitII	5+0.188G	8001	5	5	1	69	25	84
Imazamethabenz+SunitII	5+0.188G	8001	20	5	4	50	3	70
Imazamethabenz+SunitII	5+0.188G	8002	5	10	1	66	16	81
Imazamethabenz+SunitII	5+0.188G	8002	10	5	1	55	8	75
Imazamethabenz+SunitII	5+0.188G	8004	10	10	1	54	11	75
Imazamethabenz+SunitII	5+0.188G	8004	20	5	1	59	11	72
Imazamethabenz+SunitII	5+0.188G	8006	30	5	1	46	4	73
C.V. %						11	69	6
LSD 5%						9	11	7
# OF REPS						4	4	4

Summary

Imazamethabenz gave the greatest oats control when applied with 8001 nozzles delivering 5 gpa. Increasing the volume from 8001 nozzles to 20 gpa reduced imazamethabenz control of oats. Further imazamethabenz also tended to be less effective with 10 gap than 5 gpa from 8002 nozzles. These results are contrary to the common belief that high spray volumes are important to imazamethabenz efficacy and previous research may be a response unique to the use of Sun-it II or the lack of a wheat canopy to intercept droplets.

Imazethapyr on grasses, Fargo 1996. 'Valley' oats, Siberian foxtail millet, and white proso millet were seeded in adjacent drill strips on August 12. Treatments were applied perpendicular to the drill strips so that each plot contained all three species. Treatments were applied at 28 psi with a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced at 20 inches. This arrangement eliminated wheel tracks within the plot. Treatments were applied to oats 6- to 8-inches tall, 5- to 8-leaf, and 1- to 2-tillers; foxtail millet 6- to 9-inches tall, 7- to 9-leaf, and 2- to 3-tillers; and proso millet 7- to 10-inches tall, 6- to 8-leaf and 2-tillers on September 9 with 86 F, calm wind, 30% RH, and sunny sky. Plot size was 11.5 by 23 feet and the experiment was a randomized complete block design with four replicates. A visual estimate of percentage control was taken on September 25.

Treatment	Tip	Gpa	Mph	Rate	9/25 Oat	9/25 Fxmi	9/25 Prmi
				oz/A		%	
Imazethapyr+Act90	8001	5	5	0.25+0.25%	37	50	37
Imazethapyr+SunitII	8001	5	5	0.25+0.2G	66	74	68
Imazethapyr+Act90	8001	5	5	0.5+0.25%	55	73	61
Imazethapyr+SunitII	8001	5	5	0.5+0.2G	85	89	81
Imazethapyr+Act90	8001	5	5	0.75+0.25%	70	80	68
Imazethapyr+SunitII	8001	5	5	0.75+0.2G	88	91	84
Imazethapyr+Act90	8004	20	5	0.25+0.25%	41	56	49
Imazethapyr+SunitII	8004	20	5	0.25+2G	50	70	58
Imazethapyr+Act90	8004	20	5	0.5+0.25%	58	70	68
Imazethapyr+SunitII	8004	20	5	0.5+0.2G	65	77	73
Imazethapyr+Act90	8004	20	5	0.75+0.25%	63	80	70
Imazethapyr+SunitII	8004	20	5	0.75+0.2G	76	85	80
C.V. %					12	13	11
LSD 5%					10	14	10
# OF REPS					4	4	4

Summary

Imazethapyr was similarly phytotoxic to grasses when applied at 5 or 20 gpa, when with Activator 90. Sun-it II was more effective than Activator 90 as an adjuvant with imazethapyr at all rates regardless of spray volume. However, imazethapyr applied with Sun-it II was more effective when applied at 5 gpa from 8001 nozzles than 20 gpa from 8004 nozzles. Applications of imazethapyr with Sun-it II at 5 gpa with 8001 nozzles would allow for use of 0.25 oz/A lower rate with equal control as with 20 gpa from 8004 nozzles.

Mechanical and/or chemical weed control in field pea, Carrington 1996. (Endres and Schatz) The experiment was conducted to determine if a harrow or rotary hoe may be effectively used to reduce the dependence on herbicides for weed control in field pea. The experiment was established on a loam soil with 6.5 pH and 4.2% organic matter. Plot size was 15 by 15 ft for harrow treatments and 10 by 15 ft for all other treatments. Herbicide treatments were applied to a 6.67 by 15 ft area with a hooded bicycle-wheel-type plot sprayer. PPI Sonalan was applied as a partial herbicide-check treatment at 0.75 lb/A with the sprayer delivering 17 gal/A at 30 psi through 8001 flat fan nozzles. Sonalan was applied on May 15 with 72 F, 43% RH, partly-sunny sky, and 8 mph wind. Sonalan was immediately incorporated using a tractor mounted roto-tiller set to till at a 3-4 inch depth. Tillage for final seedbed preparation was made May 21 using a Melroe culti-harrow. 'Profi' field pea was planted on May 23 in 7-inch rows at the rate of 300,000 pure live seeds/A. POST-plant tillage treatments were applied to a 13 by 15 ft area with a harrow and a 7 by 15 ft area with a rotary hoe. The tillage implements were set to till at a depth of 0.5-1 inch. The harrow was operated at 4.5 mph and the rotary hoe at 9-9.5 mph. The initial tillage treatments were made on May 28 with 71 F, sunny sky, 13 mph wind, and dry soil surface with very few emerged weeds present. The second tillage passes were performed on June 7 with 65-66 F, sunny sky, 6-8 mph wind, and dry soil surface to 1-2 inch field pea and few newly-emerged weeds. Pursuit was POST applied with the sprayer delivering 8.5 gal/A at 35 psi through 8001 flat fan nozzles. Pursuit was applied to tillage/herbicide plots at 0.023 lb/A on June 7 with 57 F, 82% RH, sunny sky, and 7 mph wind. On June 17, Pursuit was applied to the herbicide-check plots at 0.031 lb/A with 67 F, 64% RH, sunny sky, and 8 mph wind to 5-6 inch field pea, 0.5-1.5 inch common lambsquarters, and 0.5-3 inch yellow foxtail. Sparse densities of other annual weeds existed in the trial including kochia, pigweed sp., wild buckwheat, and wild mustard. Perennial weeds including Canada thistle, dandelion, perennial sowthistle, and quackgrass were hand-rogued. Pea injury was evaluated by plant counts (three, one-meter lengths of row/plot) on June 17 and by visual estimates on June 22 and July 10. Visual estimates of percentage common lambsquarters and yellow foxtail control were taken June 22 and July 10. In addition, weed density was measured in a 0.25 m^2 area/plot on June 25. The crop was harvested with a plot combine on August 28 to determine seed yield. The experiment was a randomized complete block design with four replications.

Excellent control (97-99%) of common lambsquarters and yellow foxtail was achieved with the Sonalan/Pursuit treatment (Table 1). Common lambsquarters control with the rotary hoe x 2 treatment was similar with Sonalan/Pursuit 30 days after planting (DAP). Weed control generally did not differ when comparing similar harrow and rotary hoe treatments. Two tillage passes provided 74-89% weed control 30 DAP and control was greater compared to one tillage pass. Field pea injury occurred with tillage and was greatest (9-14%) with two tillage passes. Crop injury generally did not differ when comparing similar harrow and rotary hoe treatments (Table 2). All treatments increased seed yield compared to the weedy check with the greatest yield obtained with Sonalan/Pursuit. Two tillage passes with a harrow or rotary hoe resulted in yield of 54.8-58.2 bu/A, which was greater than yield with one tillage pass without Pursuit. The greater yield associated with treatments of two tillage passes likely was due to improved weed control. While tillage/Pursuit treatments generally resulted in less weed control 30 DAP compared to treatments with two tillage passes, yield was similar. Test weight was similar among treatments.

Table 1. Common lambsquarters and yellow foxtail control with mechanical and/or chemical methods in field pea (Endres and Schatz).

		Common lambsquarters			Yellow foxtail		
	Herbicide	Control		Density	Control		Density
Treatment[a]	rate[a]	6/22	7/10	6/25	6/22	7/10	6/25
	lb/A	--- % ---		plt/0.25 m	--- % ---		plt/0.25 m
Weedy check		0	0	36	0	0	95
Sonalan/Pursuit + NIS	0.75 + 0.031	97	97	6	98	99	6
Harrow x 1		52	18	45	35	0	77
Harrow x 2		87	70	17	74	61	79
Harrow x 1/Pursuit + NIS	0.023	74	58	31	66	64	91
Rotary hoe x 1		62	19	41	39	5	71
Rotary hoe x 2		89	78	18	81	59	62
Rotary hoe x 1/Pursuit + NIS	0.023	69	56	32	54	57	111
LSD (0.05)		10	18	NS	12	13	35
C.V. %		10	24	67	14	21	32

[a]NIS=Activator 90 applied at 0.25% v/v.

Table 2. Field pea performance with mechanical and/or chemical weed control (Endres and Schatz).

		'Profi' field pea				
	Herbicide	Density	Injury		Seed	Test
Treatment[a]	rate[a]	6/17	6/22	7/10	yield	weight
	lb/A	plants/m	--- % ---		bu/A	lb/bu
Weedy check		11	0	0	35.8	63.4
Sonalan/Pursuit + NIS	0.75 + 0.031	11	1	1	76.5	64.1
Harrow x 1		12	6	4	47.7	63.5
Harrow x 2		11	14	10	54.8	63.4
Harrow x 1/Pursuit + NIS	0.023	12	6	6	56.2	64.3
Rotary hoe x 1		13	9	6	46.4	63.5
Rotary hoe x 2		12	11	9	58.2	63.6
Rotary hoe x 1/Pursuit + NIS	0.023	10	8	5	57.8	63.9
LSD (0.05)		NS	4	2	5.7	NS
C.V. %		18	44	24	7	1

[a]NIS=Activator 90 applied at 0.25% v/v.

<u>Field pea, lentil, and lupin response to herbicides, Carrington 1996.</u> (Endres and Schatz) The experiment was conducted to evaluate weed control and alternative grain legume tolerance to selected soil- and POST-applied herbicides. The experiment was conducted on a Heimdahl loam soil with 6.5 pH and 4.2% organic matter. Plot size was 10 by 25 ft. Herbicide treatments were applied to a 6.67 by 25 ft area with a hooded bicycle-wheel-type plot sprayer. PPI treatments were applied at 17 gal/A at 30 psi through 8001 flat fan nozzles on May 16 with 53 F, 91% RH, cloudy sky, and 5 mph wind. PPI treatments were immediately incorporated using a tractor mounted roto-tiller set at a 3-4 inch depth. On May 20, 'Profi' field pea, 'Richlea' lentil, and 'Lupro 2085' lupin were planted in 7-inch rows at pure live seed rates of 300,000 seeds/A, 60 lb/A, and 250,000 seeds/A, respectively. The PRE treatment was applied at 17.5 gal/A at 35 psi through 8001 flat fan nozzles on May 21 with 71 F, 24% RH, partly-sunny sky, and 19 mph wind. POST treatments were applied at 10 gal/A at 35 psi through 8001 flat fan nozzles. On June 7, POST treatments were applied, except the Chiptox and second application of the Sencor and Pursuit sequential treatments, with 52 F, 89% RH, sunny sky, and 4 mph wind to 2-3 inch field pea and lentil, 1-3 inch lupin, 1 inch common lambsquarters, and 3-4 leaf yellow foxtail. On June 17, the remaining POST treatments were applied with 60 F, 78% RH, sunny sky, and 6 mph wind to 6-8 inch field pea, 6 inch lentil, 4-5 inch lupin, 1-2 inch common lambsquarters, and 4-5 leaf yellow and green foxtail. Sparse densities of other annual weeds existed in the trial including kochia, pigweed sp., wild buckwheat, wild mustard, and wild oat. Weed control and legume injury were evaluated July 13 and 31. Field pea were harvested with a plot combine on August 28 to determine seed yield. The experiment was a randomized complete block design with four replicates.

Common lambsquarters and foxtail control was excellent (95-99%) when evaluated across the grain legumes with Sonalan/Pursuit and Sencor treatments (Table 1). The sequential Pursuit and Pursuit + Poast treatments improved weed control compared to Pursuit at 0.031 lb/A + NIS. The reduced rate of Raptor + MVO provided similar weed control as Raptor at 0.031 lb/A + NIS. Common lambsquarters control (62-72%) with Raptor was improved compared to Pursuit at 0.031 lb/A and was similar to sequential Pursuit and Pursuit + Poast treatments. However, foxtail control with Raptor was similar to Pursuit at 0.031 lb/A + NIS. Foxtail control evaluated late in the season (July 31) by legumes was excellent with Sonalan/Pursuit, Sencor at 0.19 lb/A, and sequential Sencor treatments (Table 2). With herbicide treatments that provided less than excellent foxtail control, field pea appears to be more competitive with foxtail compared to lentil and lupin.

Table 1. Weed control across alternative grain legumes (Endres and Schatz).

Herbicide Treatment[a]	Rate	July 13 Common lambsquarters	Foxtail[b]
	lb/A	---------- % ----------	
PPI			
Far-Go	1.25	0	0
Prowl	0.75	76	83
Sonalan/Pursuit + NIS (POST)	0.75/0.031	98	97
PRE			
Goal	0.5	42	46
POST			
Sencor	0.19	99	98
Sencor/Sencor	0.095/0.095	99	99
Pursuit + NIS	0.031	37	66
Pursuit + NIS/ Pursuit + NIS	0.016/ 0.016	59	81
Pursuit + Poast + MVO	0.031 + 0.2 + 2 pt	63	80
Raptor + MVO	0.024 + 1.5 pt	72	66
Raptor + NIS	0.031	62	61
Chiptox	0.38	80	0
Sencor + Chiptox	0.13 + 0.13	99	95
Untreated check	--	0	0
C.V. %		17	11
LSD (0.05)		16	9

[a]NIS=Activator 90 applied at 0.25%; MVO=Scoil.
[b]Yellow and green foxtail present with yellow as predominant species.

Table 2. Foxtail control in field pea, lentil, and lupin (Endres and Schatz).

Treatment[b]	Herbicide Rate	Foxtail control (7/31)[a] Field pea	Lentil	Lupin
	lb/A	%		
PPI				
Far-Go	1.25	0	0	0
Prowl	0.75	83	71	79
Sonalan/Pursuit + NIS (POST)	0.75/0.031	98	96	96
PRE				
Goal	0.5	65	23	33
POST				
Sencor	0.19	97	97	95
Sencor/Sencor	0.095/0.095	99	98	98
Pursuit + NIS	0.031	83	74	66
Pursuit + NIS/ Pursuit + NIS	0.016/ 0.016	80	81	72
Pursuit + Poast + MVO	0.031 + 0.2 + 2 pt	86	81	77
Raptor + MVO	0.024 + 1.5 pt	82	66	58
Raptor + NIS	0.031	80	65	62
Chiptox	0.38	0	0	0
Sencor + Chiptox	0.13 + 0.13	91	84	81
Untreated check	--	0	0	0
C.V. %		8	12	10
LSD (0.05)		8	10	8

[a]Yellow and green foxtail present with yellow as predominant species.
[b]NIS=Activator 90 applied at 0.25%; MVO=Scoil.

Sencor treatments caused excessive injury (15-99%) to all legumes (Table 3). Lentil was sensitive to most herbicide treatments except Far-Go, Prowl, and Pursuit at 0.031 lb/A + NIS. In addition to the Sencor treatments, lupin injury was high with Raptor + MVO and Chiptox. Sequential Sencor and Pursuit treatments generally did not reduce crop injury compared to Sencor at 0.19 lb/A and Pursuit at 0.031 lb/A + NIS. Lentil and lupin injury from Raptor + MVO was much higher compared to Raptor + NIS and Pursuit treatments. Field pea seed yield was highest with Prowl, Sonalan/Pursuit, Raptor, and Pursuit treatments except Pursuit at 0.031 lb/A + NIS (Table 4). Pea performance associated with these treatments likely was due to generally good weed control and crop tolerance.

Table 3. Field pea, lentil, and lupin injury associated with herbicide treatments (Endres and Schatz).

	Herbicide	Grain legume injury					
		Field pea		Lentil		Lupin	
Treatment[a]	Rate	7/13	7/31	7/13	7/31	7/13	7/31
	lb/A	%					
PPI							
Far-Go	1.25	0	0	0	0	0	0
Prowl	0.75	0	0	9	5	0	0
Sonalan/Pursuit + NIS (POST)	0.75/0.031	6	2	37	30	5	0
PRE							
Goal	0.5	9	6	72	71	0	0
POST							
Sencor	0.19	73	61	97	94	85	82
Sencor/Sencor	0.095/0.095	65	43	98	98	99	99
Pursuit + NIS	0.031	0	0	9	6	5	3
Pursuit + NIS/ Pursuit + NIS	0.016/ 0.016	1	0	16	17	2	0
Pursuit + Poast + MVO	0.031 + 0.2 + 2 pt	0	0	16	16	1	0
Raptor + MVO	0.024 + 1.5 pt	4	2	63	52	51	41
Raptor + NIS	0.031	2	3	22	16	5	5
Chiptox	0.38	13	6	82	85	51	66
Sencor + Chiptox	0.13 + 0.13	22	15	92	90	90	88
Untreated check	--	0	0	0	0	0	0
C.V. %		41	60	20	18	36	46
LSD (0.05)		8	8	12	11	14	18

[a]NIS=Activator 90 applied at 0.25%; MVO=Scoil.

Table 4. Field pea seed yield associated with herbicide treatments (Endres and Schatz).

Herbicide Treatment[a]	Rate	Field pea seed yield
	lb/A	-- bu/A --
PPI		
Far-Go	1.25	34.8
Prowl	0.75	52.3
Sonalan/Pursuit + NIS (POST)	0.75/0.031	52.7
PRE		
Goal	0.5	38.2
POST		
Sencor	0.19	18.2
Sencor/Sencor	0.095/0.095	14.7
Pursuit + NIS	0.031	41.2
Pursuit + NIS/ Pursuit + NIS	0.016/ 0.016	60.9
Pursuit + Poast + MVO	0.031 + 0.2 + 2 pt	48.0
Raptor + MVO	0.024 + 1.5 pt	58.3
Raptor + NIS	0.031	62.1
Chiptox	0.38	24.5
Sencor + Chiptox	0.13 + 0.13	41.5
Untreated check	--	34.8
C.V. %		24.7
LSD (0.05)		14.6

[a]NIS=Activator 90 applied at 0.25%; MVO=Scoil.

EXP31130A as EPP treatments in no-till corn, Fargo 1996. All treatments were applied early preplant to untilled spring wheat stubble April 29 with a bicycle wheel plot sprayer equipped with 4- 8002 flat fan nozzles and delivering 17 gal/A at 40 psi with air temperature 63 F, wind 0- to 5-mph, RH 23%, the sky sunny and the soil surface barely dry. The entire experiment was sprayed May 15 with 1 qt/A Roundup Ultra to kill emerged weeds. On May 16 Interstate Payco 4X85 hybrid corn was seeded in 30-inch rows. Visual estimates of percentage corn injury were taken on June 11 and July 3 and percentage weed control were taken on July 3 and 25. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replicates. Weed infestation were uniform, but sparse at less than 10 of a species/yd^2.

Treatment[a]	Rate	6/11	7/3					7/25			
		Corn	Corn	Fota	Rrpw	Colq	KOCZ	Fota	Rrpw	Colq	KOCZ
	lb/A	%									
EXP31130A	0.094	0	0	90	99	99	99	74	90	99	99
EXP31130A	0.141+0	2	0	94	99	99	99	86	99	99	99
EXP31130A+Acet&S-ME	0.094+1	1	0	90	98	99	99	79	99	99	99
EXP31130A+Acet&S-ME	0.141+1	3	2	95	99	99	99	91	99	99	99
EXP31130A+Acet&S-ME	0.094+1.5	0	0	86	99	99	99	73	98	99	99
EXP31130A+Acet&S-ME+Atra-DF	0.094+1+0.5	0	0	95	99	99	99	89	99	99	99
EXP31130A+Meto&S	0.094+1.25	0	0	94	99	99	99	88	99	99	96
EXP31130A+Meto&S	0.141+1.25	2	4	97	99	99	99	93	99	99	99
EXP31130A+Meto&S	0.094+1.875	1	0	95	99	99	99	92	99	99	99
EXP31130A+Meto&S+Atra-DF	0.094+1+0.5	0	2	98	99	99	99	94	99	99	99
EXP31130A+Atra-DF	0.094+0.5	1	0	95	99	99	99	92	99	99	99
EXP31130A+Cyan-DF+Atra-DF	0.094+1.5+0.5	2	1	97	99	99	99	96	99	99	99
Meto&S+Cyan-DF+Atra-DF	2+1.5+0.5	0	1	81	93	99	99	55	85	99	99
Meto&S+Atra-DF	3+0.5	0	0	93	96	89	99	85	96	80	99
Dimethenamid+Cyan-DF	1.5+1.5	0	0	58	74	97	99	43	51	94	99
Untreated	0	0	0	0	0	0	0	0	0	0	0
C.V. %		144	303	7	4	5		8	8	7	1
LSD 5%		1	NS	8	5	7		9	10	9	2
# OF REPS		4	4	4	4	4	1	4	4	4	3

[a] S=safener and ME=micro encapsulated.

Summary

All herbicide treatments controlled all broadleaf weeds, except metolachlor&benoxacor(Dual II)+cyanazine or atrazine or dimethenamid+cyanazine. However, metolachlor&benoxacor when with EXP 31130A controlled both broadleaf weeds and foxtail. EXP 31130A at 0.141 lb/A gave complete control for broadleaf weeds, but also gave 80% foxtail control on 7/25 which was equal to treatments containing metolachlor or acetochlor. EXP 31130A+cyananzine +atrazine was the most effective herbicide treatment. None of herbcide treatments injured corn.

EXP31130A as EPP treatments in conventional till corn, Fargo 1996. The entire experiment was tilled with a field cultivator on April 29. On May 3 treatments were applied using a bicycle wheel plot sprayer equipped with 4- 8002 flat fan nozzles and delivering 17 gal/A at 40 psi with air temperature 52 F, wind 3 mph, RH 29%, the sky overcast, and the soil surface dry. The entire experiment was sprayed with 1 qt/A Roundup Ultra May 15 and Interstate Payco 4X85 hybrid corn was seeded in 30-inch rows May 16. Visual estimates of percentage corn injury were made June 11 and July 2 and percentage weed control July 2. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replicates. Weed infestation was variable, but when present populations were dense at 4 wild oat plants/yd^2; 5 yellow foxtail, wild buckwheat, and redroot pigweed plants/ft^2 ; and 1 - to 5- common lambsquarters and common cocklebur plants/yd^2.

Treatment[a]	Rate	6/11 Corn	7/02 Corn	Wioa	Yeft	Wimu	Wibu	Rrpw	Colq
	lb/A				%				
EXP31130A	0.094	0	0	3	83	95	5	84	95
EXP31130A	0.141	2	0	15	92	99	13	89	99
EXP31130A+Acet&S-ME	0.094+1	1	0	28	95	94	28	99	99
EXP31130A+Acet&S-ME	0.141+1	3	0	50	94	99	30	95	98
EXP31130A+Acet&S-ME	0.094+1.5	0	0	43	96	91	47	99	99
EXP31130A+Acet&S-ME+Atra-DF	0.094+1+0.5	0	0	66	92	97	33	99	99
EXP31130A+Meto&S	0.094+1.25	0	0	20	87	99	0	88	99
EXP31130A+Meto&S	0.141+1.25	2	0	28	94	99	23	98	99
EXP31130A+Meto&S	0.094+1.875	1	0	23	89	97	7	95	99
EXP31130A+Meto&S+Atra-DF	0.094+1.25+0.05	0	0	55	90	99	67	88	97
EXP31130A+Atra-DF	0.094+0.5	1	0	45	91	97	40	75	83
EXP31130A+Cyan-DF+Atra-DF	0.094+1.5+0.5	2	0	74	91	99	88	95	99
Meto&S+Cyan-DF+Atra-DF	2+1.5+0.5	0	0	0	74	76	20	23	77
Meto&S+Atra-DF	3+0.5	0	0	29	91	87	17	82	60
Dimethenamid+Cyan-DF	1.5+1.5	0	0	41	87	80	7	42	32
Untreated	0	0	0	0	0	0	0	0	0
C.V. %		144	0	59	6	8	68	19	11
LSD 5%		1	NS	27	7	9	30	24	15
# OF REPS		4	4	4	4	4	3	3	3

[a]S=Safener and ME=micro encapsulated.

Summary

None of the herbicide treatments injured corn or gave adequate wild oat or wild buckwheat control. All EXP31130A treatments controlled wild mustard, and yellow foxtail, except some treatments with EXP31130A at 0.094 lb/A. Inclusion of acetochlor or metolachlor with EXP31130A did not greatly enhance weed control compared to EXP31130A at 0.141 lb/A applied alone, except wild oat and redroot pigweed control was increased by inclusion of cyanazine and atrazine. EXP31130A at 0.094 lb/A often was enhanced by a tank mixture with another herbicide. Weed control generally was greater for EX31130A treatments than the labeled reference treatments, except EXP31130A alone at 0.094.

EXP31130A preemergence treatments in no-till corn, Fargo 1996. The field for this experiment was worked with a field cultivator April 29 and May 15. Interstate Payco 4X85 hybrid corn was seeded in 30-inch rows May 16. Treatments were applied after seeding using a shielded bicycle wheel plot sprayer equipped with 4-8002 flat fan nozzles and delivering 17 gal/A at 40 psi with air temperature 75 F, wind 15 mph, RH 60%, a cloudy sky, and dry soil surface. Visual estimates of percentage corn injury were taken June 11 and July 2 and percentage weed control July 2 and 24. plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replicates. Weed infestations were variable but dense when present at 5 wild oat and wild mustard plants/yd^2; 1- to 5- foxtail, wild buckwheat, and redroot pigweed plants®ft^2; and 10 kochia and common lambsquarters plants/yd^2.

Treatment[a]	Rate	6/11	7/3					7/25			
		Corn	Corn	Fota	Colq	Rrpw	KOCZ	Fota	Rrpw	Colq	KOCZ
	lb/A	%									
EXP31130A	0.094	0	0	90	99	92	99	82	92	98	99
EXP31130A	0.118	1	0	95	99	97	99	92	96	99	99
EXP31130A+Acet&S-ME	0.094+1	0	0	97	99	99	99	92	99	99	99
EXP31130A+Acet&S-ME	0.118+1	1	0	98	99	99	99	98	99	99	99
EXP31130A+Acet&S-ME	0.094+1.5	1	1	99	99	99	99	98	99	99	99
EXP31130A+Acet&S-ME+Atra-DF	0.094+1.5+0.5	2	3	99	99	99	99	99	99	99	99
EXP31130A+Meto&S	0.094+1.25	3	1	97	99	99	99	91	98	99	99
EXP31130A+Meto&S	0.118+1.25	3	0	97	99	99	99	96	99	99	99
EXP31130A+Meto&S	0.094+1.875	2	0	98	99	99	99	93	96	99	99
EXP31130A+Meto&Bxcr+Atra-DF	0.094+1.25+0.5	0	1	98	99	99	99	96	99	99	99
EXP31130A+Atra-DF	0.094+0.5	1	0	96	99	99	99	93	97	99	99
EXP31130A+Cyan-DF+Atra-DF	0.094+1.5+0.5	2	0	96	99	95	99	92	95	99	99
Meto&Bxcr+Cyan-DF+Atra-DF	2+1.5+0.5	0	0	92	99	97	99	85	75	98	99
Meto&Bxcr+Atra-DF	3+0.5	0	0	89	99	93	99	81	91	97	99
Dimethenamid+Cyan-DF	1.5+1.5	0	0	86	93	92	99	75	87	92	99
Untreated	0	1	0	0	0	0	0	0	0	0	0
C.V. %		171	321	4	3	5	0	6	6	2	0
LSD 5%		NS	NS	6	4	6	NS	7	8	3	NS
# OF REPS		4	4	4	4	4	4	4	4	4	4

[a] S=Safener and ME=micro encapsulated.

Summary

In general the herbicides applied preemergence after corn seeded in this experiment, were more effective than when applied early preplant (about 2 wk before seeding corn) in the other no-till experiment. Control of all weeds was or tended to be greater for treatments containing EXP31130A than the reference treatments with labeled herbicides, except for EXP3110A applied alone at 0.094 lb/A.

EXP31130A preemergence treatments in conventional till corn, Fargo 1996. The field for this experiment was worked with a field cultivator April 29 and May 15. Interstate Payco 4X85 hybrid corn was seeded in 30-inch rows May 16. Treatments were applied after seeding using a shielded bicycle wheel plot sprayer equipped with 4- 8002 flat fan nozzles and delivering 17 gal/A at 40 psi with air temperature 75 F, wind 15 mph, RH 60%, a couldy sky, and dry soil surface. Visual estimates of percentage corn injury were taken June 11 and July 2 and percentage weed control July 2 and 24. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replicates. Weed infestations were variable but dense when present at 5 wild oat and wild mustard plants/yd^2; 1- to 5-foxtail, wild buckwheat, and redroot pigweed plants/ft^2; and 10 kochia and common lambsquarters plants/yd^2.

