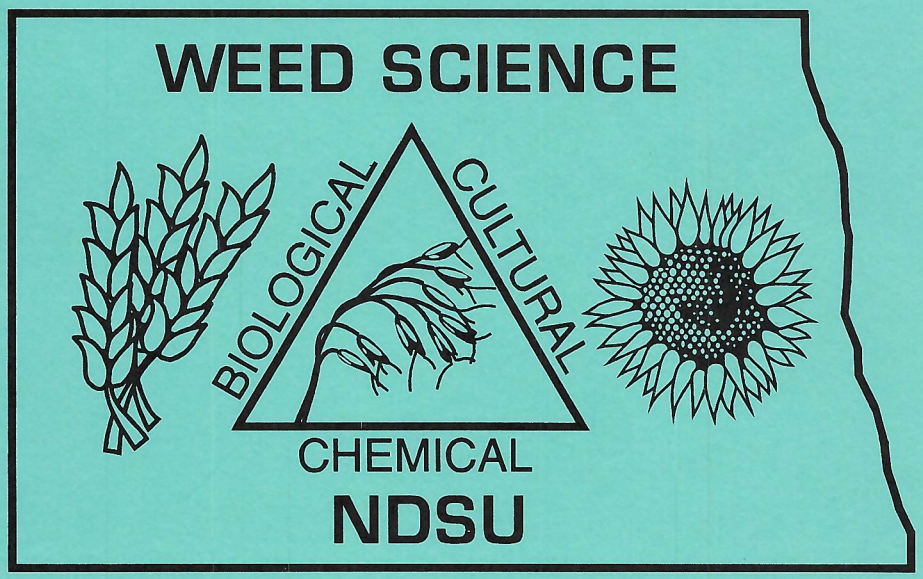
1995
NORTH DAKOTA
Weed Control Research



Weed Research Projects, Department of Crop and Weed Sciences
NORTH DAKOTA STATE UNIVERSITY
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NOT FOR PUBLICATION

SUMMARY OF 1995
WEED CONTROL EXPERIMENTS

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Reference to commercial products or trade names is made with no intended endorsement, and failure to mention products or trade names is done with no intended discrimination by North Dakota State University. Experiments with pesticides on non-labelled crops or target species does not imply endorsement of non-labelled uses of pesticides by North Dakota State University.

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CLIMATIC DATA-, Carrington, 1995

	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	50	39	82	53	70	40	80	53	85	56
2				.09	.04		53	31	60	41	83	53	67	50	90	59	84	54
3		.01		.01			37	8	53	41	85	54	72	58	72	52	86	50
4		.03		.45			27	4	63	33	84	56	67	55	79	52	89	60
5		.01	.06	.45		.71	48	25	61	40	82	62	63	50	84	55	74	60
6		.16	.08			.02	38	23	58	44	83	52	74	48	87	63	65	44
7		.26	.56	.76		.04	48	26	71	49	52	44	80	52	88	64	58	38
8		.56				.04	32	19	57	47	58	43	78	58	87	51	64	33
9		.35				.04	32	21	50	41	68	38	84	59	81	52	68	36
10						.06	39	26	66	37	69	48	84	64	80	48	76	44
11				.02	.15	.05	33	29	72	46	72	39	90	68	76	56	77	52
12		.08		.25	.05	.07	54	32	57	38	77	45	89	64	79	59	85	56
13				.17			59	31	43	36	84	56	81	65	81	52	75	47
14		.05		2.47			58	35	68	32	88	57	78	59	78	53	71	36
15	.56						46	33	76	37	91	68	79	56	90	52	85	52
16	.03						39	32	55	35	90	70	69	57	88	63	64	37
17	.01			.13			48	28	64	30	92	70	74	54	93	70	65	39
18						.03	45	33	71	38	87	66	81	53	79	51	64	39
19						.04	50	30	68	45	88	60	71	55	83	50	49	31
20			.34	.81			50	32	65	38	89	64	78	53	89	50	47	28
21	.01	.54	.19	.14	.79	.03	51	30	69	41	76	63	77	60	80	51	43	24
22							61	27	53	38	79	62	75	55	94	63	56	22
23	.13	.14	.71				50	32	60	33	74	62	83	54	77	56	61	36
24	.01	.14	.01		.50		49	31	54	41	62	57	72	57	67	59	62	36
25	.09		.06		.01		45	33	60	37	65	53	75	54	76	59	73	40
26		.06			.02	.05	43	30	59	44	74	50	81	58	74	57	76	39
27		.01		.34	.02		44	34	63	50	74	58	80	62	77	60	79	39
28							42	32	71	49	67	56	77	54	76	55	82	47
29	.07		.14			.03	47	34	78	46	63	52	84	51	84	55	70	46
30	.01				.01		54	38	81	54	64	44	79	55	76	51	55	38
31									82	57			73	50	80	44		

CLIMATIC DATA-, Casselton 1995

	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							39	26	58	40	84	53	70	44	73	49	80	51
2		.02					41	26	58	40	83	55	80	56	79	55	87	51
3				.75			56	31	63	42	83	56	70	58	87	57	85	54
4		.01		.40			44	5	56	43	84	55	70	58	77	53	87	57
5		.07		.85			27	5	67	40	86	63	66	58	84	65	90	64
6		.35	.03	.92		1.10	53	24	63	45	88	62	60	53	84	70	75	63
7			.80			.12	35	25	62	50	86	48	79	51	85	65	70	41
8		.02	.02				51	21	66	50	58	41	80	51	92	66	60	37
9		.8			.01		37	25	66	44	64	46	80	51	86	49	66	36
10		.34	.13				36	25	45	41	74	48	84	65	86	50	71	42
11	.12				.06		38	25	62	39	76	45	87	62	87	60	74	49
12	.16			.67			38	29	69	42	76	47	91	67	87	60	78	57
13				1.09	.60		52	30	73	43	82	51	90	67	76	53	88	59
14		.14		.18			60	33	61	37	87	55	85	64	81	52	77	57
15	.46					.23	62	34	71	38	91	67	79	62	86	52	79	39
16							40	35	74	41	94	71	81	61	86	60	81	54
17				1.02			41	30	55	32	93	73	76	57	86	67	67	37
18							45	34	64	38	99	68	78	57	89	70	71	37
19				.22		.05	51	30	72	44	92	67	82	57	93	47	72	39
20							53	31	77	41	94	67	77	56	90	52	55	26
21							56	33	68	37	95	65	80	59	90	56	54	28
22		.07	.03	.12	.25		57	29	73	47	95	65	83	56	88	57	47	22
23			.18				64	40	58	33	89	68	80	57	89	57	54	34
24					.01		52	32	66	38	81	59	84	58	83	59	62	35
25		.33					53	36	65	37	75	60	77	54	74	61	75	37
26			.02				53	30	66	37	76	59	75	55	74	57	77	39
27		.13	.28				45	31	59	51	79	62	81	60	80	60	78	39
28			.33			.03	47	34	66	46	79	62	85	60	80	60	79	39
29							50	31	71	45	79	56	80	52	78	61	86	54
30						1.25	58	40	81	46	71	52	85	60	83	61	65	52
31									83	55			88	56	84	51		