		6/11	7/2								7/24				
Treatment[a]	Rate	Corn	Corn	Wioa	Fota	Wimu	Wibu	Rrpw	Colq	KOCZ	Wioa	Grft	Rrpw	Colq	Wibu
	lb/A		%												
EXP31130A	0.071	0	0	0	64	98	3	89	98	86	0	70	74	90	10
EXP31130A	0.094	2	2	32	76	99	33	92	99	99	30	81	87	99	35
EXP31130A	0.118	2	0	27	78	99	40	94	99	99	0	89	86	98	54
EXP3+Acet&S	0.094+1	1	0	43	86	99	18	99	99	93	10	88	99	99	15
EXP3+Meto&S	0.094+1.25	2	0	40	90	99	43	99	99	99	30	96	99	99	0
EXP3+Atra	0.094+1	2	0	48	90	99	79	96	99	99	13	93	99	99	77
EXP3+Meto&S	0.094+1+1	1	0	53	95	99	87	99	99	76	55	96	99	99	96
EXP3+Meto&S+Atra	0.094+1+0.5	1	0	47	89	99	75	98	99	99	31	94	96	99	85
EXP3+Atra	0.094+0.5	1	0	40	87	99	65	89	98	99	18	85	91	99	79
EXP3+Meto&S	0.094+1.5	1	0	37	89	96	47	95	99	99	10	89	92	99	65
EXP3+Acet&S	0.094+1.2	0	0	33	85	99	40	98	99	98	20	86	97	99	49
Meto&S+Atra	3+1	0	0	33	83	79	47	64	63	66	76	81	51	54	72
Dime+Cyan-DF	1.5+1.5	0	0	35	83	90	48	67	55	97	13	73	67	41	60
Dime-S+Cyan-DF	1.25+1.5	0	0	28	86	89	58	76	57	76	33	88	86	50	48
Flum&Meto	2.25	3	4	25	81	99	61	98	95	99	0	70	87	80	61
Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C.V. %		165	607	45	8	8	53	11	12	19	81	10	21	18	34
LSD 5%		NS	NS	25	9	10	41	13	15	27	24	11	24	21	24
# OF REPS		4	4	3	4	4	3	4	4	3	4	4	4	4	4

[a]S=safener, ME=micro encapsulated, Atra=Atrazine in dry flowable formulation (DF) and EXP3= EXP31130A.

Summary

None of the herbicide treatments injured corn. Wild oats and wild buckwheat were not adequately controlled by any herbicide treatments. The tank mix mix herbicides with EXP31130A only increased foxtail and redroot pigweed control compared to EXP31130A alone at 0.9 lb/A. EXP31130A treatments were especially beneficial for redroot pigweed and common lambsquarters control when compared to labeled herbicide reference treatments. Wild buckwheat control was greater in the EPP experiment with all treatments. Wild buckwheat emerges early and is quite tolerant to glyphosate so emerged plants may have been present at treatment. EXP31130A appeared more effective EPP than PE for redroot pigweed, indicating a possible loss of residual for late emerging redroot plants.

Post weed control in corn, Casselton 1996. '4X85' corn was seeded May 30. Treatments (3-4lf) were applied to 3- to 4-leaf corn, wild mustard and common lambsquarters, and 2- to 3.5-leaf foxtail, on June 17 with 75 F, 40% RH, clear sky, and 5- to 8-mph wind. Treatments (4lf) were applied to 4-leaf corn, 4- to 6-leaf wild mustard and common lambsquarters, and 4- to 4.5-leaf foxtail on June 20 with 79 F, 30% RH, clear sky, and 10- to 20-mph wind. Treatments were applied with a shielded bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were green and yellow foxtail 5 plants/ft^2, wild mustard and common cocklebur 1- to 5-plants/yd^2 and common lambsquarters 1 plant /yd^2.

Treatment	Rate	7/16				8/06		
		Corn	Yeft	Wimu	Cocb	Yeft	Cocb	Colq
	oz/A	%						
Thif&Rims+Act90+28N (3-4lf)	0.25+0.25%+2%	0	61	98	49	51	54	50
Thif&Rims+Scoil (3-4lf)	0.25+1%	0	87	99	74	60	70	53
Thif&Rims+ND-4 (3-4lf)	0.25+1%	0	87	99	73	61	65	59
Thif&Rims+Dica-dma+Act90+28N (3-4lf)	0.25+2+0.25%+2%	0	88	99	84	64	90	89
Thif&Rims+Dica-dma+Scoil (3-4lf)	0.25+2+1%	0	85	99	83	60	90	89
Thif&Rims+Dica-dma+ND-4 (3-4lf)	0.25+2+1%	0	83	99	89	63	93	89
Thif&Rims+Atra-DF+Scoil (3-4lf)	0.25+6+1%	0	77	99	61	58	64	90
Nicosulfuron+Scoil (4lf)	0.25+1%	0	94	99	49	81	24	36
Nicosulfuron+ND-4 (4lf)	0.25+1%	0	93	99	25	79	19	29
Nicosulfuron+Atra-DF+Scoil (4lf)	0.25+6+1%	0	91	99	34	69	25	83
Nico+Dica-dma+Act90+28N (4lf)	0.25+2+0.25%+2%	0	85	99	97	66	94	93
Nicosulfuron+Dica-dma+Scoil (4lf)	0.25+2+1%	0	93	99	98	74	94	94
Nicosulfuron+Dica-dma+ND-4 (4lf)	0.25+2+1%	0	95	99	98	81	94	94
Nicosulfuron+NAF-73+ACT90+28N (4lf)	0.25+23+0.25%+2%	0	77	99	97	55	94	93
Nicosulfuron+NAF-73+ND-4 (4lf)	0.25+3+1%	0	74	99	99	55	94	94
Nicosulfuron+NAF-73+Scoil (4lf)	0.25+3+1%	0	90	99	98	71	95	95
Untreated	0	0	0	0	0	0	0	0
C.V. %		0	7	1	15	10	7	11
LSD 5%		NS	8	1	15	9	7	11
# OF REPS		4	4	4	4	4	4	4

Summary

ND-4 was similar to Scoil and more effective than Acivator 90 + 28% N as an adjvuant with thifensulfuron & rimsulfuron. Nicosulfuron gave equal foxtail control when applied with Scoil or ND-4. Cocklebur control (8/06) was 90% or more only when dicamba or NAF-73 were treatment components. However, yellow foxtail control from nicosulfuron was antagonized by NAF-73 except when applied with Scoil. Foxtail apparently emerged after treatment for both the 3- to 4-leaf and 4-leaf treatments which were only 3 days apart.

PRE and POST treatments in corn, Carrington, 1996. (Zollinger, Schatz, and Zwinger) An experiment was conducted in corn to evaluate weed control from labeled and experimental herbicides applied PRE and POST in corn. 'Keltgen KS940' corn was seeded May 15 and PRE treatments were applied May 20 with 50 F air, 55% RH, 100% clouds, dry surface, moist below surface, and 0 to 5 mph wind. POST treatments were applied June 14 with 82 F air, 40% RH, 60% clouds and 0 to 5 mph wind to V3 to V4 corn, 2 to 6 inch green and yellow, 1 to 4 inch diameter rosette wild mustard, 1 to 2 inch redroot pigweed and prostrate pigweed, 3 to 4 inch common lambsquarters, 3 to 6 inch kochia, and 2 to 3 inch wild buckwheat. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with four replicates per treatment.

		July 16				
Treatment[a]	Rate	Fxtl	Rrpw	Colq	Kocz	Wibw
	Product/A	% control				
PRE						
Dual II + Cy-Pro	3 pt + 2 qt	0	0	0	0	0
Dual Magnum + Cy-Pro	1.88 pt +2 qt	5	15	5	0	5
Frontier + Cy-Pro	2 pt + 2 qt	0	0	0	0	0
Frntr(SAN1289) + Cy-Pro	17.6 fl oz + 2 qt	41	30	23	50	54
Surpass + Cy-Pro	2.5 pt + 2 qt	50	18	20	38	34
Axiom	20 fl oz	0	0	5	0	0
Axiom + Cy-Pro	20 fl oz + 2 qt	21	0	23	23	40
PRE fb POST						
Dual II/Scorpion III + NIS+UAN	2pt/0.25 lb	16	87	84	80	50
DualII/BroadstrkPlus+NIS+UAN	2pt/1.6 oz	14	30	23	13	18
Dual II/BroadstrkPlus+NIS+UAN	2pt/3.2 oz	14	50	15	30	10
Dual II/Banvel	2 pt/1 pt	28	99	99	99	95
Dual II/Buctril	2 pt/1 pt	20	76	68	76	30
Dual II/SAN 1269H + NIS+UAN	2 pt/0.5lb+0.25%+1.25%	49	97	94	90	88
Dual II/Shotgun + Banvel	2 pt/2 pt + 2 fl oz	38	99	99	97	94
POST						
Basis + PO + UAN	0.33 oz	61	93	54	33	65
Basis + Banvel + NIS + UAN	0.33 oz + 0.5 pt	70	97	98	78	89
Accent + Banvel + NIS + UAN	0.67 oz + 0.5 pt	73	97	98	99	93
Accent+Scorpion III+NIS+UAN	0.67 oz + 4 oz	84	85	61	89	40
Accent + Buctril + NIS + UAN	0.67 oz + 1 pt	82	99	96	96	79
Accent + Permit + NIS + UAN	0.67 oz + 0.33 oz	81	96	30	45	49
Accent + NIS + UAN	0.33 oz	56	68	15	10	5
Accent + Dispatch	0.33 oz + 2.5 qt/A	74	88	25	10	20
Accent + Scoil	0.33 oz + 1% v/v	70	95	23	20	25
Accent + Class Act II	0.33 oz + 4% v/v	52	84	39	40	28
Accent + Class Act II + Destiny	0.33oz+4% v/v	58	50	59	50	25
Accent+Class Act IIDB+Destiny	0.33oz+22lb/100ga	70	98	64	73	42
Accent + Atrazine + Scoil	0.33oz+0.42lb+1.5pt/A	80	99	85	76	85
Accent + Scorpion III + Scoil	0.33 oz+0.25 lb+1.5 pt/A	64	98	60	89	50
Untreated		0	0	0	0	0
LSD (0.05)		19	11	18	15	12

[a]Refer to "List of Herbicides Tested" for herbicide and adjuvant information. Activator 90 was used for nonionic surfactant (NIS) at 0.25 % v/v, Herbimax was used as the petroleum oil (PO) at 1% v/v, 28%UAN was applied at 2.5% v/v for PRE fb POST treatments (SAN1269H treatments contained UAN at 1.25% v/v) and at 2 qt/A for all POST treatments, Destiny was applied at 1 qt/100 gallons water, and Scoil was applied at 1.5 pt/A.

Redroot and prostrate pigweed were rated together. Weed Pressure: High for lambsquarters, foxtail, and wild buckwheat; Low for pigweeds and kochia. Very little rainfall occurred for 1 to 1.5 months after application. POST treatments were applied later than normal so weed control from POST treatments were lower than if treatments were made on smaller weeds. No corn injury was observed. All treatments gave complete wild mustard control.

POST treatments in corn, Casselton, 1996. (Zollinger) An experiment was conducted to evaluate weed control in corn from labeled and experimental herbicides applied EPOST and POST. Interstate 'Payco 4X85' corn was seeded May 30 and EPOST treatments were applied June 14 at 12:30 pm with 86 F air, 78 F soil at 4 inches, 98 F at soil surface, 65% RH, 60% clouds and 7 to 13 mph wind to V2 corn, 4 to 5 inches tall, 1 to 2 inch tall and 3 leaf green and yellow foxtail, 1 to 4 inch diameter rosette wild mustard, 1 to 2 inch redroot pigweed, 1 to 2 inch and 3 to 4 leaf common lambsquarters, and 1 to 3 inch and 2 leaf common cocklebur. POST treatments were applied June 25 at 6:30 am with 60 F air, 68 F soil at 4 inches, 80% RH, 100% clouds and 3 to 7 mph wind to V4 to V5 corn, 1 to 3 inch green and yellow foxtail, 2 to 6 inch diameter rosette wild mustard, 1 to 3 inch redroot pigweed. 1 to 3 inch common lambsquarters, and 1 to 5 inch common cocklebur. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 2					July 23				
		Fxtl	Wimu	Rrpw	Colq	Cocb	Fxtl	Wimu	Rrpw	Colq	Cocb
Early POST	Product/A	% control									
Basis + PO + UAN	0.33 oz	88	97	99	74	50	56	99	94	39	49
Basis + Dispatch 2N	0.33 oz + 2.5qt	86	97	99	87	49	48	94	97	43	48
Basis + Atrazine + PO+UAN	0.33 oz + 0.42 lb	87	98	99	97	60	75	97	97	60	41
Basis + Banvel+NIS+UAN	0.33 oz + 0.5 pt	88	99	99	99	95	56	99	99	49	85
POST											
Accent + PO + UAN	0.67 oz	93	99	99	38	53	76	97	99	20	36
Accent+Atrazine+PO+UAN	0.67oz + 0.42 lb	95	99	99	96	58	73	99	99	66	40
Accent+Banvel+PO+UAN	0.67 oz + 0.5 pt	92	98	99	98	88	75	99	99	60	93
Accent+Buctril+NIS+UAN	0.67 oz + 1 pt	91	99	99	98	96	65	99	70	49	86
Acnt+Scrpn III+NIS+UAN	0.67 oz + 4 oz	86	99	99	98	82	79	99	99	92	92
Accent+Resouce+PO+UAN	0.67 oz + 4 oz	92	99	99	53	51	76	99	99	30	40
Acnt+Rsrc+Atra+PO+UAN	0.67+4oz+.42 lb	92	99	99	96	76	71	99	99	50	56
Acnt+Rsrc+Bnvl+NIS+UAN	0.67+4oz+.5pt	84	99	99	99	93	81	99	99	80	91
Accent + PO + UAN	0.33 oz	88	99	99	23	33	59	99	99	31	29
Accent + Dispatch	0.33 oz + 2.5qt	88	98	99	53	56	81	99	99	53	31
Accent + Scoil	0.33 oz+1% v\v	85	99	99	33	30	24	99	99	30	21
Accent + Meth-Oil	0.33 oz+1% v\v	71	98	99	25	15	31	74	99	15	9
Accent + Rivet	0.33 oz	80	99	99	30	21	30	99	99	15	8
Accent + Destiny+AMS	0.33+1%v\v+2lb	77	99	99	28	20	26	99	99	30	10
Accent + Class Act II	0.33 oz+4%v\v	87	99	99	43	33	69	99	99	35	21
Accent+Class Act II+Dstny	0.33 oz + 4%	84	98	99	41	29	68	99	99	33	15
Accent+ClsAct IIDB+Dstny	0.33+22lb\100ga	91	99	99	61	65	55	99	99	45	46
Accent + Impressive	0.33 oz	59	99	99	20	25	53	99	99	13	10
Accent+Imprsv+Sundance II	0.33	90	98	89	58	49	63	99	99	45	25
Accent+Imprsv+Ortech	0.33	72	99	99	20	20	68	99	99	15	3
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		9	2	6	16	12	14	14	11	18	17

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. NIS = Activator 90 at 0.25 % v/v, PO = Herbimax at 1% v/v, Rivet at 2 qt/100 gal, Class Act II at 4% v/v, Destiny at 1 qt\100 gal, Impressive at 2.125 lb/A, Sundance II at 0.375% v/v, Ortech at 0.5% v/v, and 28%UAN was applied at 2 qt/A.

Treatments were applied earlier than normal due to large rosette wild mustard and heavy wild mustard pressure which would have limited spray interception on weeds if applied later. Weed pressure: High for wild mustard, common cocklebur, and common lambquarters; Medium for foxtail and redroot pigweed. 1.5 inches of precipitation occurred in the four weeks following EPOST application and 0.9 inches in the four weeks following POST treatments. Less than 0.5 inch rainfall occurred in the after the first 2 to 3 weeks after application.

PRE treatments in corn, Casselton, 1996. (Zollinger) An experiment was conducted in corn to evaluate weed control from labeled and experimental herbicides applied PRE. Interstate 'Payco 4X85' corn was seeded May 30 and PRE treatments applied June 4 with 77 F air, 58 F soil at 4 inches, 58% RH, and 0 to 3 mph wind. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equiped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

		June 18						July 23				
Treatment[a]	Rate	Fxtl	Wimu	Rrpw	Colq	Vema	Cocb	Fxtl	Wimu	Rrpw	Colq	Cocb
	pt/A	% control										
Dual II + Cy-Pro L	3 + 4	91	87	94	76	16	15	81	99	75	65	13
Dual Magnum + Cy-Pro L	1.88 + 4	90	86	88	80	10	14	73	99	80	68	38
Frontier + Cy-Pro L	2 + 4	91	90	90	83	14	18	70	99	88	83	39
Frntr(SAN1289) + CyPro	17.6 fl oz + 4	91	89	89	80	15	11	82	99	90	83	15
Surpass	2.5	94	48	96	92	13	11	80	99	85	83	15
Surpass + Cy-Pro L	2.5 + 4	92	92	99	92	38	36	89	99	94	81	41
Axiom	20 fl oz	66	69	85	75	38	14	33	99	73	60	38
Axiom	24 fl oz	60	71	97	91	19	19	45	99	79	66	36
Axiom + Cy-Pro DF	20 + 2.22lb prod	71	90	92	82	33	24	33	99	60	54	40
Cy-Pro L	4.8 qt	60	85	99	99	25	28	65	99	95	94	46
Cy-Pro DF	5.3 lb prod	45	84	80	85	15	26	73	99	92	92	46
Cy-Pro AT L	5.3 qt	64	86	97	94	88	46	95	99	99	99	70
Cy-Pro AT DF	5.8 lb prod	87	90	99	99	93	40	93	99	99	99	77
Untreated		0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		12	8	12	8	16	14	17	NS	17	19	15

[a]Refer to 'List of Herbicides Tested' for herbicide information. SAN 1289 is an active isomer of dimethenamid (Frontier) and was used at 55% of the Frontier rate. Frontier 7.5 is being replaced with Frontier 6.0. Alpha-metolachlor is active ingredient of Dual Magnum and is the active isomer of metolachlor and was used at 62.5% of the metolachlor (Dual) rate. Cy-Pro (cyanazine) is from Griffin and is formulated as an L or DF similar to Bladex from DuPont.

Cocklebur competition was very heavy and resulted in a significant reduction in foxtail, redroot pigweed, and common lambsquarters population.

Only 0.32 inches of precipitation occurred in the first two weeks and 0.81 inches of precipitation occurred in the first three weeks following application. No crop injury occurred with any treatment. Dual and Dual Magnum, and Frontier and Frontier (SAN 1289) at rates used generally gave similar weed control. Cy-Pro in tankmix with other herbicides increased weed control. Cy-Pro used alone was applied at labeled rates according to soil texture and organic matter.

PRE and POST treatments in corn, Mooreton, 1996. (Zollinger and Seibert) An experiment was conducted in corn to evaluate weed control from labeled and experimental herbicides applied PRE and POST in corn. A mixture of several corn varieties were seeded May 1 and PRE treatments were applied May 2 at 12:00 noon with 47 F air, 42 F soil temp at 4 inches deep, 55% RH, 100% clouds, dry surface, moist below surface, and 0 to 3 mph wind. EPOST treatments were applied June 10 at 8:40 am with 82 F air, 64 F soil at 4 inches, 30% RH, 60% clouds and 0 to 1 mph wind to V2 to V3 corn, 1 to 3 inch and 1 to 4 leaf green foxtail, 1 to 5 inch diameter rosette wild mustard, 1 to 2 inch redroot pigweed, 1 to 3 inch common lambsquarters, 1 to 4 inch common cocklebur, 1 to 3 inch kochia, and 1 inch and 1 to 2 leaf hairy and E. black nightshade.
POST treatments were applied June 18 at 6:00 am with 65 F air, 71 F at soil surface, 85% RH, 10% clouds and 0 to 5 mph wind to V4 and 6 to 9 inch tall corn, 1 to 3 inch green foxtail, emerging wild proso millet, 2 to 16 inch tall bolted wild mustard, 1 to 4 inch redroot pigweed, 1 to 16 inch (6 to 7 inch ave) common lambsquarters, 1 to 5 inch common cocklebur, 1 to 8 inch kochia, and 1 to 2 inch and 1 to 6 leaf hairy and E. black nightshade.

Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with four replicates per treatment.

Weed Pressure: High for common lambsquarters; Medium for foxtail, redroot pigweed, common cocklebur; and Low for kochia, hairy and E. black nightshade, and wild mustardwimu

In PRE followed by POST treatments, Dual II was applied PRE at 2 pt/A, a rate lower than label for soil type and organic matter content PRE to suppress/control grasses so broadleaf weed control could be evaluated. Some treatments, especially those containing atrazine, enhanced grass control.

Soil applied herbicides worked well due to good precipitation soon after application. POST applied treatments were applied later than desired because of delays from rain and high winds. Grasses and some broadleaves were very tall at the time of POST application. This study was an "acid test" for POST treatments. Common lambsquarters is a good bioassay species for adjuvant differences from Accent and half rate. All treatments gave 100% kochia and eastern black nightshade control at the July 15th evaluation.

Treatment[a]	Rate	Corn	Grft	Wimu	Rrpw	Colq	Cocb	Kocz	Hans
		July 5							
	Product/A	% inj	% control						
PRE									
Dual II + Cy-Pro	3 pt + 2 qt	18	84	99	99	99	78	99	91
Dual Magnum + Cy-Pro	1.88 pt + 2 qt	3	82	99	99	99	85	99	96
Frontier + Cy-Pro	32 pt + 2 qt	12	89	99	94	99	81	99	91
Frntr(SAN1289) + Cy-Pro	17.6 fl oz + 2 qt	13	87	99	99	99	77	99	99
Surpass + Cy-Pro	2.5 pt + 2 qt	0	91	99	99	99	73	99	96
Axiom	20 fl oz	0	92	99	86	86	43	99	27
Axiom + Cy-Pro	20 fl oz + 2 qt	13	96	99	99	99	85	99	96
PRE fb POST									
Dual II/Scorpion III + NIS+UAN	2pt/0.25 lb	0	96	99	99	86	90	99	89
Dual II/BroadstrkPlus+NIS+UAN	2pt/1.6 oz	0	97	99	95	82	92	66	83
Dual II/BroadstrkPlus+NIS+UAN	2pt/3.2 oz	0	98	99	98	78	92	96	91
Dual II/Banvel	2 pt/1 pt	3	90	99	99	99	98	99	98
Dual II/Buctril	2 pt/1 pt	2	84	99	99	98	99	99	99
Dual II/SAN 1269H + NIS+UAN	2 pt/0.5lb+0.25%+1.25%	3	94	99	99	99	95	99	94
Dual II/Shotgun + Banvel	2 pt/2 pt + 2 fl oz	7	86	99	99	99	99	99	99
EPOST									
Basis + PO + UAN	0.33 oz	5	96	99	99	68	40	99	47
Basis + Banvel + NIS + UAN	0.33 oz + 0.5 pt	0	86	99	99	99	93	99	86
POST									
Accent + Banvel + NIS + UAN	0.67 oz + 0.5	7	98	99	99	96	98	99	96
Accent+ScorpionIII+NIS+UAN	0.67 oz + 4 oz	0	97	99	99	99	99	99	99
Accent + Buctril + NIS + UAN	0.67 oz + 1 pt	7	98	99	99	99	99	99	99
Accent + Permit + NIS + UAN	0.67 oz + 0.33 oz	2	90	99	99	57	99	99	53
Accent + NIS + UAN	0.33 oz	0	90	99	98	33	13	80	17
Accent + Dispatch 2N	0.33 oz + 2.5 qt/A	0	96	99	99	58	33	89	25
Accent + Scoil	0.33 oz + 1% v/v	0	97	99	83	68	37	94	53
Accent + Class Act II	0.33 oz + 4% v/v	0	97	99	99	65	30	98	32
Accent + Class Act II + Destiny	0.33oz + 4% v/v	0	97	99	99	67	37	94	37
Accent+Class Act IIDB+Destiny	0.33oz + 22lb/100ga	0	97	99	99	73	37	98	30
Accent + Atrazine + Scoil	0.33oz+0.42lb+1.5pt/A	0	98	99	99	99	80	96	99
Accent + Scorpion III + Scoil	0.33 oz+0.25 lb+1.5 pt/A	3	96	99	99	99	96	99	98
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		8	13	0	11	18	10	15	18

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Activator 90 was used for nonionic surfactant (NIS) at 0.25 % v/v, Herbimax was used as the petroleum oil (PO) at 1% v/v, 28%UAN was applied at 2.5% v/v for PRE fn POST treatments (SAN1269H treatments contained UAN at 1.25% v/v) and at 2 qt/A for all POST treatments, Destiny was applied at 1 qt/100 gallons water, and Scoil was applied at 1.5 pt/A. Dual Magnum contains alpha-metolachlor the active isomer of metolachlor and was used at 62.5% of the Dual II rate. Frontier (SAN 1289) contains the active isomer of dimethenamid (Frontier) and was used at 55% of the Frontier rate. The name Broadstrike Plus will be replaced with Hornet in 1997. SAN 1269G is a premix of SAN 836H and dicamba.

Treatment[a]	Rate	July 15								
		Corn	Grft	Wipm	Wimu	Rrpw	Colq	Cocb	Kocz	Hans
	Product/A	% inj	% control							
PRE										
Dual II + CyPro	3 pt + 2 qt	22	96	76	99	99	99	78	99	95
Dual Magnum + CyPro	1.88 pt +2 qt	5	98	78	99	99	99	90	99	96
Frontier + CyPro	32 pt + 2 qt	13	96	76	99	79	99	53	99	81
Frntr(SAN1289) + CyPro	17.6 fl oz + 2 qt	7	97	73	99	91	98	82	99	71
Surpass + CyPro	2.5 pt + 2 qt	2	97	85	99	88	99	78	99	96
Axiom	20 fl oz	0	99	88	99	98	95	50	99	33
Axiom + CyPro	20 fl oz + 2 qt	40	98	88	99	94	98	53	99	59
PRE fb POST										
Dual II/Scorpion III + NIS+UAN	2pt/0.25 lb	3	97	90	99	99	81	78	99	86
Dual II/BroadstrkPlus+NIS+UAN	2pt/1.6 oz	0	99	82	99	99	48	67	99	75
Dual II/BroadstrkPlus+NIS+UAN	2pt/3.2 oz	0	97	93	99	99	77	85	99	87
Dual II/Banvel	2 pt/1 pt	2	97	93	99	99	99	91	99	92
Dual II/Buctril	2 pt/1 pt	2	96	83	99	99	91	83	99	73
Dual II/SAN 1269H + NIS+UAN	2 pt/0.5lb	0	98	98	99	99	99	95	99	98
Dual II/Shotgun + Banvel	2 pt/2 pt + 2 fl oz	6	96	76	99	99	95	93	99	95
EPOST										
Basis + PO + UAN	0.33 oz	2	89	79	99	96	61	33	99	48
Basis + Banvel + NIS + UAN	0.33 oz + 0.5 pt	0	90	83	99	99	99	93	99	81
POST										
Accent + Banvel + NIS + UAN	0.67 oz + 0.5	3	97	96	99	98	99	98	99	98
Accent+ScorpionIII+NIS+UAN	0.67 oz + 4 oz	2	95	88	99	98	98	96	99	96
Accent + Buctril + NIS + UAN	0.67 oz + 1 pt	2	93	92	99	98	91	97	99	94
Accent + Permit + NIS + UAN	0.67 oz + 0.33 oz	0	96	91	99	95	56	93	99	63
Accent + NIS + UAN	0.33 oz	0	98	93	99	96	23	28	99	28
Accent + Dispatch 2N	0.33 oz + 2.5 qt/A	0	97	93	99	99	47	37	99	40
Accent + Scoil	0.33 oz + 1% v/v	0	98	92	99	90	48	56	99	47
Accent + Class Act II	0.33 oz + 4% v/v	0	98	93	99	81	37	37	99	37
Accent + Class Act II + Destiny	0.33oz + 4% v/v	0	97	90	99	90	63	38	99	37
Accent + ClassActIIDB+Destiny	0.33oz+22lb/100ga	0	98	94	99	79	87	33	99	42
Accent + Atrazine + Scoil	0.33oz+0.42lb	0	93	90	99	89	96	72	99	75
Accent + Scorpion III + Scoil	0.33 oz+0.25 lb	0	96	92	99	98	96	96	99	93
Untreated		0	0	0	0	0	0	0	0	0
LSD (0.05)		14	5	14	0	18	12	19	0	20

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Activator 90 was used for nonionic surfactant (NIS) at 0.25 % v/v, Herbimax was used as the petroleum oil (PO) at 1% v/v, 28%UAN was applied at 2.5% v/v for PRE fn POST treatments (SAN1269H treatments contained UAN at 1.25% v/v) and at 2 qt/A for all POST treatments, Destiny was applied at 1 qt/100 gallons water, and Scoil was applied at 1.5 pt/A. Dual Magnum contains alpha-metolachlor the active isomer of metolachlor and was used at 62.5% of the Dual II rate. Frontier (SAN 1289) contains the active isomer of dimethenamid (Frontier) and was used at 55% of the Frontier rate. The name Broadstrike Plus will be replaced with Hornet in 1997. SAN 1269G is a premix of SAN 836H and dicamba.

PPI treatments in corn, Casselton, 1996. (Zollinger) An experiment was conducted to evaluate weed control in corn from labeled and experimental herbicides applied PPI. Interstate 'Payco 4X85' corn and PPI treatments were applied May 30 with 80 F air, 57 F soil at 4 inches, 53% RH, and 10 to 13 mph wind. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equiped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

		June 18					July 23				
Treatment[a]	Rate	Fxtl	Wimu	Rrpw	Colq	Cocb	Fxtl	Wimu	Rrpw	Colq	Cocb
	pt/A	% control									
PPI											
DoublePlay	5	94	66	99	99	21	78	50	80	88	25
Surpass	2.5	99	65	99	99	48	90	48	83	85	25
Axiom	20 fl oz	66	98	99	99	39	34	75	62	90	25
Axiom + Cy-Pro DF	20 fl oz + 4	96	99	99	99	92	87	99	99	98	95
Axiom	22 fl oz	80	93	99	99	26	46	74	75	77	23
Axiom	24 fl oz	91	95	99	99	63	84	85	99	98	33
Dual II	3	98	41	99	99	15	98	35	91	94	10
Dual Magnum	1.88	99	26	74	74	9	98	28	90	88	10
Dual Magnum+Cy-Pro L	1.88 + 4	99	99	99	99	95	98	99	99	99	96
Frontier	2	99	65	99	99	35	98	43	80	85	18
Frontier (SAN1289)	17.6 fl oz	98	63	99	99	34	74	20	67	59	15
SAN1289 + Cy-Pro L	17.6 fl oz + 4	67	76	99	99	58	60	70	89	82	30
Surpass + Cy-Pro L	2.5 + 4	99	99	99	99	73	94	99	99	99	95
Cy-Pro L	4.8 qt L	94	99	99	99	90	97	99	99	99	99
Cy-Pro DF	5.3 lb DF	0	0	0	0	0	0	0	50	0	0
CyPro AT L	5.3 qt	99	99	99	99	93	99	99	99	99	99
CyPro AT DF	5.8 lb DF	97	99	99	99	94	98	99	99	99	99
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		14	13	16	16	11	20	19	17	18	18

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. SAN 1289 is the active isomer of Frontier and was applied at 55% of the labeled rate of Frontier. Frontier 7.5EC is being replaced with Frontier 6.0EC. Dual Magnum is alpha metolachlor and the active isomer of metolachlor and was used at 62.5% of the labeled metolachlor rate. Cy-Pro (cyanazine) is sold by Griffin.

Cocklebur infestation was very heavy which reduced populations of foxtail, redroot pigweed, and common lambsquarters.

Cy-Pro DF at 5.3 lb pr/A settled out and could not be kept in suspension after vigorous agitiation prior to and during application. After application the material had settled to the bottom of the bottle and had coated the sides of the bottle. The bottle could be not be cleaned and was discarded.

0.3 inches precipitation occurred in the first two weeks following application. 0.8 inches of precipitation occurred in first three weeks following application. Cy-Pro was applied at label rate according to soil type and organic matter content.

PRE/POST treatments in corn, Casselton, 1996. (Zollinger) An experiment was conducted to evaluate weed control in corn from labeled and experimental herbicides applied PRE followed by POST applications. Interstate 'Payco 4X85' corn was seeded May 30 and Dual II at 2 pt/A was applied June 4, 1996 with 77 air, 58 F soil at 4 inches, 58% RH, and 0 to 3 mph wind. EPOST treatments were applied June 18 at 1:30 pm with 82 F air, 72 F soil at 4 inches, 70% RH, 60% clouds and 5 to 7 mph wind to V2 to V3 corn, 1 to 2 inch green and yellow foxtail, 1 to 4 inch diameter rosette wild mustard, 1 to 2 inch redroot pigweed. 1 to 2 inch common lambsquarters, and 1 to 3 inch common cocklebur. POST treatments were applied June 25 at 6:30 am with 60 F air, 68 F soil at 4 inches, 80% RH, 100% clouds and 3 to 7 mph wind to V4 to V5 corn, 1 to 3 inch green and yellow foxtail, 2 to 6 inch diameter rosette wild mustard, 1 to 3 inch redroot pigweed. 1 to 3 inch common lambsquarters, and 1 to 5 inch common cocklebur. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 2					July 23				
		Fxtl	Wimu	Rrpw	Colq	Cocb	Fxtl	Wimu	Rrpw	Colq	Cocb
Early POST	Product/A	% control									
Broadstrike Plus+NIS+UAN	1.6 oz	73	97	35	54	40	15	97	42	45	68
Broadstrike Plus+NIS+UAN	3.2 oz	83	96	54	70	76	30	99	33	69	91
SAN 1269H	0.375 lb	85	92	75	96	97	80	97	99	91	79
SAN 1269H	0.5 lb	84	93	97	99	98	78	98	99	97	83
POST											
Scorpion III + NIS + UAN	0.25 lb	82	97	91	85	68	49	97	80	86	78
Broadstrike Plus+NIS+UAN	1.6 oz	77	98	60	46	48	14	95	30	23	73
Broadstrike Plus+NIS+UAN	3.2 oz	81	97	61	35	51	25	98	28	30	65
SAN 1269H	0.375 lb	88	94	97	97	96	87	97	99	90	87
SAN 1269H	0.5 lb	86	92	98	99	98	86	98	99	92	85
Permit + PO	0.66 oz	64	97	87	20	98	0	91	25	0	35
Resource + NIS	4 fl oz	60	63	75	71	55	20	10	20	15	18
Resource + Atrazine+NIS	4 fl oz+0.42 lb	80	96	98	99	60	20	67	67	94	40
Resource + Banvel + NIS	4 fl oz + 0.5 pt	57	85	98	97	88	13	74	62	88	78
Resource+2,4-Damine+NIS	4 fl oz + 0.5 pt	63	96	98	99	86	5	99	98	95	80
Buctril	1 pt	76	97	99	94	89	11	82	96	72	76
Buctril + Atrazine	1 pt+0.42 lb	91	98	99	99	92	71	99	98	97	81
Buctril + Permit + NIS	0.75+0.167 oz	77	99	98	94	91	18	99	92	90	74
Buctril + Permit + NIS	0.75+0.33 oz	74	99	99	99	90	14	99	99	98	76
Buctril + Permit + NIS	1 pt+0.167 oz	77	98	99	97	88	10	99	87	75	68
Buctril + Permit + NIS	1 pt + 0.33 oz	78	98	99	99	91	30	99	99	97	76
Shotgun	2 pt	87	98	99	99	88	56	99	99	97	66
Shotgun	3 pt	91	99	99	99	94	73	99	99	98	85
Shotgun + Banvel	1.5 pt+2 fl oz	85	99	99	99	93	55	99	99	99	76
Shotgun + Buctril	1.5 pt+0.75 pt	88	99	99	99	93	56	99	99	99	71
Shotgun + Sencor	1.5 pt + 2 oz	91	98	99	99	91	59	99	99	89	71
SAN 1412+Clarity+UAN	2.25 pt + 1 pt	45	98	99	99	99	13	97	99	99	99
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		14	8	11	14	11	13	14	20	12	15

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Activator 90 was used for nonionic surfactant (NIS) at 0.25 % v/v, Herbimax was used as the petroleum oil (PO) at 1% v/v, and 28%UAN was applied at 1.25% v/v with SAN 1269H and at 2.5% v/v in all other treatments. The name Broadstrike Plus is being replaced with Hornet in 1997. SAN 1269 is a premix of SAN 836H plus dicamba. SAN 1412 is a 6 lb/gal concentration and is a premix of dimethenamid plus dicamba at a 5:1 ratio.

Dual II was applied broadcast PRE at 2 pt/A to the entire study except the last treatment to suppress/control grasses and allow evaluation of broadleaf weeds. Weed Pressure: High for wild mustard, common cocklebur, common lambsquarters; Medium for foxtail and redroot pigweed. Treatments containing atrazine enhanced grass control. Treatments containing Scorpion III or Broadstrike Plus gave between 60 and 85% Canada thistle control but the infestation was not consistent enough to rate. 0.3 inches of rain occurred in the first two weeks after application and 0.8 inches in the first three weeks after application.

Weed control in glufosinate tolerant corn, Casselton, 1996. (Zollinger) An experiment was conducted in glufosinate tolerant corn to evaluate weed control from Liberty applied in different application systems and with different herbicide combinations. A Holden 95 day maturity class glufosinate tolerant corn variety nc commercially available was seeded and PRE treatments were applied May 30 with 77 F air, 77 F soil at 4 inches, and 0 to 3 mph wind. EPOST treatments were applied on June 18 with 82 F air, 99 F soil surface, 72 F soil at 4 inches, 70% RH, 60% clouds and 5 to 7 mph wind to V1-V2 corn, 1 to 2 inch green and yellow foxtail, 1 to 4 inch diameter rosette wild mustard, 0.5 to 2 inch redroot pigweed, weed, 1-2 inch common lambsquarters, and 1 to 3 inch common cocklebur. POST treatments were applied on June 25 with 60 F air, 68 F soil surface, 80% RH, 100% clouds and 3-7 mph wind to V4 to V5 corn, 1 to 4 inch green and yellow foxtail, 1 to 7 inch diameter rosette wild mustard, 1 to 3 inch redroot pigweed, 1 to 3 inch common lambsquarters, and 1 to 5 inch common cocklebur. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equiped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with four replicates per treatment.

			July 2					July 23				
Treatment[a]	Rate	Corn Inj	Fxtl	Wimu	Rrpw	Colq	Cocb	Fxtl	Wimu	Rrpw	Colq	Cocb
	pt/A	% inj	% control									
PRE												
Bicep II	2.4qt	5	59	72	80	70	36	13	0	0	0	3
PRE fb POST												
Dual II/Liberty	3/1.75	0	96	93	99	99	74	91	69	76	63	55
Frontier/Liberty	2/1.75	10	89	75	99	97	77	82	81	69	70	61
Frontier/Clarity	2/1	6	76	97	99	99	98	48	99	99	99	91
Atrazine/Liberty	0.55 lb/1.75	0	97	99	99	99	96	84	97	89	77	84
EPOST												
Frontier + Liberty	1.25 + 1.75	3	94	99	99	99	95	86	80	86	76	79
Clarity + Liberty	1 + 1.75	30	96	97	99	99	98	75	92	93	90	88
Frntr+Clarity+Lbrty	1.25 + 1 + 1.75	23	93	97	99	99	98	84	95	95	91	92
Liberty + Atrazine	1.75 + 0.55 lb	0	94	99	99	99	93	74	90	90	79	74
Accent+Buctril+ Act 90 + 28%UAN	0.67 oz + 1 + 0.25% v/v + 2 qt	5	88	99	99	99	93	69	84	80	68	76
EPOST fb POST												
Liberty/Liberty	1.75 + 1.75	0	93	99	99	99	96	70	78	60	53	70
Untreated		0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		11	13	19	9	14	13	13	10	18	17	17

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Act 90 = Activator 90 NIS, Frntr = Frontier.

Treatments containing dicamba gave up to 30% corn injury but rapidly recovered. At July 2, excellent weed control was observed with most treatments containing Liberty. Liberty controlled most weeds when applied alone, as a sequential application following a soil applied treatment, or as a late POST treatment following a POST application of Liberty. However, by July 23, large weeds and a small amount of weeds germinating reduced control of most weeds evaluated. Little rainfall occurring in the month following application helpe to prevent additional weed flushes. Treatments containing Liberty and Clarity provided the most complete weed control.

Canada thistle control in potato, Fargo, 1996. (Zollinger) An experiment was conducted in potato to determine Canada thistle control from Basis applied with adjuvants. The study was located at Fargo in an area where Canada thistle was well established with populations ranging from 2 to 6 shoots per sq. ft. POST treatments were applied on June 29 at 2:00 pm with 90 F air, 105 F at soil surface, 85% RH, 0% clouds, dry surface, slightly moist below surface, and 0 to 3 mph wind to 5 to 10 inch potato and 2 to 20 inch rosette to bolted Canada thistle. LPOST treatment were applied on July 8 at 7:00 am with 65 F air, 65 F on soil surface, 50% RH, 50% clouds, dry surface, dry below surface, and 0 to 5 mph wind to 7 to 12 inch potato and desiccated Canada thistle. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 22 Cath	Sept 13 Cath
	Product/A	--------- % control	---------
POST			
Matrix + NIS	1.5 oz + 0.25% v/v	38	21
Matrix + Scoil	1.5 oz + 1.5 pt/A	43	28
Matrix + ND-4	1.5 oz + 1.5 pt/A	45	31
Matrix + Scoil	1 oz + 1.5 pt/A	43	29
POST fb LPOST			
Matrix + Scoil/Matrix + Scoil	1 oz + 1.5 pt/0.5 oz + 1.5 pt	45	34
Matrix + Scoil/Matrix + Scoil	1 oz + 1.5 pt/1 oz + 1.5 pt	45	43
Basagran + PO/Basagran + PO	1 qt + 1 qt/1 qt + 1 qt	94	91
Untreated		0	0
LSD (0.05)		14	6

[a]Activator 90 was used for nonionic surfactant at 0.25% v/v, Herbimax was used for petroleum oil (PO) at 1 qt/A, , Scoil and ND-4 are methylated seed oil (MSO) adjuvants.

Hot, dry conditons existed for 3 to 4 weeks prior to POST application. No visable injury to potato was observed with any Matrix treatment. Basagran treatment caused slight speckling of potato leaves and potato rapidly recovered. No after planting cultivation or tillage was performed anytime during the growing season.

More Canada thistle leaf necrosis occurred with treatments containing Scoil and ND-4 than NIS. Applying Matrix at the full labeled amount with nonionic surfactant or methylated seed oil adjuvants applied alone or in sequential applications did not provide greater than 45% Canada thistle control which requires more effective control measures in crops rotated with potato. Canada thistle control did not respond to rate or benefit from split applications of Matrix.

Symptoms on Canada thistle from Matrix were typical ALS stunting, chlorosis (mainly in the growing points), and some leaf necrosis. All Matrix treatments prevented Canada thistle plants from bolting, forming buds, and seed formation.

Matrix treatments in potato, Grand Forks, ND, 1996. (Zollinger) An experiment was conducted to evaluate grass control and potato response from POST grass herbicides. 'NorValley' potato was seeded on June 7 in Grand Forks, ND and PRE treatments were applied June 14 at 2:30 pm to 5:00 pm with 91 F air, 72 F soil at 4 inches, 94 F on soil surface, 50% RH, 70% clouds, dry surface, moist below surface, and 5 to 7 mph wind. POST treatments were applied on July 3 at 7:30 am to 9:00 am with 68 to 72 F air, 70 to 74 F on soil surface, 50% RH, 70% clouds, dry surface, moist below surface, and 0 to 2 mph wind to 3 to 6 inch potato, 2 to 4 inch green and yellow foxtail, 2 to 4 inch redroot pigweed, 2 to 4 inch common lambsquarters, and 2 to 8 inch Canada thistle. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles for soil applied treatments and 18 gpa at 40 psi through 8002 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 31			
		Fxtl	Rrpw	Colq	Cath
	Product/A	-------- % control --------			
PRE					
Matrix	1 oz	0	30	0	0
Matrix	1.5 oz	38	97	0	0
Matrix + Dual II	1 oz + 2 pt	26	30	20	30
Matrix + Prowl	1 oz + 0.75 pt	20	30	40	0
Matrix + Lexone DF	1 oz + 4 oz	0	10	0	5
PRE fb POST					
Matrix/Matrix + NIS	1 oz/1 oz + 0.25% v/v	74	99	30	14
POST					
Matrix + NIS	1 oz + 0.25% v/v	40	50	20	20
Matrix + PO	1 oz + 1% v/v	74	99	30	10
Matrix + Scoil	1 oz + 1% v/v	81	99	30	13
Matrix + ND-4	1 oz + 1% v/v	88	99	30	23
Matrix + ND-71	1 oz + 0.5% v/v	74	73	33	23
Matrix + ND-71	1 oz + 1% v/v	75	85	40	30
Matrix + ND-72	1 oz + 1% v/v	66	89	30	23
Matrix + Lexone + NIS	1 oz + 4 oz + 0.25% v/v	46	92	28	20
Untreated		0	0	0	0
LSD (0.05)		11	6	6	8

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Activator 90 was used as nonionic surfactant at 0.25% v/v, Herbimax was used for petroleum oil (PO) at 1% v/v.

No potato injury was observed with any herbicide treatment. Weeds were larger at POST application than recommended on the Matrix label. Very little precipitation occured in the two to three weeks following PRE application to activate Matrix which resulted in poor weed control. No cultivation or tillage was performed after seeding and herbicide application which is not characteristic of normal production practices. The objective of this experiment was to determine weed control exclusively from Matrix and without any other control measures.

Generally, MSO type adjuvants enhanced Matrix herbicide more than NIS or PO adjuvants. Matrix with some MSO type adjuvants gave up to 88% foxtail and complete redroot pigweed control. Matrix applied PRE or POST gave poor common lambsquarters and Canada thistle control.

POST grass control in potato, Grand Forks, ND and East Grand Forks, MN, 1996. (Zollinger) An experiment was conducted to evaluate grass control and potato response from POST grass herbicides. 'NorValley' potato was seeded in Grand Forks, ND and 'Goldrush' potato was seeded in East Grand Forks, MN in the spring of 1996 and POST treatments were applied at both locations July 3 at 7:30 am to 9:00 am with 68 to 72 F air, 70 to 74 F on soil surface, 50% RH, 70% clouds, dry surface, moist below surface, and 0 to 2 mph wind to 2 to 5 inch potato, 2 to 5 inch green and yellow foxtail, 2 to 5 inch volunteer wheat, and 2 to 6 inch quackgrass.

Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

		July 31					
		Grand Forks, ND		East Grand Forks, MN			
Treatment[a]	Rate	Pota	Fxtl	Pota	Fxtl	Wht	Qugr
	Product/A	% inj	% cntl	% inj	---	% control	----
Ultima 160 + Dash HC	20 fl oz + 1 pt/A	0	95	0	92	78	71
Assure II + PO	8 fl oz + 1% v/v	0	84	0	82	81	87
Prism + PO	13 fl oz + 1% v/v	0	91	0	94	94	81
Prism + PO	17 fl oz + 1% v/v	0	97	0	96	99	95
Untreated		0	0	0	0	0	0
LSD (0.05)		NS	4	NS	3	4	5

		August 15					
		Grand Forks, ND		East Grand Forks, MN			
Treatment[a]	Rate	Pota	Fxtl	Pota	Fxtl	Wht	Qugr
	Product/A	% inj	% cntl	% inj	---	% control	----
Ultima 160 + Dash HC	20 fl oz + 1 pt/A	0	99	0	99	84	77
Assure II + PO	8 fl oz + 1% v/v	0	87	0	91	90	97
Prism + PO	13 fl oz + 1% v/v	0	95	0	99	97	89
Prism + PO	17 fl oz + 1% v/v	0	99	0	99	99	99
Untreated		0	0	0	0	0	0
LSD (0.05)		NS	4	NS	3	3	4

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Herbimax was used for petroleum oil (PO) at 1% v/v.

Cultivation or post-planting tillage was performed at East Grand Forks, MN but not at Grand Forks, ND. No potato injury was observed with any treatment. Ultima 160 provided excellent foxtail control but marginal wheat and fair quackgrass control. Assure II provided complete green foxtail control but lower foxtail ratings were from yellow foxtail. Assure II provided excellent quackgrass control but less wheat control. Prism generally provided excellent grass control.

Potato vine kill, Grand Forks, 1996. (Zollinger and Preston) An experiment was conducted to evaluate potato vine desiccation from nonlabeled products under investigation and from diquat with adjuvants. The experiment was located near Grand Forks, North Dakota in a field containing 'Goldrush' potato. The plots were sprayed on August 27 from 6:30 pm to 8:30 pm with a four-wheel all-terrain vehicle spraying four rows 100 feet in length applying 30 gpa at 30 psi at the nozzles. All the demonstration plots were evaluated and ranked from 0 - 100% vine and stem desiccation at three, seven and ten days after treatment. A ten pound tuber sample was hand dug from each of the sixteen plots and placed into storage for stem and discoloration sampling. On October 1, 1996, five random tubers from each plot were sliced with a chip slicer on the stem end removing 0.05 inch with each slice. The first, third, and fifth slice were evaluated with five slices being a 0.25 inch in depth from the stem end. Tubers were ranked for vascular discoloration on the stem end by this method. On October 1, 1996, five random tubers from each plot were hand sliced on a chip slicer on the stem end removing 0.05 inch with each slice. From the five tubers, they were evaluated after one slice, three slices and five slices with five slices being a .025 inch in depth from the stem end. Tubers were ranked for any vascular discoloration on the stem end by this method. On some of the treatments, there was vascular discoloration which could have been also from Verticillium or Fusarium wilt that was evident in the field and could not be conclusive that it was from the vine desiccation materials.

		Desiccation/defoliation			Stem end discoloration[b] 5 tubers/treatment		
		Aug 30	Sept 2	Sept 7	Slice number		
Treatment[a]	Rate	3 DAT	7 DAT	10 DAT	1st	3rd	5th
	lb/A	%			No. of discolored slices		
Resource + PO	8 fl oz + 1 qt/A	5	5	15	2	0	0
Resource + PO	16 fl oz + 1 qt/A	5	10	15	4	2	0
Resource + PO	24 fl oz + 1 qt/A	5	15	25	2	0	0
Stellar + PO	5 fl oz + 1 qt/A	10	15	40	0	0	0
Stellar + PO	10 fl oz + 1 qt/A	15	15	40	2	1	0
Stellar + PO	15 fl oz + 1 qt/A	15	35	45	2	1	1
Diquat + Preference	1 pt + 0.25% v/v	60	80	95	2	1	0
Diquat + Preference	2 pt + 0.25% v/v	50	85	99	1	0	0
Diquat + 17% COC	1 pt + 1 qt	45	80	99	1	0	0
Diquat + Class Act	1 pt + 2.5% v/v	45	80	95	3	2	1
Diquat + Class Act IIDB	1 pt + 22 lb/100 ga	45	85	99	2	2	0
Diquat + Hasten	1 pt + 1 pt	45	85	95	3	1	1
Diquat + Eth-N-Gard	1 pt + 2 pt	50	90	99	2	3	0
Diquat + R-900	1 pt + 1 pt	50	85	95	3	2	1
Diquat + W-1961	1 pt + 1 pt	50	85	92	4	2	1
Untreated		0	0	0	2	0	0

[a]Stellar = premix of flumiclorac & lactofen, Preference and R-900 are nonionic surfactants, 17% COC is a petroleum oil adjuvant, Class Act and Class Act IIDB are nonionic surfactant plus ammonium sulfate or 28% urea ammonium nitrate fertilizer blend adjuvants from Cenex Land 'O Lakes. Hasten is an ethylated seed oil adjuvant, Eth-N-Gard is a ethylated seed oil plus 28% urea ammonium nitrate blend adjuvant, W-1961 is an experimental adjuvant, and all three are from WilFarm.

[b]Each slice was 0.05 inches thick.

Treatments containing Resource or Stellar with petroleum oil adjuvant did not provide adequate potato vine kill desiccation and gave less than 45% potato vine kill. Diquat with Eth-N-Gard provided more rapid vine desiccation at 7 days after treatment but was similar to diquat with other adjuvants at 10 days after treatment. At 10 days after treatment, diquat with adjuvants gave greater than 92% vine kill. Vascular discoloration was observed from some treatments. However, Verticillium or Fusarium wilt evident in the field could have also caused these symptoms. Therefore, vascular discoloration cannot be attributed only to vine desiccation materials tested.

Weed control in potato, Oakes 1992. (Greenland) An experiment was conducted to evaluate nightshade control in potato. Russet Burbank potatoes were seeded in spring of 1992. Treatments were applied on June 8 (EPOST) with 68 F, 62% RH, 60% cloudy sky and 8 mph wind to 1-5 inch potatoes, and on June 23 (POST) with 75 F, 43% RH, 60% cloudy sky and 6.5 mph wind to 12-18 inch potatoes. Treatments were applied to an 6 ft wide area the length of 12 by 20 ft plots with a compressed air hand sprayer delivering 33 gpa at 30 psi through 8004 flat fan nozzles. The experiment was a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 1 Nightshade	September 11 EBNS	September 11 HNS	Tuber Yield
	oz ai/A	% control	% control		cwt/A
Matrix + Lexone	0.125+1	43	5	10	352
Matrix + Lexone	0.25+2	43	15	90	328
Matrix + Lexone	0.5+4	50	15	75	341
Matrix + Lexone + 0.5% NIS	0.125+1	48	8	65	332
Matrix + Lexone + 0.5% NIS	0.25+2	58	13	50	308
Matrix + Lexone + 0.5% NIS	0.5+4	78	10	90	312
Dual + Prowl	24 +8	90	65	0	307
Untreated		0	0	0	305
LSD (0.05)		16	22	57	31
C.V. %		22	92	50	7

[a]Refer to 'Table of Herbicides Tested' for active ingredients of herbicides tested.

The objective of this experiment was to determine if Matrix plus Lexone controls nightshade without injuring potatoes. This herbicide combination did not control eastern black nightshade, but did control hairy nightshade at the medium to higher rates. Matrix plus Lexone controlled redroot pigweed, common lambsquarter, and yellow foxtail, but the population of these weeds was too low for a good test. Matrix plus Lexone did not visibly injure the potato vines and did not reduce yield. Yield was higher in plots receiving Matrix plus Lexone than in the check. There did not seem to be any difference in weed control between the timing of applications. The EPOST application was easier to apply due to less interference from the potatoes.

AC 299,263 for weed control in soybeans, Casselton 1996. 'Ozzie' soybeans were seeded May 30. Treatments (PPI) were soil applied and field cultivator plus harrow incorporated before seeding. Post emergence treatments were applied to unifoliolate soybeans, 3- to 4-leaf foxtail, 2- to 6-leaf common cocklebur, 4-leaf common lambsquarters, and 4- to 8-leaf wild mustard on June 20 with 79 F, 30% RH, clear sky, and 10- to 20-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities on July 31 were more than 10 green and yellow foxtail plants/ft^2, more than 5 wild mustard plants/ft^2, 1 common cocklebur plant/yd^2, and less than 1 common lambsquarters plant/yd^2.

Treatment	Rate	7/12					7/31				
		Sobe	Fota	Cocb	Colq	Wimu	Sobe	Fota	Wimu	Cocb	Colq
	oz/A	%									
PEND(PPI) /AC 299,263+28N+SunitII	16 /.5+.25G+.18G	12	99	95	96	99	1	98	97	90	96
PEND(PPI) /AC 299,263+28N+SunitII	16 /.64+.25G+.18G	13	99	99	99	99	1	98	99	96	99
AC 299,263+28N+SunitII	.5+.25G+.18G	8	94	95	86	99	1	91	98	89	91
AC 299,263+28N+SunitII	.64+.25G+.18G	7	97	97	90	99	0	93	99	91	96
AC 299,263+ND-4	.5+1%	3	88	88	79	98	0	88	95	59	70
AC 299,263+ND-72	.5+1%	4	93	94	90	99	0	91	97	79	93
Imep+Thif+28N+X-77	1+.03+.25G+.25%	0	81	94	78	98	0	88	90	80	68
Imep+Thif+28N+X-77	.5+.03+.25G+.25%	0	81	93	76	97	0	83	87	76	78
Imep+Thif+SunitII	.5+.03+.18G	1	85	90	83	99	0	88	92	84	87
Imazethapyr+Thif+ND-4	.5+.03+1%	0	82	93	81	98	0	87	86	78	84
Imep+Acif+28N+X-77	1+2+.25G+.25%	3	75	93	66	97	0	79	89	74	33
Imazethapyr+Acif+28N	.5+2+.25G+.25%	1	39	66	46	88	0	40	71	39	5
Imazethapyr+Acif+SunitII	.5+2+.18G	1	51	89	55	97	0	53	93	73	55
Imazethapyr+Acif+ND-4	.5+2+1%	0	51	93	60	96	0	63	86	76	61
Imazethapyr+SunitII	.5+.18G	0	76	93	64	93	1	86	86	79	63
Imazethapyr+ND-4	.5+1%	1	75	94	69	91	0	88	89	86	56
Imazethapyr+ND-72	.5+1%	0	73	86	64	91	0	82	89	64	59
Untreated	0	0	0	0	0	0	0	0	0	0	0
C.V. %		105	6	7	14	4	412	11	6	17	22
LSD 5%		4	7	8	14	5	NS	12	7	17	20
# OF REPS		4	4	4	4	4	4	4	4	4	4

Summary

Pendimethalin PPI followed by AC 299,263 at 0.5 or 0.64 oz/A plus 28% N plus Sun-it II gave excellent (90+) control of all weeds. Acifluorfen (but not thifensulfuron) in combination with imazethapyr reduce foxtail control from imazethapyr. ND-72 was generally similar to Sun-it II with AC 299,263, but ND-4 tended to be less effective than ND-72 for common cocklebur and common lambsquaters control.

<u>Bentazon plus adjuvants for grass control in soybeans.</u> 'Ozzie' soybeans were seeded May 30. Treatments were applied to 2.5- to 3.5-inch soybeans, 4- to 8-leaf wild mustard, and 2-to 4-leaf redroot pigweed on June 18 with 78 F, 56% RH, partly cloudy sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. Treatments (/) were applied broadcast, one week after treatments, for grass control. The experiment was a randomized complete block design with four replicates. Wild mustard and redroot pigweed were variable from 1 to 10 plants/yd^2.

Treatment	Rate	7/10		7/31		
		Sobe	Wimu	Sobe	Wimu	Rrpw
	oz/A			%		
Bent+PO/Seth+Scoil	12+.18G/3+.18G	0	96	0	89	39
Bent+ND-4/Seth+Scoil	12+1%/3+.18G	0	98	0	96	32
Bent+ND-71/Seth+Scoil	12+1%/3+.18G	1	96	0	92	82
Bent+ND-72/Seth+Scoil	12+1%/3+.18G	1	95	0	90	40
Bent+ND-98/Seth+Scoil	12+1%/3+.18G	0	98	3	94	58
Bent+SilwetL77/Seth+Scoil	12+.12%/3+.18G	0	96	1	91	80
Bent+Thif+Act90+28N/Seth+Scoil	12+.03+.25%+2%/3+.18G	0	98	0	95	97
Bent+Thif+ND-4/Seth+Scoil	12+.03+1%/3+.18G	0	99	0	95	93
Bent+Thif+Scoil/Seth+Scoil	12+.03+1%/3+.18G	0	99	1	90	90
Bent+Clas+Act90+28N/Seth+Scoil	12+.15+.25%+2%/3+.18G	0	98	0	95	55
Bent+Clas+ND-4/Seth+Scoil	12+.15+1%/3+.18G	0	99	1	93	67
Bent+Clas+Scoil/Seth+Scoil	12+.15+1%/3+.18G	0	99	0	97	37
Imep+SunitII	.75+.18G	0	74	0	88	91
Untreated	0	0	50	0	0	0
C.V. %		508	27	313	5	16
LSD 5%		NS	NS	NS	6	17
# OF REPS		4	4	4	4	3

Summary

Weed populations were highly variable and results indicate significant differences and may represent a chance occurance. The only conclusion was that thifensulfuron enhanced redroot pigweed control when with bentazon.

CGA-277476(Expert™)plus other herbicides in soybean, Casselton 1996. An experiment was conducted to determine broadspectrum weed control from CGA-277476 plus other commercial weed control products. 'Ozzie' soybeans were seeded after trifluralin 4E treatments were applied and incorporated into moist soil on May 30. POST treatments were applied to 1st trifoliolate soybeans, 1- to 2-inch common lambsquarters and redroot pigweed, 1- to 4-inch common cocklebur, and 1- to 3-inch green and yellow foxtail on June 20 with 79 F, 30% RH, clear sky, and 10- to 20-mph winds, except for sethoxydim split-treatments which were applied on June 18. All treatments were applied with a bicycle wheel-type plot sprayer delivering 17 gpa at 40 psi through 8002 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block with four replicates.