CLIMATIC DATA-, Crookston, 1995

	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				.09	39	29	58	40	86	60	72	49	79	58	82	56
2		.24		.03	.12		49	27	60	42	85	57	71	53	86	59	85	55
3	.05	.11					33	3	59	38	86	66	78	62	77	53	85	62
4		.03		.81		.04	24	4	63	32	87	65	68	59	83	56	90	61
5	.02			2.64		1.09	39	18	58	34	84	60	60	51	82	67	76	63
6		.16	1.05			.59	33	20	70	49	84	47	73	48	79	67	65	38
7		.02	.49				46	18	66	48	55	39	78	55	88	71	58	36
8		.11		1.52			35	18	61	42	62	42	79	55	83	51	65	41
9		.87					39	22	46	37	70	54	81	63	82	49	68	45
10							41	28	64	41	72	45	86	63	80	55	72	52
11	.03				.07		35	30	70	44	74	47	86	67	78	57	75	55
12		.01		.02	.11		51	33	67	40	82	52	92	68	78	60	86	55
13				.17	.07		55	33	55	36	82	57	86	63	80	55	75	37
14				1.20			60	35	68	36	90	67	79	58	79	50	66	40
15	.03						44	32	71	41	91	71	80	62	87	60	73	54
16	.03			.78			39	31	55	32	92	74	72	58	85	68	64	33
17							45	32	63	33	99	71	75	55	88	73	67	37
18				.36	1.15	.15	50	29	72	46	92	71	80	60	88	53	62	35
19		.14					49	30	68	42	92	70	74	58	81	54	51	31
20							54	35	61	36	94	67	80	61	87	52	50	31
21				.01		.08	52	29	67	48	91	64	81	57	81	59	50	28
22	.14				.07		58	33	56	37	88	67	77	54	89	57	51	28
23	.03						52	35	63	36	83	61	80	61	78	58	62	35
24					.65		51	33	58	34	65	59	73	50	63	58	61	40
25			.02				51	28	66	38	72	59	75	53	72	55	72	40
26			.24				47	32	70	51	73	60	80	63	73	56	71	39
27		.08	.05		1.03		45	33	69	47	82	63	84	61	79	62	78	43
28							45	33	74	39	80	59	80	48	75	53	84	51
29			.01			.81	54	37	81	55	94	49	83	61	82	60	62	49
30			.21				57	40	86	51	65	41	85	53	81	54	57	40
31									85	54			73	51	76	53		

CLIMATIC DATA-, Dickinson, 1995

	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		.19	.21				66	24	46	35	82	52	75	44	88	54	90	47
2			.03	.48			56	32	49	36	78	56	84	51	89	54	81	50
3				.06			36	14	59	42	80	56	67	54	74	46	93	54
4			.01	1.46			30	12	67	34	79	56	60	54	83	55	82	54
5						.02	54	28	67	38	76	57	70	52	90	60	83	61
6		.78	.06			.15	43	19	53	47	80	52	78	52	96	64	64	46
7		.01	.12	.08			56	26	69	42	52	43	89	59	96	67	60	37
8	.01	1.37		.02			40	24	54	48	54	42	82	60	79	52	65	38
9		.64					26	20	61	44	55	38	88	64	81	48	66	40
10	.15			.08			36	22	68	42	71	40	88	61	82	47	80	52
11				.76			38	21	74	46	74	43	92	64	84	58	79	53
12		1.40		.41	.10		57	22	57	34	78	49	85	62	80	62	83	51
13		.25		.15	.19		61	30	44	33	86	58	81	62	72	56	71	46
14	.08			.01			55	35	65	31	88	59	76	59	80	52	74	39
15	.38						51	33	72	40	91	68	82	60	96	55	85	48
16	.01			.01			52	28	49	37	94	69	73	54	98	66	61	47
17							46	32	63	31	92	68	76	52	92	69	72	50
18		.01		.13		.02	51	30	72	42	81	59	82	52	70	48	66	40
19							56	29	57	40	86	55	70	57	86	44	50	49
20	.07		.07	.05			42	34	66	32	76	59	81	51	92	45	43	24
21	.02		.53		.04		51	33	73	41	74	55	71	56	96	58	43	22
22	.01		.24				59	29	56	37	80	60	75	50	96	65	63	23
23	.02	.17	.01		3.84		50	32	60	32	73	54	83	51	87	56	62	38
24			.08		.01		56	27	55	34	64	54	76	56	80	63	66	29
25		.01		.97	.47		41	26	61	32	73	45	83	60	79	62	72	36
26		.57		.21	.05		45	23	52	45	78	51	88	60	77	63	76	35
27		.05	.03	.01	.02	.15	54	28	57	48	80	55	82	57	80	58	81	50
28					.11		42	31	68	47	68	48	95	60	75	56	79	46
29			.01				46	27	74	44	59	47	75	51	90	58	74	49
30	.13						46	28	78	49	67	41	77	46	73	54	64	42
31									80	51					82	47		