Treatment	Rate	Soybean inj.			Fxtl		Cocb		Colq	
		6/27	7/3	7/17	7/3	7/17	7/3	7/17	7/3	7/17
	(lb ai/A)									
Trifluralin 4E (PPI)	0.67	0	0	0	91	95	0	0	70	77
Trif(PPI)/CGA277+NIS+28%	0.67/0.07+0.25%+2 qts	11	0	0	95	92	94	83	97	89
Trif(PPI)/CGA277+CGA248+NIS+28%	0.67/0.056+0.0036+0.25%+2 qts	19	16	0	97	95	95	70	96	91
Trif(PPI)/CGA277+Thif+NIS	0.67/0.056+0.0039+0.25%	9	3	3	95	91	96	78	96	90
Trif(PPI)/CGA277+Acif+NIS	0.67/0.056+0.25+0.25%	11	5	0	96	76	92	53	92	83
Trif(PPI)/Acif+NIS	0.67/0.25+0.25%	13	5	0	83	52	81	41	88	63
Seth+Scoil/CGA277+NIS+28%	0.19+1.5 pt/0.07+0.25%+2 qts	11	8	4	96	98	96	94	91	79
Seth+Scoil/CGA277+CGA248+NIS+28%	0.19+1.5 pt/0.056+0.0036+0.25%+2 qts	20	21	4	96	99	95	75	93	69
Seth+Scoil/CGA277+Thif+NIS	0.19+1.5 pt/0.056+0.0039+0.25%	5	3	0	97	99	95	89	95	85
Seth+CGA277+Agri-dex (pH 6.2)	0.25+0.07+1 qt	6	4	10	96	99	94	94	91	75
Seth+CGA277+Agri-dex (pH 5)	0.25+0.07+1 qt	6	5	5	96	99	89	66	90	63
Seth+CGA277+CGA248+Agri-dex (pH 6.2)	0.25+0.056+0.0036+1 qt	21	19	3	96	98	96	70	94	66
Seth+CGA277+CGA248+Agri-dex (pH 5)	0.25+0.056+0.0036+1 qt	19	21	3	96	99	93	58	91	66
Seth+CGA277+Thif+Agri-dex (pH 6.2)	0.25+0.056+0.039+1 qt	8	5	10	95	99	95	95	94	83
Seth+CGA277+Thif+Agri-dex (pH 5)	0.25+0.056+0.039+1 qt	8	8	8	96	99	95	93	94	90
AC 299,263+SunitII+28%	0.031+1.5 pt+2 qts	9	5	13	96	99	95	95	91	84
Untreated	0	0	0	0	0	0	0	0	0	0
LSD (5%)		4	7	4	3	11	3	8	7	11
C.V. (%)		26	68	67	2	9	3	8	5	10

Soybean injury was greatest at 16 to 21% from the CGA-277476+CGA-248757+NIS+28%N and Seth+CGA-277476+CGA-248757+Agri-dex tank mixes 7 and 13 days after treatment (DAT). However, soybean injury from either tank mix was less than 5% at 27 DAT. Soybean injury was not affected by spray solution pH. Green and yellow control was greater than 90% for all treatments except Trif/Acif+NIS at 13 and 27 DAT and Trif/CGA-277476+Acif+NIS at 27 DAT. At 27 DAT, a second flush of foxtail had emerged in plots treated with Seth and CGA-277476, but not in Trif treated lots. Common cocklebur control was generally greater than 90% except for plots treated with Trif/Acif and Trif alone at 13 DAT. Common cocklebur growing points were severely damaged by all POST treatments at 13 DAT. However by 27 DAT, plants had regrown from axillary buds, especially in Acif and CGA-248757 treated plots, and thus control levels were decreased. Common lambsquarters control was greater than 85% except for Trifluralin at 13 DAT. When tank mixed with Seth, CGA-277476 gave less common lambsquarters control at pH 6.2 than at pH 5. Thifensulfuron enhanced or tended to enhance CGA-277476 control of common lambsquarters when tank mixed with Seth, but not when applied to Trif treated plots.

Soil applied treatments in soybean, Mooreton, 1996. (Zollinger) An experiment was conducted to evaluate weed control in soybean from labeled and experimental herbicides soil applied. 'Dawson' soybean were seeded and PPI treatments were applied April 29 at 1:00 pm with 53 F air, 35% RH, 0% clouds, and 10 to 12 mph wind. PRE treatments were applied May 2 at 10:00 am with 54 F air, 40 F soil temp at 4 inches deep, 55% RH, 100% clouds, and 0 to 2 mph wind.

Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equiped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 1								
		Wht	Fxtl	Rrpw	Colq	Kocz	Wibw	Smwe	Corw	Snfl
	pt/A	% control								
PPI										
Authority + Treflan	0.5 + 1.5	87	96	98	96	96	61	91	91	86
Broadstrike + Treflan	2.25	65	96	96	98	95	90	98	91	91
Broadstrike + Dual	2.5	75	95	91	84	90	86	73	81	88
FirstRate + Treflan	0.74 oz + 1.5	95	91	98	96	94	95	96	93	95
PRE										
Broadstrike + Dual	2.5	87	95	91	94	84	88	88	78	84
FirstRate + Frontier	0.6 oz + 20 fl oz	95	96	98	97	91	84	95	91	91
FirstRate + Frontier	0.74 oz + 20 fl oz	99	91	91	96	95	91	95	95	95
Untreated		0	0	0	0	0	0	0	0	0
LSD (0.05)		7	6	8	8	5	12	7	7	6

[a]Refer to 'List of Herbicides Tested' for herbicide information.

This experiment was established as a 30 treatment study but POST treatments were not applied because of low weed pressure and high winds that removed emerged weeds. Data was collected for only for soil applied treatments. Soil texture at Mooreton was a sandy loam and soil applied treatments were applied at the highest rate allowed by the label which higher than recommended on the label according to soiul type. Adequate rainfall occurred shortly after application contributing to good weed control from PRE treatments. However, generally Broadstrike + Dual gave less weed control than other treatments.

Soil and POST treatments in soybean, Casselton, 1996. (Zollinger) An experiment was conducted to evaluate weed control in soybean from labeled and experimental herbicides applied PPI and PRE alone and followed by POST treatments. 'McCall" soybean was seeded May 30 and PPI treatments were applied May 30 at 12:00 noon with 80 F air, 57 F soil at 4 inches, 53% RH, and 10 to 13 mph wind. PRE treatments were applied June 4 with 70 F air, 58 F soil at 4 inches, 60% RH, and 5 to 8 mph wind. EPOST treatments were applied June 18, 1996 at 1:30 pm with 82 F air, 72 F soil at 4 inches, 70% RH, 60% clouds and 5 to 7 mph wind to V1 soybean, 1 to 2 inch green and yellow foxtail, 1 to 4 inch diameter rosette wild mustard, 1 to 2 inch redroot pigweed, 1 to 2 inch common lambsquarters, and 1 to 3 inch common cocklebur. POST treatments were applied June 25, 1996 at 6:30 am with 60 F air, 68 F soil at 4 inches, 80% RH, 100% clouds and 3 to 7 mph wind to V2 to V3 soybean, 1 to 3 inch green and yellow foxtail, 2 to 8 inch diameter rosette wild mustard, 1 to 3 inch redroot pigweed, 1 to 3 inch common lambsquarters, and 1 to 5 inch common cocklebur. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with four replicates per treatment.

		21 DAT					July 24				
Treatment[a]	Rate	Fxtl	Wimu	Rrpw	Colq	Cocb	Fxtl	Wimu	Rrpw	Colq	Cocb
	Product/A	% control									
PPI											
Authority	0.5 lb	97	93	99	99	95	66	91	99	99	91
Authority + Sencor	0.5 lb+0.3 lb	96	96	99	99	96	66	94	99	99	82
Broadstrike + Treflan	2.25 pt	98	96	99	99	79	91	99	99	99	49
Broadstrike + Dual	2.5 pt	98	94	99	99	85	80	99	99	99	30
Treflan + FirstRate	1.5 pt+0.6 oz	97	97	99	99	93	91	99	99	99	94
Treflan + FirstRate	1.5 pt+0.74oz	98	96	99	99	89	93	99	99	99	98
PPI fb POST											
Treflan/FirstRate+NIS+UAN	1.5pt/0.3 oz	98	79	99	99	93	74	83	62	85	88
Trfn/FrstRt+Pinn+NIS+UAN	"/0.3oz+.25oz	95	84	99	99	68	69	85	99	99	13
Trfn/FrstRt+Blzr+NIS+UAN	"/0.3oz+1pt	97	66	99	99	92	91	76	99	94	87
PRE											
Authority	0.5 lb	5	26	99	99	19	0	24	99	97	0
Authority + Sencor	0.5 lb+0.3 lb	35	50	99	99	29	5	97	99	99	16
Broadstrike + Dual	2.5 pt	54	69	99	99	8	28	74	40	31	8
Frontier + FirstRate	20 floz+0.6 oz	40	82	99	92	23	30	84	94	35	15
Frontier + FirstRate	20floz+0.74oz	59	84	99	89	46	38	74	84	28	41
Cobra	16 fl oz	21	88	99	85	46	8	99	95	18	45
Cobra + Frontier	16floz+20floz	58	88	99	84	44	23	92	96	18	30
Cobra	19.2 fl oz 13	85	99	94	46	0	99	95	35	49	
Cobra + Frontier	" + 20 fl oz	55	86	99	67	43	5	98	95	13	38
Cobra + Prowl	16 floz+2.4 pt	29	88	99	82	59	10	98	98	50	44
PRE fb EPOST											
Dual II/Expert+NIS+UAN	2 pt/1.2 oz	20	67	60	39	53	35	92	25	20	51
"/Expt+Action+NIS+UAN	"/1.5oz+1.5oz	21	75	99	69	38	25	95	49	45	73
"/Expert+Blazer+NIS	"/1.2oz+1.5pt	23	79	84	53	35	25	94	49	15	79
EPOST											
Dual II+Expert+Cobra+PO	"+1.2oz+8oz	21	97	99	75	85	18	99	96	55	90
Expert + Pinnacle + NIS	1.2 oz+0.25oz	16	79	99	79	56	23	97	95	42	15
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		12	17	11	16	14	15	19	10	12	10

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant. Activator 90 was used for NIS at 0.125% v/v with FirstRate and at 0.25% v/v with Expert, Herbimax was used as the PO at 1% v/v, and 28%UAN was applied at 1.25% v/v with SAN 1269H and at 2.5% v/v with all other POST treatments.

0.3 and 0.8 inches of rain occurred in the 2 and 3 weeks following soil applied treatments, 1.5 inncjes occurred in the 4 weeks following EPOST and 0.9 inches occurred in the 4 weeks following POST treatments. Weed Pressure: High for wild mustard, common cocklebur, common lambsquarters; Medium for foxtail and redroot pigweed.

Pursuit and Raptor treatments in soybean, Casselton, 1996. (Zollinger) An experiment was conducted to evaluate weed control in soybean from Pursuit and Raptor applied alone and in tankmix combinations. 'McCall" soybean was seeded May 30 and PPI treatments were applied May 30 at 12:00 noon with 80 F air, 57 F soil at 4 inches, 53% RH, and 10 to 13 mph wind. POST treatments were applied June 21 with 78 F air, 57 F soil at 4 inches, 91 F at soil surface, 45% RH, 50% clouds and 10 to 20 mph wind to unifoliate to V1 and 3 to 5 inch soybean, 1 to 4 inch and 2 to 5 leaf green and yellow foxtail, 1 to 4 inch diameter and 4 to 6 leaf rosette wild mustard, 1 to 2 inch and 2 to 6 leaf redroot pigweed, 1 to 2 inch and 3 to 5 leaf common lambsquarters, and emerge to 4 inch common cocklebur. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 8					July 19				
		Fxtl	Wimu	Colq	Cocb	Wibw	Fxtl	Wimu	Rrpw	Colq	Cocb
PPI Prowl at 3 pt/A fb POST	fl oz/A	% control									
Prowl/Pursuit + Sun-It II + UAN	1.44 oz	99	99	99	96	77	99	99	99	98	97
Prwl/Pursuit+Status+SII+UAN	1.44 oz+10	99	99	99	99	99	94	99	99	99	97
Prowl/Raptor + Sun-It II + UAN	4	99	99	99	97	99	98	99	99	98	94
Prowl/Raptor+Status+SII+UAN	4 + 10	98	99	99	95	98	91	99	99	98	89
Prowl/Raptor+Sun-ItII+UAN	5	99	99	99	98	99	98	99	99	99	98
Prowl/Raptor+Status+SII+UAN	5 + 10	98	99	98	97	99	90	99	99	98	89
Prwl/Prst+Pncl+NIS+UAN	1.44+.125oz	99	99	99	97	99	98	99	99	99	98
POST											
Raptor + Sun-It II + UAN	4	89	99	91	91	59	87	99	99	95	94
Raptor + Status + SII + UAN	4 + 10	85	99	76	78	91	50	99	99	75	81
Raptor + Sun-It II + UAN	5	87	99	90	83	64	87	99	99	90	88
Raptor + Status + SII + UAN	5 + 10	83	99	96	91	58	51	99	99	88	90
Galaxy + Poast Plus+PO+UAN	2 pt + 24	90	80	53	74	20	68	82	99	39	54
Concert + Assure II+NIS+UAN	0.5 oz + 8	34	99	84	73	24	16	96	99	81	63
Rptr+Status+SII+UAN+ACA	5 + 10	89	99	95	93	75	63	96	99	88	93
Squadron + Prestige+SII+UAN	3pt + 18	79	94	55	88	62	50	99	99	46	78
Raptor at 3 fl oz/A											
Raptor + Rivet	0.5 % v/v	85	99	79	71	40	73	96	99	55	81
Raptor + Meth-Oil	1.5 pt/A	84	99	78	66	26	69	92	99	75	78
Raptor + Activate Plus	0.25% v/v	82	94	74	63	41	60	99	99	43	59
Raptor + Prime Oil	2 pt/A	83	99	75	70	40	73	96	99	64	75
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		5	6	15	12	15	11	9	0	12	17

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Activator 90 was used for nonionic surfactant (NIS) at 0.25% v/v, Herbimax was used as the petroleum oil (PO) at 1% v/v, Sun-It II (SII) was applied at 1.5 pt/A, 28%UAN was applied at 2 qt/A with Concert and at 1 qt/A with all other treatments, ACA was applied at 10.56 oz/A. Status = aciflourfen (Blazer), Prestige = sethoxydim (Poast).

0.9 inches of rain occurred in the four weeks following POST application. Weed Pressure: High for wild mustard, foxtail and common cocklebur; Medium for common lambsquarters; Light for redroot pigweed and wild buckwheat. All treatments gave complete redroot pigweed control in the July 8 evaluation. Wild buckwheat was not evaluated in the final rating because of nonuniform populations. No crop injury was observed at evaluation. Prowl applied PPI followed by POST applications of Pursuit or Raptor alone or in tank-mix combination generally provided excellent weed control. Common lambsquarters and common cocklebur control was lower when Raptor was applied alone at 4 fl oz/A rather than with Status at the same rate. However, antagonism was overcome when Raptor was applied at 5 fl oz/A. ACA applied with Raptor and Status appeared to minimal impact on weed control compared to similar treatments without ACA. Concert appeared to antagonize foxtail control from Assure II. Yellow foxtail was primarily present at evaluation. Adjuvants (NIS, PO, MSO type, and Rivet) applied at recommended rates exhibited little differences on weed control from Raptor at 3 fl oz/A.

Resource treatments in soybean, Casselton, 1996. (Zollinger) An experiment was conducted to evaluate weed control in soybean from Resource applied alone and in tankmix combinations. 'McCall" soybean was seeded May 30 and POST treatments were applied June 18 at 2:30 pm with 85 F air, 78 F soil at 4 inches, 96 F at soil surface, 40% RH, 50% clouds and 8 to 12 mph wind to unifoliate to V1 and 3 to 4 inch soybean, 2.5 to 3.5 inch and 2 to 4 leaf green and yellow foxtail, 1 to 16 inch tall (3 to 5 inches ave) emergence to bloom wild mustard, 1 to 2 inch and 1 to 4 leaf redroot pigweed, 1 to 3 inch and 1 to 4 leaf common lambsquarters, and emerge to 2 inch common cocklebur. Prism was applied broadcast at 13 fl oz/A to all treatments lacking a grass control herbicides on July 1 with 82 F, 91 F at soil surface, 75% RH, 30% clouds, 0 to 4 mph wind, to 2 to 5 inch tall green and yellow foxtail.

Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

		July 2						July 24				
Treatment[a]	Rate	Sobe	Fxtl	Wimu	Rrpw	Colq	Cocb	Wimu	Rrpw	Colq	Cocb	Yield
	fl oz/A	% inj	% control									bu/A
Resource + PO + UAN	4	5	0	7	50	37	45	0	96	60	47	4
Resource A-200+PO+UAN	4	5	10	30	46	47	33	0	89	57	43	5
Resource + Cobra+PO+UAN	4 + 6	10	62	98	97	48	91	91	99	60	77	3
Resource+Pursuit+PO+UAN	4 + 1.44 oz	8	79	98	96	62	95	94	99	47	93	7
Rsrc+Cobra+Slct+PO+UAN	4 + 6 + 6	15	70	97	97	58	86	85	99	33	85	6
Rsrc+Prst+Slct+PO+UAN	4+1.44oz+4	9	94	98	97	62	95	99	99	62	98	14
Rsrc+Cobra+Prst+PO+UAN	4+4+1.44oz	9	95	99	96	65	93	99	99	72	95	11
Rsrc+Bsgn+Cobra+PO+UAN	4 + 1 pt+6	10	72	99	98	63	96	98	99	68	89	11
Resource+Storm+PO+UAN	4 + 1.5 pt	15	70	97	97	62	94	90	99	40	85	10
Rsrc+Bsgn+Slct+PO+UAN	4 + 1 pt+8	12	57	97	97	64	96	88	89	57	92	7
Resource+Pncl+PO+UAN	4 + 0.25 oz	9	48	92	76	44	62	65	99	67	43	6
Resource+Fusion+PO+UAN	4 + 8	8	98	5	48	27	37	0	57	43	53	7
Rsrc+Assure II+PO+UAN	4 + 8	7	97	17	66	23	30	0	66	50	20	8
Resource+Select+PO+UAN	4 + 6	6	57	15	51	28	23	0	50	50	20	6
Untreated		0	0	0	0	0	0	0	0	0	0	7
LSD (0.05)		4	14	15	17	18	12	14	17	16	16	5

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Herbimax was used as the petroleum oil (PO) at 0.5% v/v, 28%UAN was applied at 2 qt/A. Resource A-200 was an experimental aromatic formulation of Resource.

0.9 inches of rain occureed in the four weeks following application. Weed Pressure: High for wild mustard, foxtail, and common cocklebur; Medium for common lambsquarters; Light for redroot pigweed and wild buckwheat. Minor soybean injury was observed at the July 2 evaluation was the crop had recovered at the later evaluation. All treatments gave complete foxtail at the final rating probable due to severe competition from common cocklebur, foxtail, and wild mustard. Resource applied alone did not provide adequate weed control. Dry weather and weed stress may have contributed to low weed control from Resource and other herbicides used in this experiment. Foxtail control was excellent from Fusion and Assure II applied with Resource but Select was antagonized when applied with Resource. None of the treatments applied provided adequate common lambsquarters control. Most herbicides other than Resource and Pinnacle provided excellent common cocklebur control.

Resource plus Pinnacle combinations in soybean, Casselton, 1996. (Zollinger) An experiment was conducted to evaluate weed control in soybean from Resource plus Pinnacle applied alone and in tankmix combinations. 'McCall" soybean was seeded May 30 and POST treatments were applied June 28 at 7:00 pm with 88 F air, 105 F at soil surface, 88% RH, 90% clouds and 3 to 7 mph wind to 5 to 6 inch and V1 to V2 soybean, 2.5 to 3.5 inch and 2 to 4 leaf green and yellow foxtail, 1 to 15 inch tal (3 to 8 inches ave) emergence to bloom wild mustard, 2 to 14 inch (5 to 6 inch ave) redroot pigweed, 1 to 5 inch and 4 to 10 leaf common lambsquarters, and 1 to 4 inch common cocklebur. Prism was applied broadcast applied at 13 fl oz/A to all treatments lacking grass control on July 1 with 82 F air, 91 F at soil surface, 75% RH, 30% clouds, 0 to 4 mph wind, to 3 to 8 inch tall green and yellow foxtail. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 8				July 24				Oct 11
		Wimu	Rrpw	Colq	Cocb	Wimu	Rrpw	Colq	Cocb	Yield
	Product/A	% control								bu/A
Resource EC + PO + UAN	0.43 oz ai	0	33	34	24	46	41	57	45	13
Resource DF + PO + UAN	0.43 oz ai	15	18	21	13	30	36	40	30	14
Resource DF + PO + UAN	0.54 oz ai	0	10	18	10	51	26	47	19	15
Rsrc EC + Pinnacle+PO+UAN	0.43 ozai+0.1 oz	74	51	38	20	89	81	70	71	19
Rsrc EC + Pinnacle+PO+UAN	0.43ozai+0.125oz	85	40	41	18	97	91	82	66	16
Rsrc DF + Pinnacle+PO+UAN	0.43 ozai+0.1 oz	75	43	55	29	90	76	71	92	18
Rsrc DF + Pinnacle+PO+UAN	0.43 ozai+0.125oz	75	41	41	19	85	79	64	91	17
Rsrc DF + Pinnacle+PO+UAN	0.54 oz ai+0.1 oz	84	53	50	28	73	80	69	84	15
Rsrc DF + Pinnacle+PO+UAN	0.54ozai+0.125 oz	74	54	51	28	91	87	70	94	16
Pinnacle + PO + UAN	0.1 oz	74	51	50	18	90	83	74	85	16
Pinnacle + NIS + UAN	0.125 oz	51	28	34	18	91	88	85	81	19
Pinnacle + NIS + UAN	0.25 oz	74	36	54	23	96	91	91	94	22
Untreated		0	0	0	0	0	0	0	0	8
LSD (0.05)		15	19	13	11	16	13	13	17	8

[a]Refer to 'List of Herbicides Tested' for harbicide and adjuvant information. Activator 90 was used for nonionic surfactant (NIS) at 0.25% v/v, Herbimax was used as the petroleum oil (PO) at 0.5% v/v, 28%UAN was applied at 2 qt/A.

One objective of this study was to compare an EC and DF formulation of Resource. 0.9 inches of rain occurred in the four weeks following application. Weed Pressure: High for redroot pigweed and wild mustard; Medium for common lambsquarters and common cocklebur; Light for foxtail. Applications were made later than desired due to high winds for an extended time. Weeds exceeded the range in size at the time of application due to delayed application. Resource applied alone or in combination with Pinnacle provided poor weed control. According to label, Resource and Pinnacle do not provide common cocklebur control. Common lambsquarters should be small (less than 2 inches) and actively growing. The weed had exceeded the 2 inch size and were drought stressed at time of application. However, Pinnacle was applied at reduced rates.

POST grass herbicides with broadleaf herbicides, Casselton, 1996. (Zollinger) An experiment was conducted to evaluate weed control in soybean from Prestige (sethoxydim) applied with POST broadleaf herbicides. 'McCall' soybean was seeded May 30. POST treatments were applied June 28 at 6:00 pm with 88 F air, 105 F at soil surface, 88% RH, 90% clouds and 3 to 7 mph wind to 5 to 6 inch and V1 to V2 trifoliate soybean, 5 leaf and 2 tiller to 6 leaf and 3 tiller, 2.5 to 8 inch (3 to 4 inch ave) green and yellow foxtail, 1 to 10 inch tall emergence to bolt wild mustard, 1 to 4 inch and 4 to 8 leaf redroot pigweed, and 1 to 4 inch and 4 to 10 leaf common lambsquarters. Select was applied on July 3 at 11:00 am with 90 F air, 109 F at soil surface, 85% RH, 20% clouds and 3 to 5 mph wind to V2 to V3 trifoliate soybean, 5 leaf and 2 tiller to 8 leaf and 3 tiller, 3 to 9 inch (3 to 5 inch ave) green and yellow foxtail. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 8				July 19			
		Fxtl	Wimu	Rrpw	Colq	Fxtl	Wimu	Rrpw	Colq
	Product/A	% control							
POST									
Pursuit + Sun-It II + UAN	1.44 oz	76	96	99	70	76	99	96	59
Pursuit + Prestige + Sull+UAN	1.44 oz+12 fl oz	75	94	99	68	82	99	99	61
Pursuit + Prestige + Sull+UAN	1.44 oz+16 fl oz	83	73	99	60	93	99	99	63
Pursuit + Prestige + Sull+UAN	1.44 oz+20 fl oz	78	96	99	60	92	99	99	64
Pursuit + Prestige + Sull+UAN	1.44 oz+22 fl oz	76	83	99	60	90	99	96	61
Pursuit + Scepter + Sull+UAN	1.44 oz+0.54 oz	72	98	99	63	76	99	99	65
Raptor + Sun-It II	4 fl oz	70	83	99	81	85	99	99	78
Raptor + Sun-It II + UAN	4 fl oz	70	68	92	76	90	99	99	81
Concert + Assure II+NIS+UAN	0.5 oz+8 fl oz	55	54	99	73	33	99	95	68
FirstRate + Assure II+PO+UAN	0.3 oz+8 fl oz	70	50	67	41	43	99	74	10
FirstRate + Select + PO+UAN	0.3 oz+4 fl oz	23	41	42	18	20	99	21	13
Cobra + Select + PO	8 fl oz+6 fl oz	43	65	99	48	14	99	99	24
Cobra + Select + PO	9.6 fl oz+6 fl oz	61	70	99	33	21	99	99	10
POST fb Select									
Pursuit+Cobra+PO/Select+PO	1.4oz+8 floz/6 floz	78	99	99	55	68	99	99	40
Basagran+Cobra+PO/Slct+PO	1pt+8 fl oz/6 fl oz	97	99	99	65	99	99	99	23
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		12	9	10	12	16	0	13	9

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Activator 90 was used for NIS at 0.25 % v/v, Herbimax was used as PO at 1% v/v with FirstRate and at 0.5% v/v with Cobra, Sun-It II (Sull) at 1 pt/A, and 28%UAN was applied at 1 qt/A.

0.9 inches rain occurred in the four weeks following application. POST applications were delayed because of extended high winds. Weed pressure: High for foxtail; Medium for wild mustadr; Light for other broadleaf weeds. Prestige (sethoxydim) is sold by American Cyanamid. Most treatments gave greater green foxtail than yellow foxtail control. Little differences in foxtail control were observed with Pursuit or Raptor applied alone or in tank-mix combination with Prestige. Assure II was antagonized more with Concert than FirstRate on foxtail. Select provided greater foxtail control when applied after the broadleaf herbicide treatment than in tank-mix combination. Raptor gave greater common lambsquarters control than Pursuit at the later evaluation.

POST treatments in soybeans, Fargo, 1996. (Zollinger) An experiment was conducted to evaluate weed control in soybean from labeled and experimental herbicides applied POST. 'McCall' soybean was seeded May 23 and EPOST treatments applied June 17 with 72 F air, 80 F at soil surface, 55% RH, and 5 to 10 mph wind. POST treatments applied June 21 with 75 F air, 85 F at soil surface, 60% RH, and 5 to 10 mph wind to 1 to 2 trifoliate soybean, 3 to 4 inch and 4 to 5 leaf yellow foxtail, 1 to 3 inch redroot pigweed, 2 to 3 inch common lambsquarters, 2 to 3 inch and 10 to 14 leaf kochia, 3 to 4 inch and 10 leaf wild buckwheat, and 1 to 2.5 inch and 2 to 4 leaf Venice mallow. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equiped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 12						July 22				
		Sobe	Yeft	Colq	Kocz	Wibw	Vema	Yeft	Colq	Kocz	Wibw	Vema
Assure II EPOST fb POST	Product/A	% control										
/FirstRate+NIS+UAN	/0.3oz+0.125% v/v	0	60	81	50	27	33	43	50	17	40	32
/FirstRate+Pncl+NIS+UAN	/0.3oz+0.25oz+0.125	0	62	83	60	40	63	53	33	17	23	42
/FirstRate+Blzr+NIS+UAN	/0.3oz+1pt+0.125%	8	50	96	73	72	66	63	99	83	96	42
POST												
FrstRt+Assure II+NIS+UAN	0.3 oz + 8 fl oz	1	77	86	50	37	62	86	78	55	50	32
Bsgn+Assure II+PO+UAN	1.5 pt + 8 fl oz	4	72	66	47	43	93	72	45	50	37	95
Basagran + Cobra + Assure II + PO + UAN	1 pt + 4 fl oz + 8 fl oz	17	65	76	72	72	88	40	43	78	30	98
Galaxy+Assure II+PO+UAN	2 pt + 8 fl oz	28	66	99	92	60	97	33	53	88	40	99
Basagran + Pinnacle + Assure II + NIS + UAN	1 pt + 0.25 oz + 8 fl oz	8	67	99	84	75	99	67	90	68	20	99
Stellar + PO + UAN	7 fl oz+0.5%+2qt	2	25	96	20	33	27	61	13	33	45	0
Pursuit + PO + UAN	1.08 oz	0	77	80	72	52	37	90	38	95	50	33
Pursuit + Sun-It II	1.08 oz + 1.5 pt	0	77	98	96	53	45	72	33	95	33	38
Raptor + Sun-It II	3 fl oz + 1.5 pt	0	86	99	99	25	30	93	92	95	37	45
Raptor + Sun-It II	4 fl oz + 1.5 pt	5	85	99	93	27	22	87	90	95	43	35
Raptor + Sun-It II	5 fl oz + 1.5 pt	3	93	99	93	27	30	95	90	95	40	37
Raptor+Pinnacle+Sun-It II	4 fl oz + 0.125 oz	1	77	99	89	63	43	94	98	87	70	43
Raptor + Cobra + Sun-It II	4 fl oz + 4 fl oz	12	89	99	99	52	43	63	97	81	33	40
Raptor + Stellar + Sun-It II	4 fl oz + 5 fl oz	17	87	99	99	60	50	67	97	95	40	38
Pursuit+Assure II+Sun-It II	1.08 oz + 8 fl oz	2	72	99	88	28	40	69	68	96	32	35
Pursuit + Select + Sun-It II	1.08 oz + 6 fl oz	0	82	99	99	37	37	57	62	27	30	17
Pursuit+Pinnicle+NIS+UAN	1.08 oz + 0.25 oz	0	69	99	96	63	30	77	62	94	80	28
Pursuit+Cobra+NIS+UAN	1.08 oz + 4 fl oz	4	27	99	93	57	60	17	82	94	40	33
Pursuit+Stellar+ PO+UAN	1.08 oz + 7 fl oz + 0.5% v/v + 2 qt	13	89	99	99	67	52	72	82	94	65	42
Basagran + Stellar + Assure II + PO + UAN	1 pt + 7 fl oz 8 fl oz + 0.5% + 2qt	18	63	99	86	60	96	40	23	92	30	92
Untreated		0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		8	18	11	19	17	13	14	15	14	11	14

[a]Refer to 'List of Herbicides Tested' for herbicides and adjuvants information. Assure II was applied at 8 fl oz/A. Activator 90 was used for nonionic surfactant (NIS) at 0.25% v/v, Herbimax was used for petroleum oil (PO) at 1% v/v, 28%UAN was applied at 2.5% v/v, Sun-It II was applied at 1.5 pt/A.