CLIMATIC DATA-, Fargo NW22, 1995

	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							39	29	58	42	82	58	72	44	79	53	84	59
2				.84			53	33	65	45	83	61	68	57	86	60	87	63
3	.01			.14			43	7	58	42	87	62	77	62	76	59	86	56
4		.01		.36			25	6	67	44	85	68	74	63	82	55	90	67
5		.01		1.07		.53	49	24	61	38	87	68	66	57	85	62	78	66
6		.25	.03			.19	36	25	67	45	84	60	73	53	85	70	70	49
7		.01	.45				51	30	67	51	60	48	79	50	90	70	59	42
8		.57		.08	.05		37	22	58	46	62	39	78	62	86	65	64	37
9		.40	.02				38	25	46	44	70	48	84	57	83	53	70	39
10			.04				40	29	60	42	74	52	85	64	90	52	74	49
11	.16				.03		35	30	70	41	74	44	90	67	82	62	78	55
12	.01			.38			51	33	74	47	81	50	90	69	87	61	87	58
13		.31		1.19	.17		58	32	53	42	86	54	83	67	77	56	77	52
14				.13			61	38	69	39	88	66	77	65	80	57	68	40
15	.35			.01		.04	45	36	74	39	92	70	78	63	88	56	76	54
16	.01	.01		.11			41	35	61	38	93	72	77	61	86	67	66	41
17							44	30	63	32	99	73	77	57	88	72	67	37
18						.03	48	36	72	37	93	70	80	57	94	59	72	43
19				.25			52	31	75	50	93	71	75	60	83	52	52	34
20			.01				56	36	65	42	94	70	79	57	90	56	52	28
21				.19	.05		54	34	72	38	93	68	82	62	86	55	46	26
22							62	26	58	41	88	66	77	58	90	66	55	24
23	.01		.09				51	30	63	33	79	62	82	60	83	62	59	38
24		.17			1.67		52	30	63	47	75	57	75	58	72	60	61	35
25		.01			.09		52	34	65	38	71	62	74	56	70	62	75	46
26		.09	.17				46	28	63	45	74	62	81	58	75	58	75	39
27		.05	.71				46	33	66	52	81	66	84	66	80	62	79	45
28							49	34	73	48	77	59	81	57	78	65	87	59
29						1.53	56	36	81	45	70	56	85	54	84	64	68	58
30						.01	59	42	84	55	67	49	89	65	83	58	58	50
31									83	59			71	55	78	53		

CLIMATIC DATA-, Hettinger, 1995

	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		.13	.09				65	23	47	38	81	49	77	46	86	55	89	47
2		.03			.11		56	31	45	35	76	55	85	48	98	54	84	52
3		.04					39	18	56	37	76	54	73	50	78	51	90	57
4				.08		.01	32	16	64	32	75	57	63	51	85	56	86	51
5		.08		.02			58	25	67	34	73	56	71	52	91	59	86	59
6		.64				.10	45	24	52	47	80	51	80	49	98	64	64	49
7		.05	.02				55	27	70	39	59	43	90	57	100	63	60	37
8		1.64		.06			35	23	56	46	50	41	85	59	78	54	64	41
9		.46	.68				25	21	56	42	50	41	92	64	85	47	65	50
10			.02			.11	31	22	66	34	66	42	90	64	81	48	78	51
11				.04	.03		31	23	71	44	71	41	96	65	89	62	78	54
12		.81		.23	.06		53	19	68	36	75	49	90	61	87	62	83	50
13		.16			.30		56	29	39	34	82	57	80	61	76	57	73	48
14				.53			53	32	62	34	86	58	77	60	83	48	74	40
15							53	31	73	36	87	66	83	55	96	55	87	49
16			.01				51	26	58	37	89	66	73	52	98	65	63	46
17							46	30	60	32	85	67	78	50	96	69	70	45
18				.02		.03	49	32	69	40	78	52	85	51	76	49	71	40
19			.02	.01		.01	52	24	60	37	84	52	72	56	85	42	48	36
20				.01			42	34	66	31	78	56	79	50	94	44	46	26
21		.10	.62				52	33	72	42	71	57	78	56	100	65	42	20
22			1.14	.15	.07		57	27	56	39	77	57	78	50	97	66	62	20
23				.01			47	28	62	32	71	57	83	52	86	62	59	34
24	.01	.04					57	24	56	39	65	46	79	56	91	65	65	28
25	.01	.11		.56	1.67		42	23	58	34	71	46	81	57	82	61	73	34
26		1.06			.75		43	19	51	47	76	46	92	60	79	61	75	32
27		.03	.01			.04	57	26	52	48	76	52	86	56	80	62	81	44
28	.03						42	28	64	45	67	47	82	54	80	58	82	62
29						.03	48	30	71	43	61	42	99	62	91	62	72	53
30	.08						43	32	74	47	66	38	86	52	74	53	65	41
31									75	48			76	50	81	47		

CLIMATIC DATA-, Minot, 1995

	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	.67				44	23	53	37	82	57	73	45	85	58	85	49
2				.12			54	23	60	41	81	55	70	52	80	52	80	52
3	.04			.04			38	10	58	40	81	56	70	56	73	47	90	53
4							28	3	55	46	83	57	67	56	82	51	86	51
5						.59	47	24	64	38	81	60	70	51	87	58	71	58
6		.43	.12			.12	38	19	56	46	82	49	78	49	92	67	65	42
7		.04	.28	.08			49	24	71	49	50	43	79	56	97	68	59	36
8		.20					30	19	60	51	60	40	81	58	85	55	65	36
9		.04					30	20	67	45	68	41	82	61	77	53	69	38
10							42	22	72	42	70	46	85	60	77	47	80	46
11					.08	.08	42	25	76	51	74	44	91	70	77	53	80	58
12		.59		.43	.04		56	26	57	35	79	52	87	64	82	59	84	57
13		.63		.28	.24		59	31	53	33	89	62	78	63	75	56	73	44
14				.24			60	35	69	34	89	60	77	58	77	50	74	40
15	.28			.12			48	32	72	39	94	68	81	59	92	50	82	47
16				.04			44	30	57	36	97	77	75	58	95	61	63	42
17	.04						49	28	66	33	93	72	75	56	99	70	67	46
18				.24	1.26		49	33	74	42	86	61	81	55	72	53	53	40
19						.12	56	32	62	40	89	57	71	56	81	51	50	34
20	.12		.83	.04			46	36	64	37	85	61	77	55	84	51	43	29
21		.18	.43	.12		.04	63	34	49	33	71	58	74	56	82	53	42	24
22		.01					60	30	57	36	81	61	75	51	90	58	58	26
23		.08			.20		50	33	60	33	71	58	80	57	78	55	62	35
24					.59		52	31	55	38	64	54	73	58	69	58	66	35
25	.08						40	30	62	33	71	55	76	54	77	60	74	39
26		.20			.31		46	30	61	44	77	56	95	61	76	57	78	39
27		.16		.04	.24		41	29	59	50	79	54	82	59	81	60	81	46
28	.28						41	31	71	46	66	55	77	55	75	54	77	49
29			.12				49	33	81	48	60	51	86	51	87	56	75	47
30							49	32	82	54	66	46	79	52	73	52	60	38
31									74	56			75	45	79	46		

CLIMATIC DATA-, Olivia, 1995

	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					35	28	58	38	80	58	73	47	76	50	75	54
2							43	30	60	40	74	52	71	55	76	50	78	58
3							60	33	63	45	81	52	78	57	81	50	82	63
4				.55	.23		54	7	56	46	84	59	85	64	84	59	83	62
5	T		.07	.30	.23		31	11	62	41	85	62	75	64	82	64	84	59
6			.04	.24	.21	.40	56	27	70	40	84	63	69	55	81	64	78	64
7		.05			.01	.10	49	32	67	54	83	64	72	52	84	67	79	49
8	.14	.16	.23	.04			38	32	67	54	78	38	78	60	83	67	62	35
9	.06	.27					45	29	56	43	56	39	83	59	86	62	66	35
10	.16	.50	.36				37	26	49	42	65	53	82	63	82	58	70	45
11	.06		.01	.03			32	26	57	38	71	46	91	66	85	69	72	47
12	.81			.03			36	31	65	42	73	48	89	72	85	70	75	53
13		.53			.09		35	28	72	42	77	53	96	73	87	69	79	56
14		.63			.55		55	34	62	42	86	62	98	74	86	54	80	42
15				.09		.55	59	36	64	43	87	67	89	67	73	56	70	50
16				.67		.04	44	36	75	43	89	70	77	72	77	65	82	50
17	T			.60			43	36	71	36	93	69	77	58	83	66	68	38
18	.16						45	36	70	44	100	69	70	56	85	67	67	40
19	.90			.70	.11	.05	38	33	72	48	94	66	80	56	91	53	62	46
20							56	33	80	43	93	67	81	57	77	54	62	35
21	.11			.05		T	43	35	67	41	93	68	81	61	80	55	54	35
22		.17	T			T	57	32	65	50	96	69	84	61	85	60	48	26
23		.10	.48				58	32	65	44	91	65	80	59	85	64	52	26
24	.22					T	64	37	67	42	83	63	79	56	87	64	59	43
25				.55	.16		54	31	64	45	83	63	86	57	85	68	62	34
26	.06				.42		58	37	72	44	77	63	79	47	79	69	78	40
27		T	.05				52	29	62	55	75	61	79	57	72	64	80	45
28		1.28	1.65	.92	.94		54	29	61	48	74	63	81	59	79	64	82	45
29	.09		.26		.13		63	42	56	45	74	57	85	57	83	63	85	60
30	.15				.11	.89	50	43	75	49	73	55	81	57	75	65	72	60
31				.19					79	57			89	59	85	54		

CLIMATIC DATA-, Williston, 1995																		
	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				62	25	50	34	84	54	77	48	88	53	88	51
2			.04				56	35	60	36	81	53	78	57	76	53	81	48
3				.87			42	10	62	34	80	57	64	58	71	45	89	56
4				1.38			33	7	60	36	82	56	59	53	87	51	79	53
5						.08	54	24	68	38	80	59	72	53	94	62	76	63
6		.31				.31	38	20	54	47	82	49	80	51	100	66	65	46
7			.08		.20		54	27	64	47	50	43	88	58	100	65	60	38
8		.20	.08				31	21	55	47	60	38	84	57	79	55	66	38
9			.08				27	20	66	47	68	37	85	64	75	52	69	40
10		.04					42	22	70	42	72	41	90	63	78	47	78	47
11				.08			49	20	76	45	76	48	91	65	77	54	82	54
12		.43		.12			58	26	62	34	81	52	87	63	86	56	84	54
13		.16		.12			65	31	54	31	88	59	75	59	71	56	72	47
14	.12						62	39	69	35	93	61	78	55	79	53	77	44
15	.55						50	33	73	37	95	67	82	57	92	54	82	46
16				.12			52	28	56	36	98	70	76	58	94	58	63	43
17							54	30	66	34	94	69	78	53	81	67	71	48
18		.28		.43			54	30	73	42	83	63	83	52	68	50	51	38
19							60	32	56	38	90	54	73	54	84	46	50	30
20				.16			44	37	67	38	82	59	80	53	87	48	44	26
21	.04	.04					56	37	66	40	84	55	72	53	86	59	44	18
22	.04						60	33	55	38	82	59	74	49	92	68	60	23
23	.08	.04	.16		1.07		52	34	60	36	68	56	84	56	85	62	63	34
24					.12		58	29	56	39	67	54	76	55	78	58	67	33
25			.08				41	27	62	33	74	50	82	55	78	60	75	37
26		.51	.04	.71	.71		48	26	53	46	83	54	92	58	76	56	76	53
27		.04					45	28	60	48	83	53	83	58	81	58	81	44
28							43	27	70	40	65	49	80	53	75	55	75	49
29			.04	.75			48	31	79	46	56	42	96	58	92	60	73	41
30							50	30	81	50	67	38	70	49	72	54	64	39
31									85	52			77	45	81	49		

SOIL TEST RESULTS AT VARIOUS WEED EXPERIMENT LOCATIONS						
	Soil texture	Organic matter	pH	lb/A N	PPM P	PPM K
Ada, MN	Loam	5.4	7.9	273	11	95
Camp Grafton (Goat)	Sandy loam	4.7	7.2	3	3	180
Camp Grafton (Insect)	Loamy sand	2.8	7.0	3	3	98
Carrington, ND	Loam	3.6	7.2	Fertilized by test		
Casselton, ND (Dalrymple)	Silty clay	5.0	7.9	Applied 80 lb N		
Chaffee, ND	Fine sandy loam	6.7	7.4	20	36	950
Colfax	Silt loam	4.5	7.4	224	29	365
Crookston, MN	Silt loam	4.03	8.0	171	8	130
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	5.9	7.1	132	17	355
Hunter, ND	Sand	7.4	6.8	14	-	-
Jamestown, ND (Pipestem Dam)	Loam	6.8	6.8	28	5	290
Minot, ND	Loam	2.7	7.0	Fertilized by test		
Minto, ND	Clay loam	6.6	7.8	211	37	980
Prinsburg, MN	Loam	5.7	7.7	202	46	355
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	5.0	7.8	141	58	530
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

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.