There was almost no rain for 2 months after application. Most weeds were drought stresses from lack of rain and extended periods of temperatures in the 90's for several days. Soybean did not grow well at this location and was drought stressed for a significant period during early developement. By August, soybean was not over 12 inches tall and had not formed a canopy over the row. Seeding drilled soybean instead of in rows helped probably in a small way in competing with weeds and preventing other subsequent weed flushes from occurring. Weed Pressure: Heavy for foxtail; Medium for kochia, wild buckwheat, Venice mallow; and Low for redroot pigweed and common lambsquarters. All treatments gave complete redrood pigweed control. Assure II provided complete green foxtail control. Treatments containing Blazer or Cobra gave bewtween 12 to 28% soybean injury at the July 12 evaluation but little effect remained at the final evaluation. Only treatments containing Rapto or Pursuit provided adequate kochia control. Most treatments, including Raptor, gave poor wild buckwheat control. Only treatments containing Basagran controlled Venice mallow.

POST treatments in soybean, Casselton, 1996. (Zollinger) An experiment was conducted to evaluate weed control in soybean from POST herbicides applied alone and in tankmix combinations. 'McCall' soybean was seeded May 30 and POST treatments were applied June 28 at 8:00 to 10:00 pm with 87 F air, 98 F at soil surface, 88% RH, 0% clouds and 0 to 3 mph wind to 5 to 6 inch and V1 to V2 soybean, 1 to 4 inch green and yellow foxtail, 1 to 5 inch tall emergence to bolt wild mustard, 1 to 4 inch redroot pigweed, 1 to 4 inch common lambsquarters, and 1 to 4 inch common cocklebur. Prism was broadcast at 13 fl oz/A to all treatments lacking grass control herbicides on July 1 with 82 F, 91 F at soil surface, 75% RH, 30% clouds, 0 to 4 mph wind, to 3 to 8 inch tall green and yellow foxtail. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

		July 8					July 25				10/11
Treatment[a]	Rate	Fxtl	Wimu	Colq	Cocb	Vema	Wimu	Colq	Cocb	Vema	Yield
	Product/A	% control									bu/A
Raptor + PO + UAN	4 fl oz	55	93	75	91	46	99	84	92	38	17
Stellar + PO + UAN	5 fl oz	0	98	48	60	33	97	67	94	38	12
Stellar + PO + UAN	7 fl oz	0	97	58	81	54	99	63	96	44	13
Basagran + PO + UAN	1 pt	0	93	43	90	77	87	69	95	91	18
Pinnacle + PO + UAN	0.1 oz	0	76	59	30	40	84	58	76	13	13
Pinnacle + NIS + UAN	0.125 oz	0	88	76	43	13	86	86	58	24	10
Pinnacle + NIS + UAN	0.25 oz	0	90	76	65	9	99	96	85	29	11
Cobra + PO + UAN	2 fl oz	0	98	43	65	43	98	46	92	69	11
Galaxy + PO + UAN	1.5 pt	0	99	71	96	94	99	66	98	78	13
Pursuit + PO + UAN	0.77 oz	0	92	45	95	35	99	57	92	10	14
Pursuit + PO + UAN	1.44 oz	0	95	53	96	38	99	67	98	21	14
Stellar + Basagran + PO+UAN	5floz+1pt	0	96	71	94	95	99	85	96	93	12
Stellar + Basagran + PO+UAN	7floz+1pt	0	97	83	94	99	98	90	97	94	16
Stellar + Pinnacle + PO+UAN	5floz+0.1oz	0	99	78	76	76	97	83	92	34	12
Stellar + Pinnacle + NIS+UAN	5floz+0.125oz	0	95	93	94	70	99	96	89	31	12
Stellar + Pinnacle + PO+UAN	7floz+0.1oz	0	96	87	93	60	97	81	91	33	11
Stellar + Pinnacle + NIS+UAN	7floz+0.125oz	0	98	86	87	76	99	96	93	29	12
Stellar + Pursuit + PO + UAN	5floz+0.77oz	0	96	70	96	78	99	77	99	34	14
Stellar + Pursuit + PO + UAN	7floz+0.77oz	0	95	53	86	76	99	79	99	34	12
Stellar + Cobra + PO + UAN	5floz+2floz	0	98	69	90	88	99	66	93	34	13
Stellar + Galaxy + PO + UAN	5floz+1.5pt	0	99	75	94	97	99	66	97	93	15
Stellar + Galaxy + PO + UAN	7floz+1.5pt	0	99	69	96	96	99	74	96	94	11
Basagran + Pinnacle+PO+UAN	1 pt + 0.1oz	0	98	73	93	97	98	88	95	94	12
Stlr+Bsgn+Pinn+PO+UAN	5+1pt+0.1oz	0	99	79	94	93	99	88	97	94	18
Stlr+Bsgn+Pinn+PO+UAN	7+1pt+0.1oz	0	97	89	96	95	99	83	95	96	13
Stellar + Select + PO + UAN	5+5 fl oz	91	99	60	67	32	97	49	92	29	13
Stellar + Assure II + PO+UAN	5floz+8floz	98	99	50	84	28	98	43	86	34	15
Stellar + Fusion + PO + UAN	5floz+10floz	95	98	43	70	30	94	48	81	30	14
Stellar + Poast Plus+PO+UAN	5floz+1.5pt	71	95	50	71	30	25	18	22	33	8
Select + PO + UAN	8 fl oz	61	0	0	0	0	0	0	0	0	8
Assure II + PO + UAN	8 fl oz	94	0	0	0	0	0	0	0	0	6
Fusion + PO + UAN	10 fl oz	95	0	0	0	0	0	0	0	0	7
Poast Plus + PO + UAN	1.5 pt	86	0	0	0	0	0	0	0	0	7
Untreated		0	0	0	0	0	0	0	0	0	8
LSD (0.05)		11	6	11	14	10	13	12	14	6	5

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. NIS = Activator 90 at 0.25% v/v, Herbimax was used as the petroleum oil (PO) at 0.5% v/v, 28%UAN was applied at 2 qt/A.

0.9 inches of rain occurred in the four weeks after application. Weed pressure at application: Heavy for foxtail; Medium for wild mustard; Light for common lambsquarters, redroot pigweed and common cocklbur. Weed pressure at first evaulation: Heavy for foxtail, wild mustard, Medium: redroot pigweed, common lambsquarters, common cocklebur; Light: wild buckwheat and Venice mallow. All treatment gave complete redroot pigweed control except those treatments containing only POST grass herbicides at both evaluations. Prism provided complete foxtail control at the final evaluation.

Weed control in Roundup Ready soybean, NW-22, 1996. (Zollinger) An experiment was conducted to evaluate weed control in Roundup Ready Soybean from single and multiple application of Roundup with competitive treatments. A non-commercial Roundup Ready Soybean variety was seeded May 30 and POST treatments were applied June 29 at 12:00 noon with 88 F air, 93 F at soil surface, 85% RH, 80% clouds and 3 to 7 mph wind to 3 to 5 inch and V2 soybean, 1 to 5 inch and 2 to 5 leaf and 2 tiller green and yellow foxtail, 1 to 10 inch tall emergence to bolt wild mustard, 1 to 8 inch redroot pigweed, and 1 to 5 inch common lambsquarters. LPOST treatments were applied July 8 at 10:00 am with 65 F air, 60 F at soil surface, 70% RH, 50% clouds and 7 to 10 mph wind to dead weeds. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 12				July 22				
		Fxtl	Wimu	Rrpw	Colq	Fxtl	Wimu	Rrpw	Colq	Cocb
	Product/A	% control								
POST										
Roundup Ultra	1 pt	99	99	98	99	91	99	91	89	99
Roundup Ultra	1.5 pt	99	99	99	99	93	97	93	93	99
Roundup Ultra	2 pt	99	99	99	99	88	92	94	90	99
Poast Plus + Galaxy+PO+UAN	1.5 pt+2 pt	70	99	68	76	35	96	63	40	99
Pursuit + NIS + UAN	1.44 oz	99	99	99	99	70	99	99	68	99
POST/LPOST										
Roundup Ultra/Roundup Ultra	1.5 pt/1 pt	99	99	99	99	99	99	97	99	99
Roundup Ultra/Roundup Ultra	1 pt/1 pt	99	99	99	99	98	99	98	98	99
LPOST										
Roundup Ultra	1 pt	99	99	98	96	91	97	93	88	99
Roundup Ultra	1.5 pt	99	99	99	99	89	99	94	92	99
Roundup Ultra	2 pt	99	99	99	99	91	99	96	90	99
Untreated		0	0	0	0	0	0	0	0	0
LSD (0.05)		2	0	3	4	5	5	10	5	0

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Activator 90 was used for nonionic surfactant (NIS) at 0.25% v/v, Herbimax was used as the petroleum oil (PO) at 1 pt/A, 28%UAN was applied at 2 qt/A.

Less than one inch of rain occurred in the four weeks after application. Weed Pressure: High for redroot pigweed and foxtail; Medium for wild mustard, common lambsquarters, kochia; Light for wild buchwheat. Roundup Ultra treatments gave bewtween 80% and 100% Canada thistle control but population was not consistant enough to evaluate. All treamtments gave complete control of wild mustard and common cocklebur. Almost no weeds emerged after POST application probably because no substantial rainfall occurred. Plots sprayed with Roundup Ultra were weed free for the duration of the experiment which was impressive because the soybean variety used was a longer season variety than use in North Dakota. The soybean variety did not canopy and could have emerged and competed with the soybean if adequate rainfall had occurred to stimulate germination.

POST treatments in soybean, Prosper, 1996. (Zollinger) An experiment was conducted to evaluate weed control in soybean from POST herbicides applied alone and in tankmix combinations. 'McCall' soybean was seeded May 30 and POST treatments were applied June 27 at 10:30 am with 92 F air, 98 F at soil surface, 87% RH, 30% clouds and 15 to 20 mph wind to V2 to V3 soybean, 2 to 4 inch and 5 to 6 leaf green and yellow foxtail, 1 to 5 inch diameter rosette wild mustard, 2 to 4 inch and 6 to 7 leaf redroot pigweed, 2 to 4 inch and 7 to 8 leaf common lambsquarters, 4 to 6 inch and 6 to 7 leaf common cocklebur, 3 to 5 inch and 13 to 15 leaf kochia, and 4 to 6 inch and 8 leaf Canada thistle. Prism was broadcast at 13 fl oz/A to all treatments lacking grass control herbicides on July 1 with 82 F, 91 F at soil surface, 75% RH, 30% clouds, 0 to 4 mph wind, to 3 to 8 inch tall green and yellow foxtail. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates/treatment.

		July 8				July 25				
Treatment[a]	Rate	Rrpw	Colq	Kocz	Cocb	Wimu	Rrpw	Colq	Kocz	Cocb
	Product/A	% control								
Raptor + PO + UAN	4 fl oz	52	63	75	78	99	93	82	78	83
Stellar + PO + UAN	5 fl oz	95	60	87	32	96	85	52	68	99
Stellar + PO + UAN	7 fl oz	83	50	57	32	99	64	50	70	99
Basagran + PO + UAN	1 pt	48	47	42	80	98	30	82	74	95
Pinnacle + PO + UAN	0.1 oz	57	50	40	28	96	75	68	55	88
Pinnacle + NIS + UAN	0.125 oz	72	65	48	35	99	90	77	58	53
Pinnacle + NIS + UAN	0.25 oz	79	75	62	30	99	70	65	70	89
Cobra + PO + UAN	2 fl oz	85	53	45	82	99	67	72	40	96
Galaxy + PO + UAN	1.5 pt	75	75	63	93	99	53	67	58	99
Pursuit + PO + UAN	0.77 oz	68	37	58	95	99	77	77	65	99
Pursuit + PO + UAN	1.44 oz	77	55	73	95	99	77	67	70	99
Stellar + Basagran + PO+UAN	5 fl oz + 1 pt	96	73	78	95	99	89	75	75	94
Stellar + Basagran + PO+UAN	7 fl oz + 1 pt	92	73	78	96	99	83	82	76	83
Stellar + Pinnacle + PO+UAN	5 fl oz + 0.1 oz	97	77	82	79	99	97	81	85	88
Stellar + Pinnacle + NIS+UAN	5 fl oz + 0.125 oz	98	86	87	88	99	94	87	88	86
Stellar + Pinnacle + PO+UAN	7 fl oz + 0.1 oz	95	70	81	43	99	96	89	70	84
Stellar + Pinnacle + NIS+UAN	7 fl oz + 0.125 oz	98	86	92	43	99	96	88	91	83
Stellar + Pursuit + PO + UAN	5 fl oz + 0.77 oz	97	85	80	95	99	95	78	72	99
Stellar + Pursuit + PO + UAN	7 fl oz + 0.77 oz	98	58	75	96	99	92	68	82	99
Stellar + Cobra + PO + UAN	5 fl oz + 2 fl oz	98	85	89	95	99	92	75	57	99
Stellar + Galaxy + PO + UAN	5 fl oz + 1.5 pt	97	93	83	96	99	82	75	87	99
Stellar + Galaxy + PO + UAN	7 fl oz + 1.5 pt	99	82	90	95	99	96	82	94	93
Basagran + Pinnacle+PO+UAN	1 pt +0.1 oz	89	72	60	95	99	88	83	67	91
Stlr+Bsgn+Pinnicle+PO+UAN	5 fl oz+1 pt+0.1 oz	97	80	84	95	99	96	92	82	94
Stlr+Bsgn+Pinnacle+PO+UAN	7 fl oz+1 pt+0.1 oz	97	80	88	98	99	87	67	70	83
Stellar + Select + PO + UAN	5 fl oz + 5 fl oz	96	67	74	75	98	82	73	78	65
Stellar + Assure II + PO+UAN	5 fl oz + 8 fl oz	65	80	67	75	70	88	78	65	67
Stellar + Fusion + PO + UAN	5 fl oz + 10 fl oz	94	60	72	70	80	77	72	50	68
Stellar + Poast Plus+PO+UAN	5 fl oz + 1.5 pt	89	67	75	73	83	60	63	63	83
Select + PO + UAN	8 fl oz	0	0	0	0	0	0	0	0	0
Assure II + PO + UAN	8 fl oz	0	0	0	0	0	0	0	0	0
Fusion + PO + UAN	10 fl oz	0	0	0	0	0	0	0	0	0
Poast Plus + PO + UAN	1.5 pt	0	0	0	0	0	0	0	0	0
Untreated		0	0	0	0	0	0	0	0	0
LSD (0.05)		12	12	17	10	11	15	13	15	17

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. NIS = Activator 90 at 0.25% v/v, Herbimax was used as the petroleum oil (PO) at 0.5% v/v, 28%UAN was applied at 2 qt/A.

Very little rainfall occurred after the first 2 to 3 weeks after application. Weed pressure at first rating: Heavy for kochia, redroot pigweed; Medium for common lambsquarters; Light for common cocklebur, wild mustard, and foxtail. Weed pressure at second rating: Heavy for kochia, redroot pigweed; Medium for common lambsquarters, common cocklebur; Light for wild mustard and foxtail. All treatment gave complete wild mustard except treatments containing only POST grass herbicides at the first evaluation. Prism provided complete foxtail control.

Bentazon + imazethapyr tankmixes in drybeans, Fargo 1996. Agri 1 Navy beans were seeded in 30-inch spaced rows, May 29. All treatments were applied with a bicycle wheel plot sprayer equipped with 4 8001 flat fan nozzles and delivering 8.5 gal/A at 40 psi. One-week-after-planting (1WAP) treatments were applied June 4 with air temperature 78 F, wind 4-6 mph, RH 29%, the sky partly cloudy, and the soil surface dry. Neither drybean nor weeds had emerged. Two-week-after-planting (2WAP) treatments were applied June 12 to 2-inch and cotyledon to unifoliolate drybean, 0.5-inch and 1- to 2-leaf yellow foxtail, 0.5-inch and 2-leaf common lambsquarters and redroot pigweed with 77 F, 12-14 mph wind (spray shield used), 31% RH, a partly cloudy sky, and dry soil surface. Three-week-after-planting (3WAP) treatments were applied June 19 to 2- to 3-inch and 25% expanded first trifoliolate drybean, 1- to 3- inch and 3- to 5-leaf yellow foxtail, 1 inch and 4- to 6-leaf redroot pigweed, and 1 inch and 4-leaf common lambsquarters with 66 F, 6 mph wind, 82% RH, a cloudy sky with occasional light mist, and a dry soil surface. Four-week-after-planting treatments (4WAP) were applied June 26 on 4- to 6-inch and 2 trifoliolate drybean, 3- to 4-inch and 3-to 4-leaf yellow foxtail, 2- to 4-inch and 4- to 8-leaf redroot pigweed, and 2 inch and 4- to 6-leaf common lambsquarters with 76 F, 0-3 mph wind, 78% RH, a cloudy sky, and dry soil surface. On July 3 treatments 2-7 were sprayed with 0.2 lb/A sethoxydim + 1 pt/A Dash HC for grass control. Visual estimates of percentage weed control were taken July 3 and August 7. The center row of each plot was harvested September 17. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replicates. Weeds were: 5 redroot pigweed plants/ft^2, 1 to 5 yellow foxtail plants/ft^2, and 10 to 15 common lambsquarters plants/yd^2.

Treatment	Rate	7/3 Rrpw	7/3 Colq	7/3 Fxtl	8/7 Rrpw	8/7 Colq	8/7 Fxtl	9/17 Plant	9/17 Yield
	lb/A	%						No.	lbs/A
Untreated	0	0	0		0	0		56	209
Bent+Imep+Sunit(1WAP)	0.5+0.032+0.94%	4	0		13	0		82	701
Bent+Imep+Sunit(2WAP)	0.5+0.032+0.94%	26	8		60	15		93	1168
Bent+Imep+Sunit(3WAP)	0.5+0.032+0.94%	93	91		87	73		113	1624
Bent+Imep+Sunit(4WAP)	0.5+0.032+0.94%	82	72		67	26		109	1102
Bent+Imep+Sunit(1WAP)/ Bent+Imep+Sunit(3WAP)	0.25+0.016+0.94%/ 0.25+0.016+0.94%	97	90		92	53		103	1623
Bent+Imep+Sunit(2WAP)/ Bent+Imep+Sunit(4WAP)	0.25+0.016+0.94%/ 0.25+0.016+0.94%	89	82		87	59		107	1391
Bent+Imep+Sunit(1WAP)/ Bent+Seth160+Sunit(3WAP)	0.5+0.032+0.94%/ 0.5+0.188+0.94%	99	98	74	99	96	94	116	1646
Bent+Imep+Sunit(2WAP)/ Bent+Seth160+Sunit(4WAP)	0.5+0.032+0.94%/ 0.5+0.188+0.94%	96	96	94	93	94	96	95	1620
C.V. %		12	9	15	12	34	3	18	18
LSD 5%		12	8	NS	12	23	NS	26	328
# OF REPS		4	4	4	4	4	4	4	4

Summary

Bentazon+imazethapyr needed to be delayed until 3 WAP for redroot pigweed control as plants had not emerged for the earlier applications. However, a second bentazon+imazethapyr application was required for late (8/7) season redroot pigweed control, apparently to control plants emerging after the 1st treatment. Control of all weeds exceeded 90% from POST bentazon at 0.5+imazethapyr at 0.032 lb/A applied 1 or 2 wk after planting followed by bentazon at 0.5 +sethoxydim at 0.188 lb/A. No drybean injury occurred at either evaluation. Drybean yield related to weed control and was increased eight fold by effective weed control.

Multiple bentazon applications in drybeans, Fargo 1996. Agri 1 Navy beans were seeded in 30-inch spaced rows, May 29. All treatments were applied with a bicycle wheel plot sprayer equipped with 4 8001 flat fan nozzles delivering 8.5 gal/A at 40 psi. One-week-after-planting (1WAP) treatments were applied June 4 with air temperature 78 F, wind 4-6 mph, RH 29%, the sky partly cloudy, and the soil surface dry. Neither drybean nor weeds had emerged. Two-week-after-planting (2WAP) treatments were applied June 12 to 2-inch and cotyledon to unifoliolate drybean, 0.5-inch and 2-leaf redroot pigweed, and cotyledon to 1-leaf wild buckwheat with 77 F, 12-14 mph wind (spray shield used), 31% RH, a partly cloudy sky, and dry soil surface. Three-week-after-planting (3WAP) treatments were applied June 19 to 2- to 3-inch and 25% expanded first trifoliolate drybean, 1 inch and 4- to 6-leaf redroot pigweed, and 1- to 4-leaf wild buckwheat with 66 F air temperature, 6 mph wind, 82% RH, a cloudy sky with occasional light mist, and a dry soil surface. Four-week-after-planting treatments (4WAP) were applied June 26 on 4- to 6-inch and 2 trifoliolate drybean, 2- to 4-inch and 4- to 8-leaf redroot pigweed, and 3- to 6-leaf wild buckwheat with 76 F, 0-3 mph wind, 78% RH, a cloudy sky, and dry soil surface. On July 3 the entire experiment was sprayed with 0.2 lb/A sethoxydim + 1 pt/A Dash HC for grass control. Visual estimates of percentage weed control were taken July 3 and August 7. The experiment was a randomized complete block design with four replicates. Redroot pigweed exceeded 5 plants/ft^2 and wild buckwheat 1 to 10 plants/yd^2.

		7/3		8/7
Treatment	Rate	Rrpw	Wibu	Rrpw
	lb/A		%	
Untreated	0	0	0	0
Bent+COC (1, 2, 3, and 4 WAP)	0.25+0.63%	95	100	33
Bent+COC (1 and 2 WAP)	0.25+0.63%	23	0	6
Bent+COC (1 and 3 WAP)	0.25+0.63%	51	95	6
Bent+COC (2 and 4 WAP)	0.25+0.63%	84	60	21
Bent+COC (2, 3, and 4 WAP)	0.33+0.63%	96	100	26
Bent+COC (1, 2, and 3 WAP)	0.33+0.63%	87	100	16
Bent+COC (1 and 3 WAP)	0.5+1.25	80	100	8
Bent+COC (2 and 4 WAP)	0.5+1.25%	94	97	28
Bent+COC (1 WAP)	0.5+1.25%	0	0	0
Bent+COC (2 WAP)	0.5+1.25%	89	100	18
Bent+COC (3 WAP)	0.75+1.25%	86	95	14
Bent+COC (4 WAP)	1+1.25%	54	100	10
Bent+Dash HC (3 WAP)	0.75+0.63%	89	100	11
Bent+Sunit (3 WAP)	0.75+0.94%	88	90	14
C.V. %		14		47
LSD 5%		14		9
# OF REPS		4	1	4

Summary

Bentazon gave 94% or more redroot pigweed control when applied four times at 0.25 lb/A + COC at 0.63%, three times at 0.33 lb/A + Sun-itII at 0.63%, and twice at 0.5 lb/A+Sun-itII at 0.63%. Redroot pigweed may have emerged after or recovered from early injury as control was much reduced at the 8/7 from the 7/3 evaluation. Bentazon as a single application was most effective when applied 2 wk after planting indicating the need for application to small emerged redroot pigweed: bentazon applied 2 and 4 wk after planting was the most effective timing for redroot pigweed control. No drybean injury was observed.

Diquat desiccation in drybeans, Fargo 1996. Agri 1 Navy beans were seeded in 30-inch spaced rows May 29. The entire experiment was treated with 0.2 lb/A sethoxydim + 1 pt/A Dash HC on July 3 and 1 lb/A bentazon + 1 pt/A COC July 25. Treatments were applied August 26 with a bicycle wheel sprayer using 3 8002 flat fan nozzles and delivering 17 gal/A at 40 psi. Drybeans had 80% yellow leaves and 90% yellow pods, redroot pigweed was 12 to 36 inches tall, and common lambsquarters was 12 to 24 inches tall. Air temperature was 62 F, wind 3-5 mph, RH 64%, the sky sunny, and the soil surface very dry. A visual estimate of percentage desiccation was taken August 29, September 3, and 9. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replicates. Weed infestation was uniform but spaced at less than 10 of each specie/yd^2.

		8/29			9/3			9/9		
Treatment	Rate	Drbe	Rrpw	Colq	Drbe	Rrpw	Colq	Drbe	Rrpw	Colq
	lb/A					%				
Diquat+Act90	0.25+0.25%	75	71	43	91	71	31	99	81	21
Diquat+Act90	0.375+0.25%	85	68	45	91	75	38	100	88	25
Diquat+Act90	0.5+0.25%	86	74	46	96	80	40	100	88	23
Paraquat+Act90	0.209+0.25%	53	61	41	79	75	25	98	85	20
Paraquat+Act90	0.313+0.25%	73	74	48	86	88	31	95	95	20
Paraquat+diquat+Act90	0.209+0.25+0.25%	86	75	51	95	86	40	100	90	23
Untreated	0	0	0	0	0	0	0	0	0	0
C.V. %		11	9	26	9	7	21	5	5	11
LSD 5%		11	8	15	10	7	9	6	5	3
# OF REPS		4	4	4	4	4	4	4	4	4

Summary

Diquat generally was more effective than paraquat (gramoxone) at desiccation of drybean but similar for redroot pigweed and common lambsquarters. Diquat or paraquat were not effective in desiccation of common lambsquarters regardless of rate. Paraquat in mixture with diquat did not desiccate more than diquat alone.

Dry bean tolerance to AC 299,263 in combination with different spray additives, Rothsay 1996. (Kleven and Zollinger) An experiment was conducted to evaluate dry bean tolerance to AC 299,263 when applied with X-77, Mor-Act, Sun-It II and 28% N. Upland navy beans and Othello pinto beans were planted June 10. Treatments were applied July 10 to 3-4 trifoliate beans with 82° F, 65% RH, 30% cloudy sky and 10-12 mph wind. Treatments were applied to plots 10 ft wide by 40 ft long with a Tractor mounted plot sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment was a randomized complete block design with four replicates/treatment.

Treatment[a]	Rate	Upland Navy Bean					Othello Pinto Bean				
		% Injury		% Maturity	%Moisture	Yield	% Injury		% Maturity	%Moisture	Yield
	lb/A	15 DAT	30 DAT			lb/A	15 DAT	30 DAT			lb/A
PURSUIT + X-77	0.032	9	0	91	21	1194	5	0	96	19	1449
AC 299,263 + X-77	0.032	11	2	91	22	1750	11	0	93	19	1661
AC 299,263 + X-77	0.063	15	5	85	23	1507	13	5	90	19	1629
PURSUIT + X-77 + 28%N	0.032	12	3	75	26	1609	9	4	88	19	1769
AC 299,263 + X-77 + 28%N	0.032	13	6	86	22	1510	10	3	91	18	1570
AC 299,263 + X-77 + 28%N	0.063	29	9	75	28	1058	19	5	85	20	1520
PURSUIT + MOR-ACT	0.032	11	6	86	24	1545	9	3	94	18	1691
AC 299,263 + MOR-ACT	0.032	18	6	71	29	1391	16	3	84	21	1762
AC 299,263 + MOR-ACT	0.063	18	8	71	29	1143	15	7	83	22	1534
PURSUIT + MOR-ACT + 28%N	0.032	19	7	76	31	1282	17	5	89	21	1680
AC 299,263 + MOR-ACT + 28%N	0.032	18	5	69	36	1223	11	5	84	21	1728
AC 299,263 + MOR-ACT + 28%N	0.063	28	11	66	37	937	25	8	80	24	1667
PURSUIT + SUN-IT II	0.032	12	4	76	26	1896	10	4	84	23	1943
AC 299,263 + SUN-IT II	0.032	20	7	74	29	1211	14	6	86	21	1604
AC 299,263 + SUN-IT II	0.063	33	18	61	47	985	29	11	74	31	1322
PURSUIT + SUN-IT II + 28%N	0.032	15	8	65	37	1293	10	6	80	23	1750
AC 299,263 + SUN-IT II + 28%N	0.032	30	11	65	42	1180	21	6	76	27	1621
AC 299,263 + SUN-IT II + 28%N	0.063	50	23	44	63	547	34	14	61	49	1183
CHECK, UNTREATED		0	0	100	22	1101	0	0	100	17	680
LSD (0.05)		3	3	10	12	513	8	2	8	7	NS

[a]X-77 was applied a 0.25% v/v, Mor-Act was applied at 1 qt/A, Sun-It II was applied at 0.75 qt/A. Maturity = % of mature check (90% of pods turned buckskin in color and texture).

This experiment was conducted in a weed free environment. Crop injury was observed as reduction in vegetative growth and leaf chlorosis. AC 299,263 at 0.032, 0.063 lb/A caused greater injury, delayed maturity, increased seed moisture, and reduced yield of Upland navy bean compared to Othello pinto bean. AC 299,263 when applied with X-77 caused less injury, delayed maturity, lower seed moisture, and reduced yield than AC 299,263 when applied with either Mor-Act or Sun-It II. AC 299,263 applied with Sun-It II caused more injury, caused greater delay in maturity, higher seed moisture and reduced yields more than AC 299,263 applied with Mor-Act or X-77. The addition of 28% urea ammonium nitrate increased injury, seed moisture, and reduced yields with the exception of Othello pinto bean yield. AC 299,263 at 0.032 lb/A caused more injury, caused greater delay in maturity, and higher seed moisture more than Pursuit at 0.032 lb/A with the exception of Othello pinto bean moisture.