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

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
Nonionic surfactants:	
Activate Plus	Terra
Activator 90	Loveland
Agra-Wet	Loveland
Amway 80	Amway
CL9506	Cenex
Induce	Helena
Kenetic	Helena
LI-700	Loveland
Optima	Helena
Preference	Loveland
R-11	Wilbur-Ellis
Silwet L-77	Loveland
Spray Booster S	Cenex
X-77	Loveland
Petroleum oil concentrates:	
DASH	BASF
Mor-Act	Wilbur-Ellis
Ethylated vegetable oils:	
Class Destiny	Cenex
Dyne-Amic	Helena
Hasten	WilFarm
Meth Oil	Terra
MSO	Loveland
Scoil	AGSCO
Sun-It II	AGSCO
Surfactant/fertilizer blends:	
ASM Plus	Terra
CL9502	Cenex
Class ACT	Cenex
Dispatch AMS	Loveland
Impressive	Rosen
PCC-700	Loveland
Surfate	AGSCO
Water conditioning agent:	
Choice	Loveland
Cayuse	Wilbur-Ellis

LIST OF HERBICIDES TESTED IN 1995

Common Name or Code Name	Abbreviation	Company	Formulation	Trade Name
AC 299,263		American Cyanamid	1 lb/gal EC	Raptor
AC 513,995		American Cyanamid		
Acetochlor&Dichlormid	Acet&Dcmd	Zeneca	6.4 lb/gal EC	Surpass
Acetochlor&MON 4660	Acet&4660	Monsanto	7 lb/gal EC	Harness
Acifluorfen	Acif	BASF	2 lb/gal E,S	Blazer
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
Bentazon	Bent	BASF	4 lb/gal S	Basagran
Bromoxynil	Brox	Rhône-Poulenc	2 lb/gal EC	Buctril
CGA 248757		Ciba	75% SG	Action
CGA 277476		Ciba	75% SG	Chart
Clethodim	Clet	Valent	2 lb/gal	Select
Clopyralid	Clpy	DowElanco	3 lb/gal S	Stinger
Clopyralid&2,4-D	Clpy&2,4-D	DowElanco	0.38 + 2 lb/gal S	Curtail
Cyanazine	Cyan	DuPont	90% DF	Bladex
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
Dicamba	Dica	Sandoz	4 lb/gal S	Banvel, Clarity
Dimethenamid	Dime	Sandoz	7.5 lb/gal EC	Frontier
Diclofop	Dcfp	AgrEvo	3 lb/gal EC	Hoelon
Difenzoquat	Dife	American Cyanamid	2 lb/gal S	Avenge
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
Ethalfluralin	Etha	DowElanco	3 lb/gal EC 10% G	Sonalan
Ethametsulfuron	Emsu	DuPont	75% DF	Muster

LIST OF HERBICIDES TESTED IN 1995

Common Name or Code Name	Abbreviation	Company	Formulation	Trade Name
Ethofumesate	Etho	AgrEvo	4 lb/gal F 1.5 lb/gal EC	Nortron
F8426		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 NAF-72	DowElanco	23.1+62.3% % DF	Broadstrike Plus
Flumetsulam& Clpy&2,4-D	Flms&Clpy &2,4-D NAF-73	DowElanco	84.3 % DF	Scorpion III
Flumiclorac	Flmc	Valent	0.86 lb/gal EC	Resource
Glyphosate	Glyt	Monsanto	3 lb/gal S	Several
Glyphosate&2,4-D	Glyt&2,4-D	Monsanto	0.9 + 0.8 lb/gal S	Landmaster II
Glyphosate&2,4-D	Glyt&2,4-D	Monsanto	0.9 + 1.5 lb/gal	Landmaster BW
Glyphosate& dicamba	Glyt&Dica	Monsanto	1.1 + 0.5 lb/gal S	Fallow Master
Imazaquin	Imqn	American Cyanamid	1.5 lb/gal S	Scepter
Imazethapyr	Imep	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
Lactofen	Lact	Valent	2 lb/gal S	Cobra
MCPA	MCPA	Rhône-Poulenc	4 lb/gal EC, S	Several

LIST OF HERBICIDES TESTED IN 1995

Common Name or Code Name	Abbreviation	Company	Formulation	Trade Name
Metolachlor	Meto	Ciba	8 lb/gal EC	Dual
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
Nicosulfuron	Nico	DuPont	75% DF	Accent*
Paraquat	Para	Zeneca	2.5 lb/gal S 2 lb/gal S	Gramoxone Extra Cyclone
PCC 136		UAP	78 %DF	None
PCC 700		UAP	15-0-0-17 (Zn)	ACA
Pendimethalin	Pend	American Cyanamid	4 lb/gal EC 3.3 lb/gal EC	Prowl
Picloram	Picl	DowElanco	2 lb/gal S	Tordon 22K
Picloram&2,4-D	Picl&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	Qucl BAS-514-34	BASF	75% WP 50% DF	Facet Impact
Quizalofop-P	Qufp-P	DuPont	0.88 lb/gal EC	Assure II
Sethoxydim	Seth	BASF	1.5 lb/gal EC 1.0 lb/gal EC	Poast Poast-Plus*
Sulfentrazone		FMC	75% DF	Authority
Sulfometuron	Sume	DuPont	75% DF	Oust
Thifensulfuron	Thif	DuPont	25% DF	Pinnacle
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*

LIST OF HERBICIDES TESTED IN 1995

Common Name or Code Name	Abbreviation	Company	Formulation	Trade Name
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

* 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 as lay-by treatments, Fargo, 1995. 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5. Lorsban insecticide at 1 lb ai/A was applied to entire plot area May 29. Herbicide treatments were applied 2:00 pm May 30 when the air temperature was 85F, relative humidity was 30%, soil temperature at six inches was 72F, wind was 10-15 mph, cloud cover was 5%, soil moisture was good, sugarbeet was in the 2 leaf stage and green and yellow foxtail was emerging (0.5 inches tall) to the 2 leaf stage (1.5 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 green and yellow foxtail control were evaluated June 14.

Treatment	Rate	Sugarbeet injury	Gr & Ye Foxtail control
	lb/A	%	%
Acetochlor (Harness)	2.4	33	48
Acetochlor (Surpass)	2.4	33	33
Alachlor	3.0	25	38
Metolachlor	3.0	8	23
Dimethenamid	1.4	0	21
Pendimethalin	1.5	34	23
EXP MEAN		22	31
C.V. %		51	31
LSD 5%		17	14
LSD 1%		23	20
# OF REPS		4	4

Summary

Acetochlor, alachlor and pendimethalin caused significant injury to two - leaf sugarbeet.

Soil applied plus postemergence herbicides, St. Thomas, 1995. Preplant incorporated herbicides were applied in 17 gpa water at 40 psi through 8002 nozzles to the center four rows of six row plots and incorporated with a rototiller set four inches deep 5:00 PM May 11 when the air temperature was 75F, relative humidity was 34%, soil temperature at six inches was 59F, wind was 11 mph, cloud cover was 25% and soil moisture was good. 'ACH 196' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 11. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band at planting. The first postemergence herbicide application was 2:00 PM June 5 when the air temperature was 84F, relative humidity was 47%, soil temperature at six inches was 74F, wind was 10-15 mph, cloud cover was 50%, soil moisture was good, sugarbeet was in the 2 to 4 leaf stage, redroot pigweed was in the cotyledon to 6 leaf stage, prostrate pigweed was in the cotyledon to 4 leaf stage, wild oats was 4 inches tall and common purslane was in the cotyledon to 4 leaf stage. The second postemergence herbicide application was 12:00 PM June 9 when the air temperature was 69F, relative humidity was 44%, soil temperature at six inches was 60F, wind was 10 mph, cloud cover was 0%, soil moisture was good, sugarbeet was in the 4 leaf stage, redroot pigweed was in the 4 to 8 leaf stage, prostrate pigweed was in the 4 leaf stage to 4 inches in diameter, wild oats was 6 inches tall and common purslane was in the 2 leaf stage to 2 inches in diameter. The third postemergence herbicide application was 3:00 PM June 16 when the air temperature was 91F, relative humidity was 53%, soil temperature at six inches was 78F, wind was 10-15 mph, cloud cover was 5%, soil moisture was fair, sugarbeet was in the 6 to 8 leaf stage, redroot pigweed was 3 to 6 inches tall, prostrate pigweed was 3 to 6 inches in diameter, wild oats was 9 inches tall and common purslane was in the 4 leaf stage to 5 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 0.4 lb ai/A+1 pint/A was applied to the entire plot area June 20. Sugarbeet injury, redroot pigweed, prostrate pigweed, wild oats and common purslane control were evaluated June 26. The slight visible effect of sethoxydim on the wild oats was ignored during evaluation on June 26. Sugarbeet was hand thinned to an 8 inch spacing and hand weeded June 28. Super Tin fungicide at 5 oz product per acre was applied to all plots July 22 and August 5. Dithane + Poast at 1.6 + 0.25 lb ai/A was applied August 25. Sugarbeet from the center two rows of each 32 foot plot was counted and harvested September 26.

Table 1.

Treatment	Rate	Sgbt inj	Rrpw cntl	Prpw cntl	Wioa cntl	Copu cntl
	lb/A	%	%	%	%	%
EPTC+Cycloate (ppi)	1.5+2.5	1	55	45	97	19
EPTC+Cycloate (ppi)	0.88+1.5	0	41	25	98	38
Desmedipham/Desmedipham	0.25/0.33	0	95	81	38	80
Desm+Clopyralid/	0.25+0.09					
Desm+Clopyralid	0.33+0.09	3	96	88	28	90
Desm+Triflusulfuron/	0.25+0.0156					
Desm+Triflusulfuron	0.33+0.0156	0	96	93	51	90
Desm+Clpy+Tfsu/	0.25+0.09+0.0156					
Desm+Clpy+Tfsu	0.33+0.09+0.0156	3	97	98	73	95
--/Desm+Clpy+Tfsu/	0.25+0.09+0.0156					
Desm+Clpy+Tfsu	0.33+0.09+0.0156	1	97	97	55	100

Table continued on next page.

Soil applied plus postemergence herbicides, St. Thomas, 1995.
(Table 1 continued)

Treatment	Rate	Sgbt inj	Rrpw cntl	Prpw cntl	Wioa cntl	Copu cntl
	lb/A	%	%	%	%	%
Desmedipham/	0.25					
Desm+Clpy+Tfsu/	0.25+0.09+0.0156					
Desm+Clpy+Tfsu	0.33+0.09+0.0156	6	100	98	86	99
Desm+Clpy+Tfsu/	0.16+0.06+0.01					
Desm+Clpy+Tfsu/	0.25+0.06+0.01					
Desm+Clpy+Tfsu	0.25+0.06+0.01	8	99	98	86	100
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	0	84	79	28	73
Desm&Phen&Etho+Clpy/	0.25+0.09					
Desm&Phen&Etho+Clpy	0.33+0.09	4	90	80	54	96
Desm&Phen&Etho+Tfsu/	0.25+0.0156					
Desm&Phen&Etho+Tfsu	0.33+0.0156	0	85	84	74	93
Desm&Phen&Etho+Clpy+Tfsu/	0.25+0.09+0.0156					
Desm&Phen&Etho+Clpy+Tfsu	0.33+0.09+0.0156	3	91	88	76	99
Desm&Phen&Etho+Clpy+Tfsu/	0.16+0.06+0.01					
Desm&Phen&Etho+Clpy+Tfsu/	0.25+0.06+0.01					
Desm&Phen&Etho+Clpy+Tfsu	0.33+0.06+0.01	6	97	97	75	100
EPTC+Cycloate (ppi)/	0.88+1.5					
Desmedipham/Desmedipham	0.16/0.25	3	93	88	100	90
EPTC+Cyloate (ppi)/	0.88+1.5					
Desm+Clopyralid/	0.16+0.09					
Desm+Clopyralid	0.25+0.09	4	94	95	99	98
EPTC+Cycloate (ppi)/	0.88+1.5					
--/Desm+Clopyralid/	0.16+0.09					
Desm+Clopyralid	0.25+0.09	6	93	94	100	97
EPTC+Cycloate (ppi)/	0.88+1.5					
Desm+Triflusulfuron/	0.16+0.0156					
Desm+Triflusulfuron	0.25+0.0156	5	97	99	99	100
EPTC+Cycloate (ppi)/	0.88+1.5					
Desm+Clpy+Tfsu/	0.16+0.06+0.01					
Desm+Clpy+Tfsu	0.25+0.06+0.01	6	96	98	98	100
EPTC+Cycloate (ppi)/	0.88+1.5					
--/Desm+Clpy+Tfsu/	0.16+0.06+0.01					
Desm+Clpy+Tfsu	0.25+0.06+0.01	4	96	89	98	96
EPTC+Cycloate (ppi)/	0.88+1.5					
Desm&Phen&Etho/Desm&Phen&Etho	0.16/0.25	6	89	86	98	80
EPTC+Cycloate (ppi)/	0.88+1.5					
--/Desm&Phen&Etho/Des&Phen&Etho	0.16/0.25	4	73	82	98	99
EPTC+Cycloate (ppi)/	0.88+1.5					
Desm&Phen&Etho+Clpy/	0.16+0.09					
Desm&Phen&Etho+Clpy	0.25+0.09	4	91	91	100	95
EPTC+Cycloate (ppi)/	0.88+1.5					
Desm&Phen&Etho+Tfsu/	0.16+0.0156					
Desm&Phen&Etho+Tfsu	0.25+0.0156	5	92	97	100	99
EPTC+Cycloate (ppi)/	0.88+1.5					
Desm&Phen&Etho+Clpy+Tfsu/	0.16+0.06+0.01					
Desm&Phen&Etho+Clpy+Tfsu	0.25+0.06+0.01	10	91	96	100	98