Dry bean tolerance to AC 299,263 in combination with different spray additives, Glyndon 1996. (Kleven and Zollinger) An experiment was conducted to evaluate dry bean tolerance to AC 299,263 when applied with X-77, Mor-Act, Sun-It II and 28% N. Upland navy beans and Othello pinto beans were planted June 1. Treatments were applied June 27 to 2-3 trifoliate beans with 80° F, 85% RH, 50% cloudy sky and 5-7 mph wind. Treatments were applied to plots 10 ft wide by 40 ft long with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment was a randomized complete block design with four replicates/treatment.

Treatment[a]	Rate	Upland Navy Bean					Othello Pinto Bean				
		% Injury		% Maturity	%Moisture	Yield	% Injury		% Maturity	%Moisture	Yield
	lb/A	15 DAT	30 DAT			lb/A	15 DAT	30 DAT			lb/A
PURSUIT + X-77	0.032	5	0	89	20	1864	4	0	100	14	1861
AC 299,263 + X-77	0.032	6	1	88	20	1742	5	0	98	14	1794
AC 299,263 + X-77	0.063	13	5	73	27	1354	13	4	88	27	1252
PURSUIT + X-77 + 28%N	0.032	6	0	85	21	1692	5	0	94	14	2299
AC 299,263 + X-77 + 28%N	0.032	9	4	85	20	1881	9	1	93	15	2113
AC 299,263 + X-77 + 28%N	0.063	17	7	61	32	1217	18	5	76	29	1387
PURSUIT + MOR-ACT	0.032	14	2	73	26	1579	12	1	86	18	2009
AC 299,263 + MOR-ACT	0.032	26	9	63	38	1343	25	8	69	33	1575
AC 299,263 + MOR-ACT	0.063	30	10	53	47	1018	30	8	61	48	1172
PURSUIT + MOR-ACT + 28%N	0.032	13	7	71	27	1675	11	2	88	17	1996
AC 299,263 + MOR-ACT + 28%N	0.032	10	6	74	24	1648	10	5	88	19	1769
AC 299,263 + MOR-ACT + 28%N	0.063	31	13	48	37	966	33	9	56	40	1037
PURSUIT + SUN-IT II	0.032	14	6	65	27	1665	11	3	83	17	1745
AC 299,263 + SUN-IT II	0.032	19	9	65	29	1417	18	5	79	25	1843
AC 299,263 + SUN-IT II	0.063	26	12	54	54	970	26	8	65	39	917
PURSUIT + SUN-IT II + 28%N	0.032	11	7	71	29	1391	11	4	89	22	1524
AC 299,263 + SUN-IT II + 28%N	0.032	22	10	65	36	1197	21	6	80	31	1540
AC 299,263 + SUN-IT II + 28%N	0.063	36	14	46	42	968	34	9	58	45	1592
CHECK, UNTREATED		0	0	100	18	1753	0	0	100	13	1879
LSD (0.05)		3	2	7	10	333	3	2	6	11	540

[a]X-77 was applied a 0.25% v/v, Mor-Act was applied at 1 qt/A, Sun-It II was applied at 0.75 qt/A. Maturity = % of mature check (90% of pods turned buckskin in color and texture).

This experiment was conducted in a weed free environment. Crop injury was observed as reduction in vegetative growth and leaf chlorosis. AC 299,263 at 0.032, 0.063 lb/A caused greater injury, delayed maturity, increased seed moisture, and reduced yield of Upland navy bean compared to Othello pinto bean. AC 299,263 when applied with X-77 caused less injury, delayed maturity, lower seed moisture, and reduced yield than AC 299,263 when applied with either Mor-Act or Sun-It II. AC 299,263 applied with Sun-It II caused more injury, caused greater delay in maturity, higher seed moisture and reduced yields more than AC 299,263 applied with Mor-Act or X-77. The addition of 28% urea ammonium nitrate increased Upland navy bean injury. AC 299,263 at 0.032 lb/A caused more injury, caused greater delay in maturity, higher seed moisture, and reduced yield more than Pursuit at 0.032 lb/A.

Dry bean cultivar tolerance to herbicides, Erie, 1996. (Zollinger and Grafton) An experiment was conducted to evaluate dry bean cultivar tolerance to herbicides. 'Othello' pinto, 'Topaz' pinto, 'Upland' navy and 'Montcalm' red kidney dry beans were seeded and soil applied treatments were applied on May 30 at 11:00 am with 68 F air, 57 F soil at 4 inches, 55% RH, 60% cloudy sky and 5-6 mph wind. PPI treatments were incorporated immediately after application with a rototiller set at 2 inches. POST treatments were applied on June 28 to 3- to 4-trifoliate dry bean with 88 F air, 96 F at soil surface, 90% RH, 75% cloudy sky and 0-3 mph wind. Treatments were applied to plots 20 ft wide by 50 ft long with a bicycle-wheel-type plot sprayer delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST applied treatments. The experiment was a randomized complete block design with a split plot arrangement and 4 replicates/treatment.

Treatment[a]	Rate	Othellc	Topaz	Upland	Montcalm	Othello	Topaz	Upland	Montcalm
	lb/A	% injury							
PPI		25 DAT				50 DAT			
Broadstrike + Treflan	0.91	5	5	12	6	5	11	10	6
Broadstrike + Treflan	1.83	8	7	20	13	11	15	21	12
PPI fb POST		15 DAT				30 DAT			
Treflan/Basagran + Morac	0.75/0.75	0	0	0	0	0	5	2	1
Treflan/ Pursuit + X-77	0.75/0.5 oz	1	4	8	1	0	1	3	1
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		8	7	11	6	7	8	10	6

Treatment[a]	Rate	Othello Mat	Othello Yld	Othello TW	Topaz Mat	Topaz Yld	Topaz TW	Upland Mat	Upland Yld	Upland TW	Montcalm Mat	Montcalm Yld	Montcalm TW
	lb/A	DAP	lb/A	g/100	DAP	lb/A	g/100	DAP	lb/A	g/100	DAP	lb/A	g/100
PPI													
Broadstrike + Treflan	0.91	29	1510	33	25	1838	34.8	25	1132	14.0	38	1850	56
Broadstrike + Treflan	1.83	29	1634	34	25	1741	34.9	33	1390	17.6	37	1719	59
PPI fb POST													
Treflan/Basagran + Morac	0.75/0.75	28	1863	34	25	2124	36.0	31	1752	17.0	38	2260	58
Treflan/ Pursuit + X-77	0.75/0.5 oz	28	1780	33	26	1872	33.8	31	1477	17.8	38	2108	58
Untreated		27	1909	33	25	2233	35.4	32	1611	16.8	38	2136	57
LSD (0.05)		NS	400	NS	NS	400	NS	NS	400	NS	NS	400	NS

[a]X-77 was applied at 0.25% v/v, Mor-Act was applied at 1 qt/A. Mat = days to maturity or when 90% of pods turned buckskin, Yld = yield in lb/A, TW = test weight in grams/100 seeds. Refer to 'Table of Herbicides Tested' for active ingredients of herbicides tested.

No crop injury was observed with any treatment when evaluated August 1. The temperature for several weeks prior to POST application was 90 to 98 F. Study was conducted in a weed free environment. Crop injury was observed as reduction in vegetative growth, slight leaf chlorosis on lower leaves only. Broadstrike + Treflan at 0.91/A is the labeled rate for the soil type at this location. Broadstrike + Treflan at 1.83 lb/A is twice the labeled rate. Herbicides had essentially no effect on growth and development of dry bean varieties.

Dry bean cultivar tolerance to herbicides, Hatton, 1996. (Zollinger and Grafton) An experiment was conducted to evaluate dry bean cultivar tolerance to herbicides. 'Othello' pinto, 'Topaz' pinto, 'Upland' navy and 'Montcalm' red kidney dry beans were seeded and soil applied treatments were applied on June 4 at 10:30 am with 68 F air, 57 F soil at 4 inches, 55% RH, 60% cloudy sky and 5-6 mph wind. PPI treatments were incorporated immediately after application with a rototiller set at 2 inches. POST treatments were applied on July 5 to 3- to 4-trifoliate dry bean with 95 F air, 104 F at soil surface, 90% RH, 40% cloudy sky and 5-10 mph wind. Treatments were applied to plots 20 ft wide by 50 ft long with a bicycle-wheel-type plot sprayer delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST applied treatments. The experiment was a randomized complete block design with a split plot arrangement and 4 replicates/treatment.

Treatment[a]	Rate	Othello	Topaz	Upland	Montcalm	Othello	Topaz	Upland	Montcalm
	lb/A	% injury							
PPI		25 DAT				50 DAT			
Broadstrike + Treflan	0.91	11	24	33	7	13	15	29	9
Broadstrike + Treflan	1.83	12	23	30	10	13	14	26	9
PPI fb POST		15 DAT				30 DAT			
Treflan/Basagran + Morac	0.75/0.75	0	0	0	0	5	5	5	5
Treflan/ Pursuit + X-77	0.75/0.5 oz	2	5	5	3	0	4	3	4
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		8	7	11	6	7	8	10	6

Treatment[a]	Rate	Othello Mat	Othello Yld	Othello TW	Topaz Mat	Topaz Yld	Topaz TW	Upland Mat	Upland Yld	Upland TW	Montcalm Mat	Montcalm Yld	Montcalm TW
	lb/A	DAP	lb/A	g/100	DAP	lb/A	g/100	DAP	lb/A	g/100	DAP	lb/A	g/100
PPI													
Broadstrike + Treflan	0.91	38	2300	33	37	2306	37.9	37	1426	15.8	46	1847	48
Broadstrike + Treflan	1.83	39	2396	34	37	1964	37.0	41	1560	16.0	47	1574	49
PPI fb POST													
Treflan/Basagran + Morac	0.75/0.75	38	2692	34	37	2608	40.7	43	2296	23.5	47	2408	56
Treflan/ Pursuit + X-77	0.75/0.5 oz	39	2079	37	38	2097	37.9	41	2287	16.8	46	2049	52
Untreated		38	1983	30	38	2190	41.1	41	2109	16.3	46	2136	51
LSD (0.05)		NS	300	4	NS	300	4	NS	300	4	NS	300	4

[a]X-77 was applied at 0.25% v/v, Mor-Act was applied at 1 qt/A. Mat = days to maturity or when 90% of pods turned buckskin, Yld = yield in lb/A, TW = test weight in grams/100 seeds. Refer to 'Table of Herbicides Tested' for active ingredients of herbicides tested.

No crop injury was observed with any treatment when evaluated August 1. The temperature for several weeks prior to POST application was 90 to 98 F. Study was conducted in a weed free environment. Crop injury was observed as reduction in vegetative growth, slight leaf chlorosis on lower leaves only. Broadstrike + Treflan at 0.9 lb/A is the labeled rate for the soil type at this location. Broadstrike + Treflan at 1.83 lb/A is twice the labeled rate. Herbicides had essentially no effect on growth and development of dry bean varieties.

PPI treatments in dry edible beans, Minto, 1996. (Zollinger and Brummond) An experiment was conducted to evaluate weed control and dry edible bean response to established and experimental herbicides in dry edible beans. 'Topaz', 'Winchester', Othello', and 'Fargo' pinto type dry edible bean varieties were seeded and PPI treatments were applied May 13 with 71 F air, 43 F soil at 4 inches, 45% RH, 30% clouds, and 0 to 4 mph wind.

Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

Treatment[a]	Rate	July 3 Topaz	Winchester	Othello	Fargo
	Product/A	% injury			
Eptam + Treflan	4 pt + 1 qt	1	1	3	1
Eptam + Sonalan	4 pt + 3.5 pt	1	0	0	0
Broadstrike + Treflan	2.25 pt	38	31	29	34
Broadstrike + Treflan	4.5 pt	48	45	45	49
Untreated		0	0	0	0
LSD (0.05)		8	9	9	8

[a]Refer to 'List of Herbicides Tested' for herbicide information.

The experiment was established as 28 treatments of soil applied and POST treatments. However, due to lack of weed pressure only crop response from the treatments listed were evaluated. The experiment was intended to Soil type was a sandy loam. The 2.25 (1X) rate of Broadstrike + Treflan rates was higher than labeled for soil type and organic matter content. Excess rainfall occurred after application. Some plots were under water for a period of time. This may have contributed to observed injury.

Eastern black nightshade control in pinto bean, Heaton 1996. (Endres and Lloyd) The experiment was conducted to evaluate eastern black nightshade control and pinto bean injury with Pursuit or Raptor (AC 299,263) and adjuvants. The experiment was established on medium loam soil with 6.8 pH and 2.4% organic matter. PPI Sonalan was applied over entire experiment. 'Othello' pinto bean was planted in 30-inch rows at the rate of 72,000 seeds/A on June 7, 1996. Treatments were applied July 9 with 55-56 F, 60-74% RH, clear sky, and 3-4 mph wind to 6-7 trifoliolate leaf pinto bean and cotyledon to 6-leaf eastern black nightshade. Treatments were applied to a 5 ft wide area the length of 7.5 by 25 ft plots with a hooded bicycle-wheel-type plot sprayer delivering 20 gal/A at 35 psi through 8002 flat fan nozzles. Visual estimates of percentage crop injury were taken July 19 and August 8. Visual estimates of percentage weed control were taken July 19 and September 24. Six feet of two bean rows/plot were hand-pulled on September 24 and machine threshed to determine seed yield. The experiment was a randomized complete block design with four replications.

		'Othello'			E. black nightshade control	
		Injury		Seed		
Treatment[a]	Rate	7/19	8/8	yield	7/19	9/24
	lb/A	-- %	---	lb/A	---- %	----
Untreated		0	0	1448.5	0	0
Basagran + Ultima 160 + MSO	0.75 + 0.2	0	0	1595.8	0	0
Pursuit + NIS	0.032	18	4	1651.9	88	83
Pursuit + MSO	0.024	12	2	2261.4	89	82
Pursuit + Basagran + MSO	0.024 + 0.5	1	0	1446.2	85	82
Raptor + NIS	0.032	11	3	1590.0	93	92
Raptor + MSO	0.032	18	5	1536.6	96	95
Raptor + Basagran + MSO	0.032 + 0.75	0	2	1369.1	95	93
LSD (0.05)		4	NS	NS	5	4
C.V. %		40	161	19	5	4

[a]NIS=Activator 90 applied at 0.25% v/v. MSO=Scoil applied at 1.5 pt/A.

Dry bean injury (leaf chlorosis and biomass reduction) ranged from 11-18% with Pursuit and Raptor 10 days after treatment (DAT). Bean injury was low 30 DAT. While early-season bean injury was less with Pursuit treatments at 0.024 lb/A compared to the 0.032 lb/A rate, eastern black nightshade control was similar. Basagran tankmixed with Pursuit or Raptor reduced bean injury 10 DAT, but nightshade control was not reduced. Raptor treatments provided full-season nightshade control (92-96%) and generally were greater than control with the Pursuit treatments. No seed yield differences were measured. This was possibly due to bean growth being more advanced than nightshade and thus the crop tolerated the weed pressure.

Acifluorfen applied in sunflower, Fargo 1996. Interstate '3311' hybrid sunflower was seeded May 29 in 30-inch rows. Treatments were applied July 2 with air temperatures 75 F, wind 5 mph, RH 22%, the sky sunny, and the soil surface dry to 10-inch and 10-leaf sunflower, 4- to 8-inch redroot pigweed with another flush in cotyledon stage, 4- to 8-inch common lambsquarters, and 4- to 10-inch wild mustard from rosette to bolt. Broadcast treatments were applied with a bicycle wheel plot sprayer equipped with 4 8001 flat fan nozzles and delivering 8.5 gal/A at 40 psi. Drop nozzle treatments were applied with an ATV sprayer equipped with a side mounted boom, 2 15-inch hose drops, and 2 8003 flat fan nozzles which delivered 15 gal/A at 28 psi and 5 mph. Nozzle height was adjusted so that the spray pattern was 30 inches wide at the soil surface. Shielded treatments were applied with an 8003E flat fan nozzle which delivered 25.5 gal/A at 40 psi. This nozzle was mounted 18 inches above the surface and in the top and center of a 24 inch wide Redball row crop spray shield and pulled by hand between rows. On July 5 treatments 1-12 were sprayed with 0.11 lb/A Prism + 1 Q/A POC to control grass weeds. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replicates. A visual estimate of percentage sunflower injury and weed control was made July 22.

Treatment	Rate	7/22 Sufl	Colq	Rrpw	Wimu
	oz/A	%			
Acifluorfen+NIS (Brdcst)	2+0.25%	13	24	40	97
Acifluorfen+NIS (Brdcst)	4+0.25%	28	34	45	99
Acifluorfen+NIS (Brdcst)	8+0.25%	33	38	50	99
Acifluorfen+MVO (Brdcst)	2+0.25%	24	31	48	97
Acifluorfen+MVO (Brdcst)	4+0.25%	29	30	51	91
Acifluorfen+MVO (Brdcst)	8+0.25%	41	35	53	99
Acifluorfen+NIS (Drop nozzle)	2+0.25%	2	25	29	70
Acifluorfen+NIS (Drop nozzle)	4+0.25%	2	26	43	95
Acifluorfen+NIS (Drop nozzle)	8+0.25%	3	23	41	87
Acifluorfen+MVO (Drop nozzle)	2+0.25%	2	20	28	55
Acifluorfen+MVO (Drop nozzle)	4+0.25%	4	20	41	87
Acifluorfen+MVO (Drop nozzle)	8+0.25%	6	38	58	99
Glyt-Ultra (Shielded)	3.75	0	79	84	84
Glyt-Ultra (Shielded)	1.88	1	74	79	81
Untreated	0	0	0	0	0
C.V. %		62	27	22	19
LSD 5%		11	13	14	23
# OF REPS		4	4	4	4

Summary

Acifluorfen at 2 oz/A broadcast applied with nonionic surfactant (NIS-Activator 90) or methylated vegetable oil (MVO-Scoil) effectively controlled wild mustard with slight to moderate injury to sunflower. Common lambsquarters or redroot pigweed control did not increase greatly with increases in acifluorfen rate applied broadcast. Aciflurofen applied through drop nozzles greatly reduced injury to sunflower without reducing common lambsquarters or redroot pigweed control. The lack of a weed control response to rate of acifluorfen indicates that weeds may have emerged after treatment. However, the shielded glyphosate applications were effective in controlling the broadleaf weeds. These results indicate that drop nozzles with acifluorfen or shielded glyphosate have potential for weed control in sunflowers planted in rows.

Hiniker no-till cultivator in sunflowers, Fargo 1996. On May 23 ethafluralin granules were broadcast applied at 1 lb ai/A on treatments 3, 4, and 5 using a Gandy airflow applicator set to spread 6 feet wide and with air temperature 64 F, wind 10-20 mph, RH 45%, and the sky cloudy. The soil was too wet to undercut so the granules were incorporated with one double wide pass of a Phoenix harrow. Interstate '3311' hybrid sunflower was seeded in 30-inch rows into untilled wheat stubble May 29 and the entire experiment was sprayed May 30 with 2.5 pt/A Roundup to kill emerged weeds. All POST treatments were applied June 17 with the broadcast treatments applied with a shielded bicycle wheel sprayer equipped with 8001 flat fan nozzles and delivering 8.5 gal/A at 40 psi and the 10 inch banded treatment applied with an ATV equipped with 2 4002E Twinjet nozzles and delivering 21 gal/A at 5 mph and 30 psi. Treatments 1, 2, and 4 were cultivated 2 inches deep with a 2-row Hiniker 6000 cultivator. Treatments 1 and 2 were cultivated again July 8. After each cultivation residue measurements were taken using 100 line transect observations per plot. A visual estimate of percentage sunflower injury was made July 3 and visual estimates of percentage weed control between rows and within rows were taken July 3 and 23. An area 2 rows wide by 20 feet long was harvested from each plot October 14. Plot size was 10 by 60 feet and the experiment was a randomized complete block design with four replicates.

	Method			7/05	7/22	7/3							7/23				
	of			Residue			In row			Between row			In row		Between row		10/14
Treatment[a]	Appl.	Cult.	Rate	cover		Sufl	Fxtl	Colq	Rrpw	Fxtl	Colq	Rrpw	Grass	Brdlf	Grass	Brdlf	Yield
		#	(lb/A)	— % —		—						% —					lbs/A
--		2		20	21	0	0	0	0	93	96	95	0	0	97	99	809
Seth+Immb+PO	banded	2	0.188+0.25+1Q	29	16	2	99	59	53	95	97	98	96	75	98	99	931
Seth+Immb+PO	brdcst	-	1+0.188+0.25+1Q	-	-	0	98	82	88	99	98	99	97	92	97	97	894
Etha-G(EPP)+Seth+Immb+POC	brdcst	1	1+0.188+0.25+1Q	26	-	3	99	74	93	99	99	99	99	94	99	99	1019
Hndwd+Etha(EPP)+S+Ib+POC	brdcst	-	1+0.188+0.25+1Q	-	-	4	99	96	97	99	98	99	98	91	98	91	937
C.V. %				17	34	183	1	40	26	3	2	2	3	15	3	6	23
LSD 5%				7	7	NS	1	38	27	4	NS	NS	4	16	NS	NS	NS
# OF REPS				4	4	4	4	4	4	4	4	4	4	4	4	4	4

[a]Hndwd=hand weeded; Etha=Etha-G; S=sethoxydim; and Ib=Imazamethabenz.

Summary

Weed densities in the area were sparse and emerged after the sunflower and thus were not competitive. Sunflower yield was not significantly different for treatments. But the cultivated only sunflower tended to yield less than those treated with herbicides, with or without cultivation. Weed control was greatest for treatments receiving preemergence treatments + POST treatments. Handweeding was not performed as weeds were controlled so treatment 4 and 5 are the same. Residue at the beginning of the experiment in spring was 90%. The undercutting cultivator did significantly reduce cover after the first cultivation but did not significantly after the second cultivation.

PRE and POST treatments in sunflower, NW-22, 1996. (Zollinger) An experiment was conducted to evaluate sunflower response and weed control from several non-labeled herbicides applied PRE, PRE followed by POST and POST treatments in sunflower. 'Interstate 3311' sunflower was seeded May 29 and PRE treatments were applied May 29 at 2:00 pm with 83 F air, 60 F soil at 4 inches, 40% RH, 5% clouds, and 5 to 9 mph wind. Assert and Prism were applied June 29 at 12:00 noon with 85 F air, 94 F at soil surface, 80% RH, 80% clouds and 3 to 7 mph wind to 6 to 10 leaf and 2 to 7 inch sunflower, 2 to 5 inch green and yellow foxtail and 4 to 10 inch tall rosette to bolt wild mustard.

Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with four replicates per treatment.

		July 3					July 22				
Treatment[a]	Rate	Snfl	Fxtl	Wimu	Rrpw	Colq	Snfl	Fxtl	Wimu	Rrpw	Colq
	lb ai/A	% inj	------	% control	-------		% inj	------	% control	-------	
PRE											
Prowl	1.5	0	81	59	78	79	0	45	50	30	20
Frontier	1.5	0	81	38	79	63	0	48	55	28	28
TopNotch	2.9	2	90	55	86	68	0	50	79	55	45
Authority	0.25	2	66	45	79	76	0	30	40	68	59
Authority	0.375	1	83	48	91	88	0	48	99	70	61
Frontier + Prowl	1.25 + 1.5	0	89	56	81	82	0	50	38	40	33
TopNotch + Prowl	2.9 + 1.5	5	90	53	89	80	0	59	81	74	69
Authority + Prowl	0.25 + 1.5	0	84	50	83	78	0	43	62	43	36
PRE fb POST											
Authority/Prism + PO	0.25/0.094	3	96	25	91	86	0	99	0	58	53
Authority/Prism + PO	0.25/0.125	1	96	25	82	77	5	99	45	53	43
POST											
Prism + Assert	0.094 + 0.25	26	92	99	10	6	18	99	99	38	28
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		4	9	18	13	18	7	17	21	18	18

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Herbimax was used as petroleum oil (PO) 1% v/v.

The study had a high infestation of redroot pigweed, green and yellow foxtail and a medium infestation of common lambsquarters and wild mustard. Less than 1 inch of precipitation occurred during the first 3 weeks after application which explains, in part, more limited control of foxtail, redroot pigweed and common lambsquarters than would expected with PRE herbicides activated through precipitation. Excellent sunflower safety was observed with all treatments except the treatment containing Assert. Assert was applied during very hot and humid conditions which contributed to stunting and yellowing observed at evaluation.

Sunflower response to Prism, NW-22, 1996. (Zollinger) An experiment was conducted to evaluate sunflower response and grass control from Prism applied POST in sunflower. 'Interstate 3311' sunflower was seeded in late May at all three locations and Prism was applied at NW-22 on June 29, at 12:00 noon with 85 F air, 94 F soil at soil surface, 80% RH, 80% clouds and 3 to 7 mph wind to 6 to 10 leaf and 2 to 7 inch sunflower, 4 to 6 inch wild oat, 2 to 5 inch green and yellow foxtail, 4 to 6 inch volunteer wheat, at Fargo on June 29 at 10:00 am with 78 F air, 86 F soil at soil surface, 70% RH, 50% clouds and 3 to 5 mph wind to 6 to 10 leaf and 2 to 7 inch sunflower, 3 to 6 inch wild oat, and 2 to 4 inch green and yellow foxtail, and at Crookston, MN on July 1 at 2:00 pm with 89 F air, 97 F soil at soil surface, 65% RH, 75% clouds and 3 to 10 mph wind to 6 to 10 leaf and 2 to 7 inch sunflower, 4 to 6 inch wild oat, and 2 to 5 inch green and yellow foxtail.

Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with four replicates per treatment.

		July 18									
		NW-22				Fargo			Crookston		
Treatment[a]	Rate	Snfl	Wioa	Fxtl	Wht	Snfl	Wioa	Fxtl	Snfl	Wioa	Fxtl
	lb ai/A	% inj	---- % control ----			% inj	- % control -		% inj	- % control -	
Prism + PO	0.094	2	93	92	90	0	99	95	2	97	99
Prism + PO	0.125	3	93	92	96	0	99	98	3	97	99
Prism + Assert + PO	0.094 + 0.25	5	93	91	86	15	99	97	9	99	99
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		3	3	5	4	5	3	4	3	3	3

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Herbimax was used as the petroleum oil (PO) and was applied at 1% v/v.

Prism provided excellent green and yellow foxtail, wild oat, and volunteer wheat control and excellent sunflower tolerance at all locations. Minor injury was due to Assert herbicide and sunflower beetle feeding. Sunflower injury observed from Assert plus Prism treatments exhibited characteristic Assert phytototoxicity of ALS stunting and yellowing.

Herbicide and insecticide tankmixes in sunflower, Carrington 1996. (Endres) The experiment was conducted to evaluate weed control and crop injury with herbicide and insecticide tankmixes. 'Wrangler 4' sunflower was solid seeded (7-inch rows) at the rate of 27,500 seeds/A on June 6, 1996. Treatments were applied July 3 with 65 F, 72% RH, overcast sky, and 12 mph wind to V6-V8 sunflower and 3-5 leaf green foxtail. Treatments were applied to a 6.67 ft wide area the length of 10 by 25 ft plots with a wand-type plot sprayer delivering 17.5 gal/A at 35 psi through 8002 flat fan nozzles. Visual estimates of percentage crop injury and weed control were taken July 17 and August 21 (R5 sunflower stage). The experiment was a randomized complete block design with four replications.

Treatment	Rate	Sunflower injury 7/17	Sunflower injury 8/21	Green foxtail control 7/17	Green foxtail control 8/21
	lb/A	%			
Untreated		0	0	0	0
Assert + Scoil	0.19 + 24 fl oz	0	0	54	23
Ultima 160 + Scoil	0.2 + 20 fl oz	0	0	97	98
Asana + Ultima 160 + Scoil	0.015 + 0.2 + 20 fl oz	0	0	98	99
Asana + Assert + Scoil	0.015 + 0.19 + 24 fl oz	0	0	43	0
Asana + Assert + Ultima 160 + Scoil	0.015 + 0.375 + 0.1 + 24 fl oz	0	0	92	99
LSD (0.05)				7	18
C.V. %				7	22

Sunflower injury did not occur with treatments including the herbicide and insecticide tankmixes. This likely was due to moderate temperatures and sunflower stage of growth during chemical application. Green foxtail control was not antagonized with the addition of Asana to treatments that included Ultima 160 + Scoil.

Sunflower response to Accent residue, NW-22, 1996. (Zollinger) An experiment was conducted to evaluate sunflower response to Accent residue. Corn was seeded at NW-22 on May 26, 1995 and Accent was applied on June 19, 1995 at with 95 F air, 46% RH, 10% clouds and 3 to 7 mph wind. Plots were roto-tilled and sunflower was seeded on May 29, 1996. Plots were sprayed 3 times with Asana for sunflower beetle control and once with Ultima 160 for grass control. Plots were not fertilized or cultivated.

Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

		July 3		October 10
Treatment[a]	Rate	Snfl	Snfl	Yield
	Product/A	------ % control	------	lb/A
Accent + NIS	0.67 oz	5	15	72
Accent + NIS	1.33 oz	6	3	89
Accent + NIS	2.67 oz	3	0	112
Untreated		9	11	52
LSD (0.05)		7	8	62

[a]Refer to 'List of Herbicides Tested' for herbicide and adjuvant information. Activator 90 was used for nonionic surfactant (NIS) at 0.25% v/v.

Uneven sunflower emergence occurred. Heavy sunflower beetle populations infested sunflowers shortly after emergence and caused injury. Some injury in the first rating was attributed to sunflower beetle activity. Asana was sprayed and sunflower readily recovered. Across the study, randomly about 1% or 2% of the plants had a white, puckered appearance. However, no ALS symptomolgy was exhibited. Sometimes the 2 inside rows were stunted more than the 2 outside rows within the same plot. Low yields at harvest were due to small heads in treated and untreated plots. Small heads may have been due to low fertility levels caused by escaped weeds in 1995 and no fertilizer applied in 1996.