Table continued on next page.

Soil applied plus postemergence herbicides, St. Thomas, 1995.
(Table 1 continued)

Treatment	Rate	Sgbt inj	Rrpw cntl	Prpw cntl	Wioa cntl	Copu cntl
	lb/A	%	%	%	%	%
EPTC+Cycloate (ppi)/	0.88+1.5					
Desm+Clpy+Tfsu/	0.1+0.03+0.008					
Desm+Clpy+Tfsu/	0.2+0.03+0.008					
Desm+Clpy+Tfsu	0.3+0.03+0.008	6	100	100	99	100
Cycloate (ppi)	2.25	0	43	15	81	0
Cycloate (ppi)	4	0	50	60	90	74
Cycl(ppi)/Desm/Desm	2.25/0.16/0.25	0	91	93	97	93
Cycl (ppi)/Desm/Desm	4/0.16/0.25	3	96	96	96	99
Cycloate (ppi)/	2.25					
Desm+Clopyralid/	0.25+0.09					
Desm+Clopyralid	0.33+0.09	4	97	90	96	98
Cycloate (ppi)/	2.25					
Desm+Triflusulfuron/	0.25+0.0156					
Desm+Triflusulfuron	0.33+0.0156	8	96	96	95	98
Cycloate (ppi)/	2.25					
Desm+Clpy+Tfsu/	0.16+0.06+0.01					
Desm+Clpy+Tfsu	0.25+0.06+0.01	4	93	91	100	100
Cycloate (ppi)/	2.25					
Desm+Clpy+Tfsu/	0.1+0.03+0.008					
Desm+Clpy+Tfsu/	0.2+0.03+0.008					
Desm+Clpy+Tfsu	0.3+0.03+0.008	3	99	100	99	100
C.V. %		91	10	10	17	15
LSD 5%		4	12	12	19	19
LSD 1%		6	16	16	26	25
# OF REPS		4	4	4	4	4

Summary

None of the treatments caused important sugarbeet injury. Postemergence treatments including desmedipham or triflusulfuron generally gave better control of redroot pigweed and prostrate pigweed than desmedipham & phenmedipham & ethofumesate. Desmedipham + triflusulfuron gave better prostrate pigweed control than desmedipham. PPI EPTC + cycloate gave better control of wild oat than PPI cycloate. Adding clopyralid or triflusulfuron to desmedipham or desmedipham & phenmedipham & ethofumesate improved or tended to improve common purslane control. Nearly all postemergence herbicides over soil-applied treatments gave over 90% control of all weed species.

Experiment continued on next page.

Soil applied plus postemergence herbicides, St. Thomas, 1995. (continued)

Table 2.

Treatment	Rate	Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	plt/64'	%	%	ton/A		lb/A
EPTC+Cycloate (ppi)	1.5+2.5	72	14.6	2.0	26.3	980	6540
EPTC+Cycloate (ppi)	0.88+1.5	84	14.2	2.1	24.7	1077	5888
Desmedipham/Desmedipham	0.25/0.33	90	14.1	2.2	25.0	1112	5882
Desm+Clopyralid/	0.25+0.09						
Desm+Clopyralid	0.33+0.09	89	14.2	2.0	24.9	1016	5969
Desm+Triflusulfuron/	0.25+0.0156						
Desm+Triflusulfuron	0.33+0.0156	89	14.2	2.1	24.4	1077	5784
Desm+Clpy+Tfsu/	0.25+0.09+0.0156						
Desm+Clpy+Tfsu	0.33+0.09+0.0156	86	13.8	2.2	26.7	1189	6024
--/Desm+Clpy+Tfsu/	0.25+0.09+0.0156						
Desm+Clpy+Tfsu	0.33+0.09+0.0156	89	14.6	2.1	25.4	1069	6220
Desmedipham/	0.25						
Desm+Clpy+Tfsu/	0.25+0.09+0.0156						
Desm+Clpy+Tfsu	0.33+0.09+0.0156	85	13.9	2.2	26.1	1173	5952
Desm+Clpy+Tfsu/	0.16+0.06+0.01						
Desm+Clpy+Tfsu/	0.25+0.06+0.01						
Desm+Clpy+Tfsu	0.25+0.06+0.01	86	14.3	2.1	25.4	1065	6088
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	91	14.5	1.9	26.2	981	6475
Desm&Phen&Etho+Clpy/	0.25+0.09						
Desm&Phen&Etho+Clpy	0.33+0.09	85	14.1	2.2	25.8	1160	6014
Desm&Phen&Etho+Tfsu/	0.25+0.0156						
Desm&Phen&Etho+Tfsu	0.33+0.0156	87	13.9	2.4	26.6	1243	6016
Desm&Phen&Etho+Clpy+Tfsu/	0.25+0.09+0.0156						
Desm&Phen&Etho+Clpy+Tfsu	0.33+0.09+0.0156	89	13.6	2.5	24.9	1315	5467
Desm&Phen&Etho+Clpy+Tfsu/	0.16+0.06+0.01						
Desm&Phen&Etho+Clpy+Tfsu/	0.25+0.06+0.01						
Desm&Phen&Etho+Clpy+Tfsu	0.33+0.06+0.01	90	14.2	2.3	24.8	1208	5773
EPTC+Cycloate (ppi)/	0.88+1.5						
Desmedipham/Desmed	0.16/0.25	78	14.5	2.1	26.5	1053	6474
EPTC+Cyloate (ppi)/	0.88+1.5						
Desm+Clopyralid/	0.16+0.09						
Desm+Clopyralid	0.25+0.09	77	14.7	2.1	26.1	1066	6438
EPTC+Cycloate (ppi)/	0.88+1.5						
--/Desm+Clopyralid/	0.16+0.09						
Desm+Clopyralid	0.25+0.09	78	14.3	2.3	25.9	1174	6121
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm+Triflusulfuron/	0.16+0.0156						
Desm+Triflusulfuron	0.25+0.0156	80	14.7	2.0	26.7	1030	6644
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm+Clpy+Tfsu/	0.16+0.06+0.01						
Desm+Clpy+Tfsu	0.25+0.06+0.01	81	14.2	2.2	26.5	1158	6239
EPTC+Cycloate (ppi)/	0.88+1.5						
--/Desm+Clpy+Tfsu/	0.16+0.06+0.01						
Desm+Clpy+Tfsu	0.25+0.06+0.01	79	14.1	2.3	25.6	1187	5951
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm&Phen&Etho/Desm&Phen&Etho	0.16/0.25	77	14.2	2.1	27.8	1112	6554