Leafy spurge control with quinclorac, a regional study. Lym, R. G., K. G. Beck, R. Becker, E. Davis, M. A. Ferrell, J. Harris, and R. Masters. During the 1993 GPAC-14 annual meeting several weed scientists met to discuss the potential of quinclorac for leafy spurge control. Initial evaluations of the herbicide had varied by state. However, researchers had applied quinclorac at various leafy spurge growth stages and/or with dissimilar or no adjuvants. It was decided to establish a regional trial to evaluate quinclorac applied alone or with adjuvants and/or other herbicides.

Researchers from six states established the regional quinclorac experiment in the fall of 1993. The regional quinclorac trial was established in 1993 when leafy spurge was in the fall-regrowth growth stage. Previous research had shown that quinclorac provided the best leafy spurge control when fall-applied. Herbicides were applied from 16 Sept. in North Dakota to 13 Oct. in Nebraska in 1993 and reapplied in 1994 (Table 1). Herbicides were applied either using a tractor-mounted or a hand-held sprayer. The adjuvant Scoil, a methylated-seed oil, was applied with most treatments. Evaluations were based on a visual estimate of percent stand reduction as compared to the control.

Leafy spurge control with quinclorac varied by region when evaluated in June 1994, 9 months after treatment (MAT). Control averaged better than 90% in CO, MN, MT, and NE but was much lower in ND and WY where control only averaged 69% (Table 2). It is not known why control was lower in ND and WY compared to the other states but picloram plus 2,4-D, the standard treatment, also was much lower. The best overall treatment was a combination of quinclorac plus picloram plus Scoil which provided 95% control averaged over all states. No grass injury was reported at any location.

Control 12 MAT again varied sharply by location (Table 3). For example, control with quinclorac at 16 oz/A ranged from 82% in NE to 29% in WY with an overall average of 58%. The most consistent control again was with the combination treatment of quinclorac plus picloram plus Scoil which averaged 74%. Quinclorac at 16 or 20 oz/A provided similar or better control than picloram plus 2,4-D at 8 + 16 oz/A at all locations. Control was similar whether quinclorac was applied alone or with Scoil.

All treatments were reapplied in 1994 to the same plot area and provided excellent leafy spurge control at all locations except Wyoming in June 1995, which was 21 months after the first treatment (MAFT) (Table 4). Quinclorac at 16 oz/A alone or with Scoil provided 98% control in all states except Wyoming which averaged 70%. Control increased to 92% in Wyoming when quinclorac was applied at 20 oz/A with Scoil.

Control gradually declined regardless of treatment in September 1995, 24 MAFT in all states except Minnesota (Table 5). The research area in Montana could not be evaluated because it had been hayed, and an early snow storm in Nebraska prevented accurate evaluations. In general, quinclorac at 16 oz/A plus Scoil provided similar control to picloram at 8 oz/A and picloram plus 2,4-D at 8 + 16 oz/A. Quinclorac plus Scoil tended to provide better long-term leafy spurge control than quinclorac applied alone. All treatments 24 MAFT in Minnesota provided excellent leafy spurge control except quinclorac at 12 oz/A plus Scoil and picloram at 8 oz/A.

The experiment was terminated after the June 1996 evaluations, 33 MAFT. The best leafy spurge control was at the MN and MT locations where quinclorac at 20 oz/A and quinclorac plus picloram at 12 + 8 oz/A still averaged 90% and 97% control, respectively. These treatments averaged 95% and 62%, respectively in ND, but only 61% and 50%, respectively in WY. Quinclorac at 16 oz/A applied with Scoil provided similar control to quinclorac alone at all locations except ND.

Two desirable attributes of quinclorac were observed during the research. There was never any injury observed to desirable forage grasses at any location. Also, the researchers noted that quinclorac did not injure many desirable broadleaf species including lead plant, purple prairie clover and red clover in NE, prairie wild rose, willow, and anemone in ND, wild rose and wild raspberry in MN. In contrast, these species are injured by treatment with either picloram or 2,4-D. Thus, quinclorac could applied from the Great Plains to the Inter-Mountain West without damage to the grass species and many desirable broadleaf species.

Leafy spurge control with quinclorac varied by region, as did the standard treatment of picloram plus 2,4-D. Since quinclorac provided leafy spurge control at least equal to picloram plus 2,4-D, the herbicide would be a useful addition to the leafy spurge control program. The extent of quinclorac use will depend on marketing and cost. The herbicide may also be useful in areas where picloram and 2,4-D cannot be used due to environmental restrictions.

Table 1. Establishment of GPAC-14 regional quinclorac study for leafy spurge control.

Location	Date	Researcher	Leafy spurge Height	Leafy spurge Growth stage	Air temp.	Relative humidity	Soil Temp.	Soil Moist.	Soil pH	Soil Type
			inches		F	%	F			
Colorado	10 Oct 93	K.G. Beck	14 to 24	Fall-45% red	57	65	50	Dry	6.5	60:30:10
	3 Oct 94		14 to 18	Fall-70% red	61	71	59	Dry		
Minnesota	23 Sept 93	R. Becker	20 to 30	Fall regrowth	58	44	53	Moist	6.9	4.7%
	8 Sept 94		11 to 18	Vegetative	84	45	64	Dry		OM
Montana	17 Sept 93	E. Davis	12 to 24	Fall regrowth	54	78	50	Moist	7.8	Loam
	19 Sept 94	J. Harris	12 to 16	Vegetative	63	55	55	Dry		
North	16 Sept 93	R. Lym	18 to 24	Fall regrowth	61	69	53	Moist	8.1	Silty-
Dakota	16 Sept 94		6 to 24	Vegetative	64	70	62	Moist		clay
Nebraska	13 Oct 93	R. Masters	5 to 15	Fall regrowth	67	49	50	Moist		Sand
	29 Sept 94		8 to 20	Fall regrowth	87	31	52	Dry		Sand
Wyoming	21 Sept 93	M. Ferrell	16 to 24	Fall regrowth	58	37	65	Mod	6.2	32:47:21
	16 Sept 94		16 to 24	Mature	67	43	80	Mod		

Table 2. Summary of GPAC-14 regional quinclorac study for leafy spurge, June 1994.

Treatment	Rate	Control 9 MAT[a]						Mean		
		CO	MN	MT	NE	ND	WY	CO MN MT NE	ND WY	All
	— oz/A —	% control								
Quinclorac + Scoil	12 + 1 qt	69	100	93	100	52	61	91	57	79
Quinclorac + Scoil	16 + 1 qt	81	100	90	100	44	72	93	58	81
Quinclorac + Scoil	20 + 1 qt	80	100	99	100	58	82	95	70	87
Quinclorac	16	84	100	93	100	63	76	94	70	86
Quinclorac + picloram + Scoil	12 + 8 + 1 qt	91	100	98	100	93	89	97	91	95
Picloram	8	91	100	99	100	73	76	98	75	90
Picloram + 2,4-D	8 + 16	88	100	91	100	61	58	95	60	83
Control		0	0	0	0	0	0	0	0	0
LSD (0.05)		12	0	6	0	41	22	3	23	8

[a]Months after treatment.

Table 3. Summary of GPAC-14 regional quinclorac study for leafy spurge control, September 1994.

Treatment	Rate	Control 12 MAT[a]						Mean	
		CO	MN	MT	NE	ND	WY	CO MN WY	All
	— oz/A —	% control							
Quinclorac + Scoil	12 + 1 qt	35	41	60	60	30	40	39	44
Quinclorac + Scoil	16 + 1 qt	58	53	61	73	15	58	56	52
Quinclorac + Scoil	20 + 1 qt	48	73	84	73	31	73	64	63
Quinclorac	16	50	65	65	82	29	63	59	58
Quinclorac + picloram + Scoil	12 + 8 + 1 qt	70	67	82	97	58	76	71	74
Picloram	8	58	52	64	88	26	53	54	55
Picloram + 2,4-D	8 + 16	61	52	61	78	32	38	50	53
Control		0	0	0	0	0	0	0	0
LSD (0.05)		18	13	15	40	38	23	10	10

[a]Months after treatment.

Table 4. Summary of GPAC-14 regional quinclorac study for leafy spurge control, June 1995.

Treatment	Rate	Control 21 MAFT[a] CO	MN	MT	NE	ND	WY	Mean Except WY
	— oz/A —	— % control —						
Quinclorac + Scoil	12 + 1 qt	90	93	93	97	100	60	94
Quinclorac + Scoil	16 + 1 qt	100	96	98	100	100	70	98
Quinclorac + Scoil	20 + 1 qt	100	99	100	100	100	92	99
Quinclorac	16	97	99	99	100	99	76	99
Quinclorac + picloram + Scoil	12 + 8 + 1 qt	100	100	100	100	100	91	100
Picloram	8	96	99	98	97	100	91	100
Picloram + 2,4-D	8 + 16	100	94	94	100	100	45	97
Control		0	0	0	0	0	0	0
LSD (0.05)		7	5	5	5	0.5	25	2

[a]Months after the first treatment.

Table 5. Summary of GPAC-14 regional quinclorac study for leafy spurge control, September 1995.

Treatment	Rate	Control 21 MAFT[a] CO	MN	MT[b]	NE[b]	ND	WY	Mean except MN
	— oz/A —	— % control —						
Quinclorac + Scoil	12 + 1 qt	50	75			76	63	63
Quinclorac + Scoil	16 + 1 qt	78	94			71	74	74
Quinclorac + Scoil	20 + 1 qt	76	99			80	92	83
Quinclorac	16	63	97			62	79	68
Quinclorac + picloram + Scoil	12 + 8 + 1 qt	84	99			82	92	87
Picloram	8	77	81			56	69	67
Picloram + 2,4-D	8 + 16	83	90			63	45	64
Control		0	0			0	0	0
LSD (0.05)		20	10			14	25	12

[a]Months after the first treatment.
[b]The research plots could not be evaluated in MT and were abandoned in NE in September 1995.

Table 6. Summary of GPAC-14 regional quinclorac study for leafy spurge control, June 1996.

Treatment	Rate	CO[b]	MN	MT	NE[c]	ND	WY	Mean MN & MT
		Control 33 MAFT[a]						
	— oz/A —	% control						
Quinclorac + Scoil	12 + 1 qt		75	69		62	23	72
Quinclorac + Scoil	16 + 1 qt		94	75		52	28	82
Quinclorac + Scoil	20 + 1 qt		99	82		62	50	90
Quinclorac	16		97	76		37	25	85
Quinclorac + picloram + Scoil	12 + 8 + 1 qt		99	95		95	61	97
Picloram	8		81	92		67	34	87
Picloram + 2,4-D	8 + 16		90	84		72	14	82
Control			0	0		0	0	0
LSD (0.05)			10	16		26	26	10

[a]Months after the first treatment.

[b]Plots were over-sprayed and could not be evaluated.

[c]The research plots were abandoned in September 1995.

Leafy spurge control with glyphosate plus 2,4-D alternated with picloram or dicamba. Rodney G. Lym. Several long-term management alternatives provide a choice of herbicides and duration of leafy spurge control. When leafy spurge infests an area that can be treated annually, then dicamba at 2 lb/A or picloram plus 2,4-D at 0.25 + 1 lb/A spring-applied will provide 85% or better leafy spurge control after 3 to 5 years. However, when these herbicides are fall applied, the picloram rate must be increased to 0.5 lb/A with 2,4-D to provide similar leafy spurge control to the spring treatment and is no longer cost-effective. Glyphosate plus 2,4-D at 0.4 + 0.6 lb/A applied in the fall provides 70 to 90% control but can cause severe grass injury. The purpose of this research was to evaluate glyphosate plus 2,4-D applied in late-June annually or rotated with various auxin herbicides for leafy spurge control.

The initial experiments were established on June 21 and June 28, 1993, near Jamestown and Valley City, North Dakota, respectively. Herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. Leafy spurge was in the late-flower to early seed-set growth stage at both locations. Retreatments for the second experiment were applied in June 1994 and 1995 at both locations when leafy spurge was in the vegetative to flowering growth stage. The soil at both locations was a loam with a 6.8 pH. The grass species present were generally bluegrass and smooth brome with occasional wheatgrass. Visual evaluations were based on percent stand reduction as compared to the control.

Glyphosate plus 2,4-D generally provided similar initial leafy spurge control to picloram plus 2,4-D and dicamba in the first months after application (data not shown), but provided better long-term control 12 months after treatment (MAT) in the first year of a rotational program (Table 1). Grass injury 3 MAT averaged 15% with glyphosate plus 2,4-D at 0.4 + 0.6 lb/A (data not shown) but declined to near zero the second year even when glyphosate plus 2,4-D was applied for 2 consecutive years. In general, leafy spurge control was similar with glyphosate plus 2,4-D applied alone or with picloram until 39 months after the first treatment (MAFT) at Jamestown where the addition of picloram improved control over glyphosate plus 2,4-D alone.

Control was better at Valley City than Jamestown 24 MAFT and averaged 76% and 47%, respectively, over all treatments (Table 1). However, within a location, control was similar regardless of treatment following the 1994 applications. The original 1993 treatments were reapplied in 1995 to the same plots. Control averaged 91% over all treatments at Valley City 36 MAFT but was much lower at Jamestown which only averaged 71%. The original 1994 treatments were reapplied in June 1996. Again control 39 MAFT averaged 95% or higher with all treatments at Valley City, but varied at Jamestown.

A second series of experiments was established to further evaluate glyphosate plus 2,4-D alone at reduced rates or in rotation with auxin herbicides for leafy spurge control. The experiments were established at the Ekre experiment station, and near Fort Ransom and Jamestown in 1995. The herbicides were applied as previously described except the picloram plus 2,4-D and dicamba treatments were applied in mid-June during the leafy spurge true-flower growth stage and the glyphosate plus 2,4-D treatments in late June during seed-set. Thus, in the second set of experiments both the auxin herbicides and the glyphosate plus 2,4-D treatments were applied at the optimum growth stage for each herbicide treatment.

In general, control in 1996 was less than in previous years regardless of treatment (Tables 1 and 2). The reason for the reduced control may be due to high air temperature at application in 1995, which ranged from 72 to 83 F during application and quickly warmed to the upper 80s to 90s F a few hours after treatment. The warm conditions may have caused too rapid absorption of the herbicide and/or rapid death to the phloem and xylem resulting in poor herbicide movement to the roots. This was evidenced by many plants that had dead leaves and stems in the upper portions, but had green stems near the soil surface. New growth emerged from the green stems approximately 6 weeks after treatment. In the previous experiments the stem tissue had been killed to the soil surface.

Control 12 MAT with glyphosate plus 2,4-D averaged 65%, which was better than the picloram plus 2,4-D or dicamba treatments which only averaged 37% (Table 2). Glyphosate alone did not control leafy spurge as well as glyphosate plus 2,4-D. Glyphosate plus 2,4-D at 0.4 + 0.6 lb/A and 0.3 + 0.46 lb/A provided similar leafy spurge control, but control declined with further rate reduction. Approximately 30% grass injury was observed with the glyphosate plus 2,4-D treatments at Ekre, but injury was minimal to none at the other two locations. Brome grass was frequently injured but bluegrass was not injured or only slightly injured at any location.

Control 15 MAFT was similar for most treatments (3 months after the 1996 retreatments) (Table 2). In general, control was similar when glyphosate plus 2,4-D was applied 2 years in a row or rotated with picloram plus 2,4-D or dicamba and averaged 77%. Glyphosate plus 2,4-D applied 2 years in a row was the least costly treatment at $18/A but there was an average of 15% grass injury. The cost rose to $22/A when picloram + 2,4-D at 0.25 + 1 lb/A was applied following glyphosate + 2,4-D but the treatment provided consistent control with little grass injury. Picloram plus 2,4-D applied 2 years in a row tended to provide the best control regardless of application rate but cost $26 to $46/A depending on the picloram rate. Dicamba treatments were too costly for the leafy spurge control provided.

Glyphosate plus 2,4-D should be used in a long-term leafy spurge management program. The treatment costs approximately $4 to $5/A less than picloram plus 2,4-D at 0.25 + 1 lb/A, provides better control 12 MAT, and can be used in areas with a high water table. The 15 to 20% grass injury is of minor concern especially if glyphosate plus 2,4-D is used as an initial treatment in a dense stand where grass production is already severely reduced.

Table 1. Leafy spurge with glyphosate plus 2,4-D, either applied alone or with picloram and/or alternated with auxin herbicides over 4 years, applied in late June at two locations in North Dakota.

1993 and 1995 Treatment	Rate	1994 and 1996 Treatment	Rate	12 MAFT[a] Control	12 MAFT[a] Grass injury	24MAFT[a] Control	36 MAFT[a] Control	36 MAFT[a] Grass injury	39 MAFT[a] Control	39 MAFT[a] Grass injury
	— lb/A —		— lb/A —	%						
Jamestown										
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Gly+2,4-D[b]+X-77	0.4+0.6+0.5%	47	0	48	71	8	55	40
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Picloram+2,4-D	0.25+1	59	0	54	64	0	77	0
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Dicamba+X-77	2+0.5%	68	0	53	67	0	75	0
Picloram+2,4-D	0.25+1	Picloram+2,4-D	0.25+1	23	0	27	53	0	93	0
Dicamba+X-77	2+0.5%	Dicamba+X-77	2+0.5%	22	0	32	71	0	91	0
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Gly+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	65	0	61	79	0	86	21
Glyphosate+2,4-D[b]+pic[c]+X-7	0.4+0.6+0.25+0.5%	Picloram+2,4-D	0.25+1	69	0	44	76	0	91	0
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Dicamba+X-77	2+0.5%	65	0	53	86	0	94	0
LSD (0.05)				18	...	NS	NS	NS	11	17
Valley City										
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Gly+2,4-D[b]+X-77	0.4+0.6+0.5%	88	0	67	76	11	95	98
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Picloram+2,4-D	0.25+1	94	5	81	97	10	99	0
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Dicamba+X-77	2+0.5%	93	0	89	97	8	98	0
Picloram+2,4-D	0.25+1	Picloram+2,4-D	0.25+1	43	0	70	93	1	98	0
Dicamba+X-77	2+0.5%	Dicamba+X-77	2+0.5%	30	0	71	89	3	95	0
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Gly+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	91	0	81	97	14	97	71
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Picloram+2,4-D	0.25+1	80	0	68	96	6	96	0
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Dicamba+X-77	2+0.5%	86	0	84	84	8	99	0
LSD (0.05)				17	3	NS	16	NS	3	38

[a]MAFT = months after first treatment.
[b]Commercial formulation - Landmaster BW.
[c]Picloram.

Table 2. Leafy spurge control with glyphosate plus 2,4-D alternated with auxin herbicides averaged over three locations in North Dakota.

1995		1996		Control		Grass injury	Total
Treatment	Rate	Treatment	Rate	12 MAFT[a]	15 MAFT[a]	15 MAFT[a]	cost
	– lb/A –		– lb/A –	%			$/A
Glyphosate + 2,4-D[b]	0.4 + 0.6	Glyphosate + 2,4-D	0.4 + 0.6	61	75	15	18
Glyphosate + 2,4-D[b]	0.4 + 0.6	Picloram + 2,4-D	0.25 + 1	69	77	6	22
Glyphosate + 2,4-D[b]	0.4 + 0.6	Dicamba	2	64	71	0	50
Picloram + 2,4-D	0.25 + 1	Picloram	0.25 + 1	36	83	3	26
Dicamba	2	Dicamba	2	37	77	3	82
Picloram + 2,4-D	0.5 + 1	Picloram + 2,4-D	0.5 + 1	39	83	3	46
Glyphosate	0.4	Picloram + 2,4-D	0.25 + 1	44	84	1	20
Glyphosate	0.4	Dicamba	2	43	61	4	47
Glyphosate + 2,4-D[b]	0.3 + 0.46	Glyphosate + 2,4-D	0.3 + 0.46	59	65	2	13
Glyphosate + 2,4-D[b]	0.2 + 0.3	Glyphosate + 2,4-D	0.2 + 0.3	39	56	5	9
LSD (0.05)				18	12	9	

[a]Months after first treatment.
[b]Commercial formulation - Campaign.

Imazameth for leafy spurge control. Rodney G. Lym. Imazameth (AC 263,222) has shown promise for leafy spurge control, especially when applied in the fall. Imazameth is classified as an ALS enzyme inhibitor with similar chemistry to imazapyr, imazaquin, and imazethapyr. These herbicides all provide fair to good leafy spurge control with some grass injury especially to cool-season species. The manufacturer has begun to sell imazameth for leafy spurge control in the region with limited research data available to the public. The purpose of this research was to evaluate imazameth for leafy spurge control as a fall-applied treatment in North Dakota.

The experiment was established on September 18, 1995, when leafy spurge was in the fall-regrowth stage and 18 to 36 inches tall with some red stems and leaves. The air temperature was 63 F, and the soil temperature at the 4 inch depth was 56 F. A light frost occurred the following morning and a killing frost of 24 F occurred on September 20. Herbicides were applied with a hand-held sprayer delivering 8.5 gpa at 35 psi. The soil was a silty clay with a 8.0 pH and 5.4% organic matter. The grass species present were generally bluegrass, prairie cordgrass, and ryegrass with some brome grass. Visual evaluations were based on percent stand reduction as compared to the control.

		Control		Grass injury	
Treatment	Rate	9 MAT[a]	12 MAT[a]	9 MAT[a]	12 MAT[a]
	— oz/A —		%		
Imazameth	2	79	13	11	3
Imazameth	4	92	8	25	5
Imazameth (fall) / (spring)[b]	2/1	78	25	10	25
Imazameth	8	100	99	64	42
Picloram + 2,4-D	8 + 16	54	23	0	2
LSD (0.05)		15	23	20	22

[a]Months after treatment.
[b]Sequential treatment.

Leafy spurge control in June 1996, 9 months after treatment (MAT) increased as imazameth rate increased and averaged 79 to 100% when imazameth was applied from 2 to 8 oz/A, respectively. Grass injury to cool-season species ranged from 10 to 64% with significant injury to the warm-season prairie cordgrass. Control decreased rapidly by 12 MAT for all treatments, except imazameth at 8 oz/A which averaged 99% control with 42% grass injury. Imazameth as a sequential treatment at 2 plus 1 oz/A did not improve leafy spurge control compared to imazameth at 2 oz/A alone but did result in more grass injury. Since this experiment was established imazameth has been labeled for leafy spurge control at 0.125 to 0.19 lb/A with methylated seed oil and nitrogen fertilizer adjuvants. The inclusion of the adjuvants in this study may have improved leafy spurge control, but also may have increased grass injury. Imazameth is currently being evaluated at lower rates, alone and with additives, and as a spring-applied treatment in an effort to obtain good leafy spurge control with minimal grass injury in North Dakota.

Leafy spurge control with *Aphthona nigriscutis* alone or combined with herbicides. Rodney G. Lym, Don A. Mundal, and Robert B. Carlson. An experiment to evaluate the effect of herbicide application timing on biocontrol insect population and leafy spurge control was established on a private farm near Cuba, North Dakota. Approximately 500 *Aphthona nigriscutis* were released in July 1989 in a moderately dense patch of leafy spurge. The insects established and began to spread to other patches of leafy spurge within the pasture prior to the beginning of this experiment.

The experiment was established in two patches of leafy spurge approximately 5000 square feet each and about 100 yards apart. The treatments included picloram plus 2,4-D at 0.5 plus 1 lb/A fall applied, picloram plus 2,4-D at 0.25 plus 1 lb/A spring applied, and an untreated control. Herbicides were applied annually beginning with the initial spring treatment on June 5, 1992, and the first fall treatment on September 10, 1992. Herbicides were reapplied at similar dates from 1993 to 1995. The plots were 15 by 50 feet, and treatments were replicated four times (two per patch). *A. nigriscutis* population was evaluated by sweep counts with a standard insect collection net and are reported as a mean of three counts/plot with five sweeps per count. Leafy spurge root samples were harvested annually in October, and carbohydrate and protein content were analyzed as a measure of root vigor.

Leafy spurge stem density declined rapidly when herbicides were fall applied to plants infested with *A. nigriscutis* (Table 1). The leafy spurge stand declined from 41 stems/0.25 m^2 in 1992 to 3 stems/0.25 m^2 the following year. Leafy spurge gradually declined with the insect alone treatment from 47 stems/0.25 m^2 in 1992 to 1.5 stems/0.25 m^2 by May 1995. Both the insect alone and fall-applied herbicide plus insect treatments provided more rapid leafy spurge stem reduction than the spring-applied herbicides plus insects treatment. Herbicides applied in June prevent the adult flea beetles from feeding on those plants, and thus probably reduce egg laying and subsequent larvae feeding.

Leafy spurge stem density recovered more rapidly from the insect alone treatment than from either herbicide plus insect treatment (Tables 1 and 2). For example, leafy spurge control averaged 73% with the insect alone treatment in May 1995, but declined rapidly once the adult flea beetles emerged (i.e., large larvae that had fed on roots pupated and then emerged) and only averaged 47 and 31% control in July and September 1995, respectively (Table 2). Leafy spurge control with the fall-applied herbicide plus insect treatment averaged slightly over 80% in May and July 1995 before declining to 60% in September.

Leafy spurge stem density was lower in 1996 than 1995 regardless of treatment, but the combination treatment of insects plus herbicides provided better control than the insects alone (Table 1). Leafy spurge control remained high in 1996 and declined only slightly from the June to September evaluation dates compared to the same time in 1995. Control averaged 91% in September 1996 with the two combination treatments compared to 79% control with the insects alone (Table 2). Since herbicide application was stopped after 1995, the decline is likely due to the insects alone.

The *A. nigriscutis* population gradually increased over time (Table 3); the population generally reached peak numbers in the first week of July each year (Table 3). Despite the increased leafy spurge control when fall-applied herbicides were combined with the flea beetles, there generally were less than half as many adults found on those herbicide treated plants compared to untreated plants. There was not much regrowth for the adults to feed on until late summer and fall, when flea beetle populations begin to naturally decline. Thus, even though the initial combination of control methods was synergistic, the fall-applied treatments had to be discontinued to prevent the flea beetles from completely abandoning the research area.

Root nutrient reserves as measured by water-soluble sucrose, starch, and protein content declined from 1993 to 1995 (Table 4). However, the decline was similar regardless of treatment except for the initial sucrose concentration and the glucose concentration in 1995. Previous research at North Dakota State University has shown that root nutrient content, especially root proteins, are a good indicator of root vigor. Thus, these nutrient reserves can estimate a treatment's effect on the root system and thus long-term control that cannot be evaluated from visual evaluations and stand counts.

Table 1. Leafy spurge density after treatment with *Aphthona nigriscutis* alone or combined with herbicide treatments near Cuba, ND.

		Date of evaluation							
Treatment[a]	Rate	June 1992	May 1993	May 1994	Sept 1994	May 1995	Sept 1995	June 1996	Sept 1996
	- lb/A -	no./0.25 m^2							
Picloram+2,4-D (spr)	0.25+1	55	52	34	19	4	10	6	2
Picloram+2,4-D (fall)	0.5+1	41	3	3	23	0.1	13	0.1	3
Insects only	. . .	47	38	25	30	1.5	17	3	9
LSD (0.05)		7	7	5	5	2	3	2	2

[a]Herbicides applied in June or September annually for 1992 to 1994.

Table 2. Leafy spurge control after treatment with *Aphthona nigriscutis* alone or combined with herbicides.

Treatment[a]	Rate	Visible control						
		May 1993	May 1994	May 1995	July 1995	Sept 1995	June 1996	Sept 1996
	- lb/A-	%						
Picloram+2,4-D (Spring)	0.25+1	6	35	91	60	73	88	93
Picloram+2,4-D (Fall)	0.5+1	93	94	81	84	60	99	90
Insects only	. . .	19	45	73	47	31	90	79
LSD (0.05)		11	10	NS	35	23	11[b]	7

[a]Herbicides applied in June or September annually for 1992 to 1994.
[b]LSD = 10%.

Table 3. Effect of herbicide application on *Aphthona nigriscutis* population 3 yr after the biocontrol insect had established.

Treatment and date[a]	Rate	*A. nigriscutis* counts[b]/year				
		1992	1993	1994	1995	1996
	lb/A	no./m^2				
Picloram+2,4-D (Spring)	0.25+1	1	0	19	76	25
Picloram+2,4-D (Fall)	0.5+1	21	52	40	30	18
Insects only	. . .	12	28	132	70	96
LSD (0.05)		5	16	63	26	29

[a]Herbicides applied in June or Sept. annually from 1992 through 1995.
[b]Maximum number obtained in weekly or biweekly sweepings from June through Sept.

Table 4. Sucrose, starch, and protein content of leafy spurge roots after introduction of *Aphthona nigriscutis* and either with or without herbicide treatment near Cuba, ND.

Treatment and application date	Rate	Sucrose[a]			Starch[b]			Protein[c]		
		93	94	95	93	94	95	93	94	95
	– lb/A -	mg/g								
Picloram + 2,4-D[d] (spring)	0.25 + 1	151	116	96	137	143	92	27	17	20
Picloram + 2,4-D[d] (fall)	0.5 + 1	153	103	92	147	128	90	27	21	19
Insect only	. . .	180	126	127	158	156	150	28	25	18
Untreated[e]	. . .	171	. .	. .	123	. .	. .	39	. .	. .
LSD (0.05)		19	NS	NS	NS	NS	30	NS	NS	NS

[a]Water-soluble carbohydrate fraction.
[b]Water-insoluble carbohydrate fraction.
[c]Soluble crude protein.
[d]*Apthona nigriscutis* were introduced in 1989, and herbicides were applied in June or Sept. from 1992 to 1994 for spring or fall application, respectively.
[e]Samples collected in insect free area near experiment.

<u>Leafy spurge control with *Aphthona nigriscutis* combined with herbicides in a sandy soil.</u> Rodney G. Lym and Calvin G. Messersmith. The leafy spurge flea beetle, *Aphthona nigriscutis*, has been successfully established in North Dakota since 1988. Flea beetles have been redistributed to all counties in North Dakota with varying establishment success. The best soil type needed for *Aphthona* spp. establishment is not well defined. However, establishment has been especially poor in very sandy soils such as those found on the Sheyenne National Grasslands in Ransom County. Previous research at North Dakota State University has shown that leafy spurge control and flea beetle populations ares increased when herbicides are used in conjunction with the *Aphthona* spp. biocontrol insects.

An experiment to evaluate the effect of herbicide application timing on biocontrol insect establishment and leafy spurge control in sandy soil was established at the Ekre Experiment station near Walcott, North Dakota. Approximately 3,000 *Aphthona nigriscutis* were released June 28, 1993, and initial stand density was evaluated. The insects were established on a south-west facing slope. The soil was a loamy-sand similar to the Sheyenne National Grasslands, with a sand:silt:clay content of 85:10:5.

The herbicide treatments included picloram plus 2,4-D at 0.5 plus 1 lb/A fall applied, picloram plus 2,4-D at 0.25 plus 1 lb/A spring applied, and an untreated control (insect only). The initial fall treatment was applied on September 23, 1993 and the spring treatment on June 22, 1994. The spring and fall treatments were reapplied to the same plots in 1994 and 1995. The plots were 15 by 50 feet and all treatments were replicated four times. *A. nigriscutis* population was evaluated by sweep counts with a standard insect collection net and are reported as a mean of three counts/plot with five sweeps per count. Leafy spurge roots were evaluated for root nutrient content by collecting root samples in October 1994 and 1995 for carbohydrate and protein analyses. The nutrient content is a measure of the long-term effect of a treatment on the leafy spurge root system.

A. nigriscutis established at the Ekre experiment station, but the population was low and only averaged 1 beetle/m^2 in 1994, 1 yr after release (Table 1). The number of beetles increased slightly to 5 beetles/m^2 in 1995 in the insect only treatment. However, the number of insects declined in 1996 to an average of 3 beetles/m^2.

The initial fall-applied herbicide treatment with insects reduced leafy spurge stem density from an average of 34 stems/0.25 m^2 to only 4 stems/0.25 m^2 9 months after treatment (Table 1). However, by August 1994 leafy spurge stem density had returned to an average of 20 stems/m^2, which was slightly higher than the stem density in the insect alone treatment (data not shown). Stem density averaged only 2 stems/m^2 in June 1996, but the decrease was due only to the herbicide application because stem density in the insect only plots remained at 24 stems/m^2.

Picloram plus 2,4-D spring applied over the insects provided slightly better control than the insects alone in May 1995 after two annual applications (Table 1). Stem density averaged 17 stems/0.25 m^2 following two spring herbicide treatments compared to 28 stems/0.25 m^2 with the insect only treatment; the latter was the same density as when the experiment was established. Density declined to 6 stems/m^2 by May 1996.

The spring-applied treatment of picloram plus 2,4-D reduced the sucrose and starch content of leafy spurge roots in the first year of the experiment (Table 2). Both herbicide-insect combination treatments reduced the sucrose content of leafy spurge roots in 1995. No treatment reduced the protein content of the roots. In general, initial leafy spurge control at the Ekre station was only due to the herbicides picloram plus 2,4-D. The insects alone had not reduced the infestation 2 years after release.

Table 1. Herbicide interaction with *Aphthona nigriscutis* for control of leafy spurge at the Ekre research station.

		Leafy spurge stand counts				*A. nigriscutis* count[b]		
		1993	1994	1995	1996			
Treatment[a]	Rate	July	May	May	June	94	95	96
	– lb/A –	no./0.25 m²				no./m²		
Picloram+2,4-D (spring)	0.25+1	35	26	17	6	0.7	1	5
Picloram+2,4-D (fall)	0.5+1	34	4	1	2	0.7	1	2
Insects only	0	30	28	28	24	1.6	5	2
LSD (0.05)		NS	5	4	3	NS	3.5	NS

[a]Herbicides applied Sept and June in 1993 and 1994 for fall or spring application, respectively.
[b]3000 insects released June 28, 1993, and evaluated in mid-June each year thereafter..

Table 2. The effect of *A. nigriscutis* alone or combined with herbicides on leafy spurge root carbohydrate and protein content at the Ekre research station.

		Sucrose[a]		Starch[b]		Protein[c]	
Treatment	Rate	1994	1995	1994	1995	1994	1995
	– lb/A –	mg/g					
Picloram + 2,4-D (spring)	0.25+1	117	97	146	102	24	16
Picloram + 2,4-D (fall)	0.5 + 1	132	93	207	132	35	17
Insects only	. . .	149	140	213	152	34	22
LSD (0.05)		22	12	45	NS	NS	NS

[a]Water-soluble carbohydrate fraction.
[b]Water-insoluble carbohydrate fraction.
[c]Soluble crude protein.

Herbicide application on an established *Aphthona* spp. flea beetle insectary for leafy spurge control. Katheryn M. Christianson and Rodney G. Lym. The flea beetles, *Aphthona czwalinae* and *A. lacertosa*, were released as biocontrol agents in a dense stand of leafy spurge near Valley City, North Dakota, in 1988. The flea beetles established very well at this location. Collection and redistribution of these insects has occurred since 1992, with over 25 million insects collected in 1995 alone. The leafy spurge stem density has decreased and plant emergence has been delayed often until July 1 or later. Previous research at North Dakota State University has shown that leafy spurge control increased when herbicides were used in conjunction with the biocontrol insects. The purpose of this research was to evaluate the effect of herbicide treatments on leafy spurge control and *Aphthona* spp. population at an established insectary.

The experiment was established on August 15, 1995, when the leafy spurge was in the vegetative growth stage. The insect feeding delayed emergence, so the leafy spurge was 12 to 24 inches tall and still in the vegetative growth stage about 2 months later than normal. There were three herbicide application dates, August 15 and 31, and September 14, 1995. Herbicides were applied using a hand-held sprayer delivering 8.5 gpa at 35 psi. The plots were 15 by 50 feet in a randomized complete block design with four replications. Evaluations were based on a visual estimate of percent stand reduction as compared to the control.

Treatment	Application date	Rate	Control 9 MAT[a]	Control 12 MAT[a]	Grass injury 9 MAT[a]	Grass injury 12 MAT[a]
		— lb/A —	—— % ——		%	
Picloram + 2,4-D	Aug 15	0.5 + 1	100	82	0	0
2,4-D	Aug 15	1	100	80	0	0
Glyphosate + 2,4-D[b]	Aug 15	0.3 + 0.46	99	94	34	8
Picloram + 2,4-D	Sept 1	0.5 + 1	100	84	0	0
2,4-D	Sept 1	1	99	88	0	0
Glyphosate + 2,4-D[b]	Sept 1	0.3 + 0.46	99	90	23	0
Picloram + 2,4-D	Sept 15	0.5 + 1	100	78	0	0
2,4-D	Sept 15	1	99	83	0	0
Glyphosate + 2,4-D[b]	Sept 15	0.3 + 0.46	99	83	70	14
Insects only		...	99	77	0	0
LSD (0.05)			NS	NS	12	5

[a]Months after treatment.
[b]Commercial formulation - Landmaster BW.

Leafy spurge control was greater than 99% for all treatments 9 months after treatment (MAT)(Table). Grass injury ranging from 23 to 70% occurred with all glyphosate plus 2,4-D treatments regardless of application date. Leafy spurge control 12 MAT by insects alone averaged 77% compared to an average of 85% when herbicides were combined with insects. Leafy spurge control with the combination treatments of herbicides and biocontrol insects was similar or slightly increased compared to the insect alone, but leafy spurge was not eliminated.

Aphthona spp. flea beetle movement along railroad right-of-ways. Katheryn M. Christianson, Rodney G. Lym, and Calvin G. Messersmith. Leafy spurge is often found in long narrow corridors such as railroad right-of-ways where it is difficult to treat. Two experiments were conducted to determine the establishment, population increase, and movement of *Aphthona* species flea beetles on a railroad right-of-way.

A. nigriscutis was released on June 28, 1993 in a dense stand of leafy spurge along a 2.5 mile stretch of the Burlington Northern railroad right-of-way near Buffalo, ND. There were five treatments consisting of 100, 200, 300, 400, and 500 adult insects distributed per release point. Release points were 260 feet apart, and treatments were replicated three times. Stem density and adult flea beetle population were monitored in the spring and summer, respectively, at the release point and at distances 10, 25, and 40 feet in a semicircle pattern from the release point.

A. nigriscutis flea beetles were found in all treatments each year after release, and leafy spurge stem density began to decline in 1995 (Table 1). The stem density decreased from an average of 18 stems/0.25 m^2 in 1993 to 7 stems/0.25 m^2 in 1996. The greatest stem density decrease was 72% when 500 beetles/treatment were released. This decrease occurred 10 feet from the release point for all treatments where beetle populations were the highest. *A. nigriscutis* populations in the 300 and 400 insects/release point treatments averaged 8 beetles/m^2 compared to 3 beetles/m^2 or less for all other treatments.

A similar experiment was established on July 10, 1995 with a mixed population of *A. czwalinae* and *A. lacertosa* along the Red River Valley and Western railroad right-of-way near Lisbon, ND. The number of insects used was increased to 500, 1000, 1500, and 2000 adults per treatment. Release points were 150 feet apart, and treatments were replicated four times. Stem density and adult flea beetle population were monitored in the spring and summer, respectively, at the release point and at distances of 10, 30, 50 and 70 feet in a circular pattern around the release point.

A. czwalinae were found at all release sites in 1996 (Table 2). The average stem density in the 2000 insects/release point declined from 21 stems/m^2 to 15 stems/m^2 1 year following release, while stem density in all other treatments was unchanged. Flea beetles will establish on industrial sites such as railroad right-of-ways. The larger the number of insects released, the more rapid the leafy spurge stem density declined. This method is more economical and may provide more long-term control than chemical methods presently used.

Table 1. *Aphthona nigriscutis* establishment after release in 1993 and leafy spurge control along the Burlington Northern railroad right-of-way near Buffalo, ND.

Treatment/	Sweep count			Leafy spurge stand count[d]			
No. of insects released[a]	1994[b]	1995[c]	1996[c]	1993	1994	1995	1996
	insects/m²			no./0.25 m²			
100	2	2	1	17	16	11	5
200	2	4	2	16	19	17	11
300	2	8	8	19	18	13	9
400	3	9	8	19	17	12	6
500	4	4	3	18	15	10	5
LSD (0.05)	NS	3	4	NS	NS	3	2

[a]Insects released June 28, 1993.

[b]Mean of 15 subcounts of 5 sweeps each at a distance of 10 to 25 feet from the release point in a semicircle.

[c]Mean of 45 subcounts of 5 sweeps each at a distance of 10 to 40 feet from the release point in a semicircle.

[d]Stand counts are an average of 21 subcounts taken from 10 to 40 feet from the release point in a semicircle.

Table 2. *Aphthona czwalinae/lacertosa* establishment after release in 1995 and leafy spurge control along the Red River Valley and Western railroad right-of-way near Lisbon, ND.

Treatment	Sweep count in 1996[b]		Leafy spurge stand count[c]	
No. of insects released[a]	June 27	July 9	Aug 1995	June 1996
	insects/m²		no./0.25 m²	
500	1	2	26	26
1000	1	2	28	31
1500	1	5	27	23
2000	2	3	21	15
LSD (0.05)	NS	NS	NS	8

[a]Insects released July 11, 1995.

[b]Mean of 47 subcounts of 5 sweeps each at a distance of 10 to 70 feet from the release point in a semicircle.

[c]Mean of 13 subcounts/rep at a distance of 10 to 70 feet and 10 to 30 feet from the release point in an oval.

Picloram plus 2,4-D applied annually for 13 years to control leafy spurge. Lym, Rodney G., and Calvin G. Messersmith. Picloram is an effective herbicide for leafy spurge control, especially when applied at rates from 1 to 2 lb/A. However, the high cost of picloram at 1 to 2 lb/A makes it uneconomical to treat large acreages in pasture and rangeland weed control programs. Research by North Dakota State University has suggested that picloram at 0.25 to 0.5 lb/A applied annually will give satisfactory leafy spurge control after 3 to 5 yr. The purposes of this experiment were to establish the number of annual applications of picloram needed to provide 90 to 100% control of leafy spurge and to investigate possible synergism between picloram and 2,4-D.

The experiment was established at three locations in North Dakota and began on 25 August 1981 at Dickinson, 1 September 1982 at Sheldon, and on 11 June 1982 at Valley City. Dickinson had a loamy fine sand soil with pH 6.6 and 3.6% organic matter, Sheldon had a fine sandy loam with pH 7.7 and 2.1% organic matter, and Valley City had a loam with pH 6.7 and 9.4% organic matter. Dickinson, located in western North Dakota, generally receives much less precipitation than the other two sites located in eastern North Dakota. All treatments were applied annually except 2,4-D alone which was applied biannually (both spring and fall). Picloram and picloram plus 2,4-D were applied in late August 1981 and in June of 1982 through 1986. The Sheldon and Dickinson locations were discontinued following the fall evaluations in 1985 and spring evaluations in 1989, respectively. The Valley City site has received ten picloram and picloram plus 2,4-D treatments and 20 2,4-D treatments prior to the evaluation in June 1992. The plots were 10 by 30 ft and each treatment was replicated four times in a randomized complete block design. Evaluations were a visual estimate of percent stand reduction as compared to the control.

Leafy spurge control averaged 79% across all treatments 48 months after first treatment (MAFT) and declined slightly to 71% following the 1988 drought (60 and 72 months MAFT) before increasing to 87% in 1990 (84 MAFT) (Table). Leafy spurge control 96 MAFT (June 1991) increased by an average of 24, 12, and 9% when 2,4-D at 1 to 2 lb/A was applied with picloram at 0.25, 0.38 or 0.5 lb/A, respectively, as compared to picloram alone. However, by 108 MAFT (June 1992) only control with picloram at 0.25 lb/A was increased by 2,4-D and averaged 68 and 85%, respectively. In general, the 2,4-D rate did not influence control when applied with picloram. Leafy spurge control averaged 80% with 2,4-D alone following 10 yr of biannual treatments.

Picloram at 0.5 lb/A alone and all picloram at 0.38 or 0.5 lb/A plus 2,4-D treatments provided or nearly provided the target of 90% leafy spurge control following four annual applications (Table). Control did not increase or increased only slightly with subsequent retreatments in these small plot experiments which have a constant pressure for reinfestation from plants in the plot borders. Since control had not or only slightly changed since 1987, the retreatments were discontinued after 1995. The only leafy spurge topgrowth observed in 1995 was in the control plots and from encroachment from plot borders.

To evaluate the longevity of control after the annual and biannual treatments had been discontinued, picloram at 2 lb/A was applied to the control plots and all borders in Sept. 1995. Leafy spurge control averaged over 97% in June 1996 12 months after the treatments had been discontinued (Table). However, by September 1996 control had declined to an average of 51% in the 2,4-D only plots. Thus, even after 13 yr of biannual treatments of 2,4-D, leafy spurge regrew rapidly the year after treatments had been discontinued. In comparison, leafy spurge control with all picloram alone and picloram plus 2,4-D treatments averaged 96%. There was a trend for treatments containing picloram at 0.5 lb/A to provide better long-term control than treatments containing picloram at 0.25 or 0.375 lb/A.

Table. Leafy spurge control with annual picloram or picloram plus 2,4-D treatments and biannual 2,4-D treatments from 1982 to 1995 in North Dakota.

		1996		Months after first treatment									
Herbicide	Rate	June	Sept.	12[a]	24	36	48	60	72	84	96	108	120
	lb/A	% control											
Picloram	0.25	100	95	39	48	48	58	49	38	64	56	68	96
Picloram	0.38	100	95	65	62	52	77	69	67	96	72	91	99
Picloram	0.5	100	97	65	71	81	86	77	71	92	81	91	99
2,4-D biannually	1	97	48	22	30	38	50	39	55	70	69	74	82
2,4-D biannually	1.5	95	53	22	24	26	45	49	49	62	57	66	74
2,4-D biannually	2	95	52	19	30	26	54	54	62	75	67	78	83
Picloram+2,4-D	0.25+1	100	87	52	66	63	85	73	76	92	80	85	95
Picloram+2,4-D	0.25+1.5	100	94	58	66	70	85	77	62	88	73	82	99
Picloram+2,4-D	0.25+2	100	92	57	62	66	83	76	77	91	88	88	99
Picloram+2,4-D	0.38+1	100	95	69	72	70	90	84	76	96	82	89	97
Picloram+2,4-D	0.38+1.5	100	95	68	74	76	93	84	79	88	83	92	99
Picloram+2,4-D	0.38+2	100	99	68	59	76	91	86	82	96	86	95	99
Picloram+2,4-D	0.5+1	100	99	71	75	84	94	87	82	96	84	97	99
Picloram+2,4-D	0.5+1.5	100	99	64	73	80	97	91	88	99	95	98	99
Picloram+2,4-D	0.5+2	100	99	76	75	81	95	91	88	99	90	96	99
LSD (0.05)		3	18	18	14	19	14	14	15	19	17	14	10
Mean of treatments		99	87	52	55	63	79	72	70	87	78	86	94

[a]Mean values through 48 and 72 months after first treatment include data from the Sheldon and Dickinson locations which were discontinued after 1985 and 1989, respectively.

General broadleaf weed control in pasture. Rodney G. Lym and Katheryn M. Christianson. Perennial and biennial pasture weeds compete with pasture and rangeland grasses for nutrients and moisture. Effective weed control will result in higher forage production and quality. However, to be cost-effective, a treatment must provide both broad spectrum and long-term weed control with minimal cost. The purpose of this research was to evaluate several herbicides alone and in combination for long-term cost-effective broadleaf weed control in pasture.

The experiment was established in a pasture that contained a variety of broadleaf weeds on the NDSU Ekre Experiment Station (Table 1). Herbicides were applied on June 4 or June 24, 1996, when most of the weeds were in the vegetative growth stage. Treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 45 psi. The plots were 15 by 50 feet and replicated four times in a randomized complete block design. The June 4 treatments were applied to the left side of the plots (7.5 feet) and the June 24 treatments were applied to the right side (7.5 feet). Initial weed control was visually evaluated on July 16, 1996 with follow-up observations made on August 30, 1996.

Most treatments controlled goldenrod, joe pyeweed, and wild licorice but only metsulfuron + 2,4-D provided even minimal mint control (Table 2). All treatments provided 80% or more goldenrod and joe pyeweed control when applied on June 4, except triasulfuron alone and dicamba applied alone or with 2,4-D. However, no treatment provided satisfactory control when applied 3 weeks later. The later application date (June 24) was best for wild licorice control when nearly all treatments averaged 100% except triasulfuron alone and glyphosate + 2,4-D. Only 2,4-D provided 100% wild licorice control when treatments were applied on June 4. Metsulfuron + 2,4-D applied on June 4 provided about 70% mint control but early evaluations were quite variable from plot to plot.

The experiment could not be evaluated in August 1996 because of very dry conditions which led to poor regrowth and severe grasshopper damage in many plots. However, observations were made on general weed control. Triasulfuron alone did not provide satisfactory control of any of the weeds evaluated. When triasulfuron was applied with 2,4-D, picloram, and dicamba, control was similar to the auxin herbicides applied alone. Metsulfuron + 2,4-D provided good to excellent control of most broadleaf plants in the pasture but at $20 to $40/A is a very expensive treatment. Triasulfuron + 2,4-D and 2,4-D alone generally provided acceptable control of most broadleaf weeds except mint. In the short term, 2,4-D alone was the most cost-effective treatment evaluated. The combination treatments of 2,4-D plus triasulfuron, metsulfuron, clopyralid, dicamba, or picloram likely will provide longer-term control than 2,4-D alone.

It is anticipated all broadleaf weeds listed in Table 1 will be evaluated for control in spring 1997. Evaluation 12 months after treatment will provide the best evidence for long-term control of these pasture and rangeland weeds.

Table 1. Broadleaf plants in the experiment and their height when treated.

Scientific name	Common name	Application date 4 June	24 June
		inches[a]	
Aster novae-angliae L.	New England aster	2 - 4	4 - 8
Asclepias syriaca L.	Common milkweed	4 - 6	6 - 8
Cirsium flodmanii (Rydb.) Arthur	Flodman thistle	Rosette	6 - 10
Eupatorium maculatum L. var. *bruneri* (A. Gray) Breitung	Joe pyeweed	2 - 4	6 - 8
Glycyrrhiza lepidota (Nutt.) Pursh	Wild licorice	2 - 4	24 - 36
Onosmodium molle Michx. var. *occidentale* (Mack.)	False gromwell	2 - 4	4 - 6
Solidago missouriensis Nutt.	Missouri goldenrod	2 - 4	4 - 8
Solidago rigida L.	Rigid goldenrod	8 - 12	12 - 24
Verbena stricta Vent.	Hoary vervain	4 - 8	8 - 16
Vicia spp.	Vetch (various)	6 - 10	12 - 24

[a]All plants were in the vegetative growth stage except the *Vicia* spp. which were at the early flower growth stage on June 24.

Table 2. Multi-species broadleaf weed control in pasture, with herbicides applied on June 4 or 24, 1996, and evaluated on July 16, 1996. near Walcott, ND.

			Goldenrod/joe pyeweed		Mint		Wild licorice		Grass injury	
Treatment	Cost	Rate	4 June	24 June	4 June	24 June	4 June	24 June	4 June	24 June
	-$/A-	– oz/A –	% control						% control	
Triasulfuron+X-77	2.25	0.28+0.25%	44	13	0	3	25	38	0	0
Triasulfuron+X-77	4.50	0.56+0.25%	54	15	3	11	35	8	0	0
Triasulfuron+dicamba+X-77	15.50	0.56+8+0.25%	81	31	3	8	7	100	0	0
Triasulfuron+picloram+X-77	14.50	0.56+4+0.25%	83	19	33	16	33	100	0	0
Triasulfuron+2,4-D+X-77	6.00	0.56+8+0.25%	78	38	44	22	30	100	0	0
Triasulfuron+2,4-D+X-77	7.50	0.56+16+0.25%	86	25	50	18	21	100	0	0
Metsulfuron+2,4-D+X-77	20.00	1+8+0.25%	99	23	71	25	55	100	0	0
Metsulfuron+2,4-D+X-77	40.00	2+16+0.25%	94	36	67	33	8	100	4	0
2,4-D	3.00	16	80	19	25	20	100	100	0	0
Glyphosate+2,4-D[a]	8.00	6.4 + 9.6	80	18	3	12	40	68	14	1
Dicamba	11.00	8	63	15	7	13	13	100	0	0
Clopyralid+2,4-D[b]	9.00	1.5+8	88	23	33	23	7	100	0	0
Dicamba+2,4-D[c]	7.50	4+11.5	75	23	3	29	9	100	0	0
Picloram+2,4-D	12.00	4+16	91	34	38	23	15	100	0	0
LSD (0.05)			23	NS	NS	16	NS	45	5	NS

[a]Commercial formulation-Landmaster BW.

[b]Commercial formulation-Curtail.

[c]Commercial formulation-Weedmaster.

Perennial sowthistle and Canada thistle control. Rodney G. Lym. Perennial sowthistle and Canada thistle have become an increasing problem in cropland in North Dakota following several seasons of high precipitation. Canada thistle has also substantially increased in pasture and rangeland. The purpose of this experiment was to evaluate perennial sowthistle and Canada thistle control using clopyralid or dicamba alone or with various formulations of 2,4-D.

The experiment was established in a mixed dense stand of thistles on June 13, 1996, when the plants were in the rosette to bolting growth stage. Canada thistle was 3 to 6 inches tall, while perennial sowthistle was 4 to 10 inches tall. Treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The experiment was in a randomized complete block design with four replications. The plots were 10 by 30 feet. Treatments were visually evaluated for percent control on September 5, 1996 which was 12 weeks after treatment.

Treatment	Rate	Perennial sowthistle	Canada thistle
	lb/A	% control	
2,4-D[a]	1	40	59
2,4-D[a]	2	86	71
2,4-D[b]	1	26	61
2,4-D[b]	2	61	80
Clopyralid	0.2	93	96
Dicamba	0.35	40	16
2,4-D[a] + clopyralid	0.25 + 0.0625	96	89
2,4-D[a] + clopyralid	0.5 + 0.125	95	89
2,4-D[a] + clopyralid	1 + 0.25	100	100
2,4-D[a] + clopyralid	1 + 0.2	100	99
2,4-D[b] + clopyralid	1 + 0.2	100	100
Clopyralid + 2,4-D[c]	0.19 + 1	90	94
2,4-D[a] + dicamba	0.25 + 0.0625	20	19
2,4-D[a] + dicamba	0.5 + 0.125	69	68
2,4-D[a] + dicamba	1 + 0.25	85	58
2,4-D[a] + dicamba	1 + 0.35	93	78
2,4-D[d] + dicamba	1 + 0.35	82	70
Dicamba + 2,4-D[d]	0.31 + 0.89	97	89
LSD (0.05)		29	26

[a]Mixed amine salts of 2,4-D (2:1 dimethylamine:diethanolamine) - Hi-Dep

[b]Mixed amine salts of 2,4-D (3:2 triisopropanolamine:dimethylamine) -Formula 40

[c]Commercial formulation - Curtail

[d]Commercial formulation - Weedmaster

Perennial sowthistle and Canada thistle control were similar and averaged 75% 12 weeks after treatment (Table). Clopyralid at 0.2 lb/A controlled an average of 93% and 96% of perennial sowthistle and Canada thistle, respectively, and was similar when applied alone or with 2,4-D at comparable rates. Dicamba at 0.35lb/A only provided 40% and 16% perennial sowthistle and Canada thistle control. However, perennial sowthistle and Canada thistle control improved to 91% and 79%, respectively, when dicamba was applied with 2,4-D. Control with 2,4-D was similar regardless of formulation and whether applied alone or combined with another herbicide.

Canada thistle control for industrial areas. Katheryn M. Christianson and Rodney G. Lym. Total vegetation control often is a goal for weed control in industrial and non-crop areas such as railroad rights-of-way. Canada thistle is an invasive perennial weed and often is the first plant to regrow in industrial and utility areas. There are many broadleaf herbicides available to control Canada thistle. The objective of this experiment was to evaluate several herbicides alone and in combination for Canada thistle control in industrial areas.

The experiment was established on a dense stand of Canada thistle on September 12, 1995, at the North Dakota State University Experiment Station at Fargo. The soil was Fargo silty clay with 3.5% organic matter and a 8.0 pH. The plants were in the rosette to early bolt growth stage, 6 to 8 inches tall. The treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The plots were 10 by 30 feet arranged in a randomized complete block design with four replications. Treatments were visually evaluated for percent Canada thistle control and bareground compared to the untreated control. All treatments provided greater than 90% Canada thistle control 9 months after treatment (MAT) except clopyralid plus 2,4-D at 4 + 24 oz/A and both dicamba + 2,4-D treatments (Table). All treatments containing metsulfuron or chlorsulfuron provided total vegetation control and averaged 94% bareground. Treatments containing picloram, dicamba, or clopyralid did not give complete vegetation control.

Canada thistle control declined slightly 12 MAT for all treatments but still exceeded 90% except for both metsulfuron plus 2,4-D treatments and dicamba plus 2,4-D at 4 + 11.5 oz/A which averaged 71% control (Table). Treatments containing chlorsulfuron at rates higher than 0.75 oz/A maintained 87% or higher bareground 12 MAT. Chlorsulfuron plus 2,4-D at 0.75 + 16 oz/A and metsulfuron plus 2,4-D at 0.6 + 16 oz/A averaged 45% bareground. No other treatment provided even short-term total vegetation control. In general, kochia and annual grasses were the first plants besides Canada thistle to begin regrowth in this study. Metsulfuron or chlorsulfuron with 2,4-D provided the best total vegetation control of the herbicides evaluated, with chlorsulfuron plus 2,4-D sustaining the best Canada thistle control.

Table. Canada thistle control for industrial areas.

Treatment	Rate	Control		Bareground	
	– oz/A –	— % —		— % —	
Metsulfuron + 2,4-D	0.3 + 16	97	79	85	29
Metsulfuron + 2,4-D	0.6 + 16	93	68	94	50
Chlorsulfuron + 2,4-D	0.75 + 16	95	82	92	41
Chlorsulfuron + 2,4-D	1.5 + 16	99	91	98	87
Chlorsulfuron + 2,4-D	2.25 + 16	100	90	98	92
Chlorsulfuron	1.125	97	91	94	77
Picloram	4	94	92	20	10
Picloram	8	98	96	24	10
Clopyralid	4	91	98	21	9
Clopyralid	8	96	93	26	13
Clopyralid + 2,4-D[b]	2 + 12	94	94	21	11
Clopyralid + 2,4-D[b]	4 + 24	82	86	20	10
Dicamba + 2,4-D[c]	4 + 11.5	72	67	16	13
Dicamba + 2,4-D[c]	8 + 23	87	96	27	13
LSD (0.05)		16	18	12	14

[a]Months after treatment.
[b]Commercial formulation - Curtail.
[c]Commercial formulation - Weedmaster.

NDSU perennial weed demo experiment 193.
Leafy spurge demonstration plots, Ekre station.

Annual application date and treatment	Cost[a]	Rate	Control/MAFT[b] 12	24	36
	$/A	— lb/A —	——	%	——
September 1993					
Picloram + 2,4-D amine	28	0.5+1	80	95	90
Picloram	25	0.5	70	98	97
Picloram + 2,4-D amine	14	0.25+1	48	65	88
2,4-D amine	6	2	5	40	0
Dicamba	36	2	20	50	85
Glyphosate + 2,4-D[c]	8	0.4+0.6	25[d]	45[f]	10[h]
June 1994					
Picloram	13	0.25	30	75	
Fosamine	80	8	77	95[g]	
Picloram + 2,4-D amine	28	0.5+1	65	97	
Picloram	25	0.5	45	78	
Picloram + 2,4-D amine	14	0.25+1	•[e]	60	
2,4-D amine	6	2	•[e]	0	
Dicamba	36	2	•[e]	25	
Glyphosate + 2,4-D[c]	8	0.4+0.6	•[e]	15	

[a]Annual treatment cost, but does not include application cost.
[b]Months after first treatment.
[c]Commercial formulation (Landmaster BW).
[d]Grass injury was 60% in June 94 and 10% in Sept.
[e]Rain fell within 2 hours of treatment, resulting in much below average control.
[f]Grass injury was 60%.
[g]Grass injury was 20%.
[h]Grass injury was 100% and treatment was discontinued.