Table continued on next page.

Soil applied plus postemergence herbicides, St. Thomas, 1995.
(Table 2 continued)

Treatment	Rate	Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	plt/64'	%	%	ton/A		lb/A
EPTC+Cycloate (ppi)/	0.88+1.5						
--/Desm&Phen&Etho/Des&Phen&Etho	0.16/0.25	73	14.7	2.0	25.4	1011	6353
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm&Phen&Etho+Clpy/	0.16+0.09						
Desm&Phen&Etho+Clpy	0.25+0.09	84	14.6	2.0	25.5	1008	6332
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm&Phen&Etho+Tfsu/	0.16+0.0156						
Desm&Phen&Etho+Tfsu	0.25+0.0156	76	14.3	2.3	26.5	1196	6217
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm&Phen&Etho+Clpy+Tfsu/	0.16+0.06+0.01						
Desm&Phen&Etho+Clpy+Tfsu	0.25+0.06+0.01	83	14.4	2.3	28.2	1163	6687
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm+Clpy+Tfsu/	0.1+0.03+0.008						
Desm+Clpy+Tfsu/	0.2+0.03+0.008						
Desm+Clpy+Tfsu	0.3+0.03+0.008	77	14.6	2.3	26.4	1131	6409
Cycloate (ppi)	2.25	74	14.8	1.9	23.4	963	5928
Cycloate (ppi)	4	71	14.1	2.3	24.5	1171	5681
Cycl(ppi)/Desm/Desm	2.25/0.16/0.25	73	14.0	2.5	26.9	1325	6017
Cycl (ppi)/Desm/Desm	4/0.16/0.25	80	14.6	2.0	26.3	1008	6527
Cycloate (ppi)/Desm+Clpy	2.25/0.25+0.09						
Desm+Clopyralid	0.33+0.09	77	14.0	2.5	26.8	1296	6094
Cycloate(ppi)/Desm+Tfsu/	2.25/0.25+0.0156						
Desm+Triflusulfuron	0.33+0.0156	80	14.4	2.2	27.2	1098	6519
Cycl(ppi)/Des+Clpy+Tfsu/	2.25/.16+.06+.01						
Desm+Clpy+Tfsu	0.25+0.06+0.01	69	13.9	2.5	25.4	1316	5643
Cycl(ppi)/Des+Clpy+Tfsu/	2.25/.1+.03+.008						
Desm+Clpy+Tfsu/	0.2+0.03+0.008						
Desm+Clpy+Tfsu	0.3+0.03+0.008	72	14.0	2.5	25.6	1285	5751
C.V. %		9	4.3	12.4	5.9	16	8
LSD 5%		10	NS	NS	2.2	NS	690
LSD 1%		14	NS	NS	NS	NS	NS
# OF REPS		4	4	4	4	4	4

Summary

Plots treated with desmedipham & phenmedipham + clopyralid + triflusulfuron applied twice were the lowest yielding in the experiment and had significantly less extractable sucrose per acre than 14 other treatments. Plots treated with preplant incorporated EPTC + cycloate followed by two applications of desmedipham & phenmedipham + clopyralid + triflusulfuron were the highest yielding in the experiment and had significantly greater extractable sucrose per acre than eight treatments. Other comparisons of yield make no more sense than this one.

Soil applied plus postemergence herbicides, Fargo, 1995. Preplant incorporated herbicides were applied in 17 gpa water at 40 psi through 8002 nozzles to the center four rows of six row plots and incorporated with a rototiller set four inches deep 4:00 PM May 5 when the air temperature was 63F, relative humidity was 26%, soil temperature at six inches was 48F, wind was 10 mph, cloud cover was 0% and soil moisture was good. 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5. The first postemergence herbicide application was 2:30 PM May 31 when the air temperature was 88F, relative humidity was 30%, soil temperature at six inches was 60F, wind was 16 mph, cloud cover was 25%, soil moisture was good, sugarbeet, redroot pigweed and prostrate spurge were in the cotyledon to 2 leaf stage and wild buckwheat was in the cotyledon to 1 leaf stage. The second postemergence herbicide application was 6:00 PM June 6 when the air temperature was 87F, relative humidity was 51%, soil temperature at six inches was 74F, wind was 0 to 5 mph, cloud cover was 60%, soil moisture was good, sugarbeet was in the 4 leaf stage, redroot pigweed was in the 4 to 6 leaf stage, prostrate spurge was 1 to 1.5 inches in diameter and wild buckwheat was in the 2 to 4 leaf stage. The third postemergence herbicide application was 12:30 PM June 14 when the air temperature was 89F, relative humidity was 52%, soil temperature at six inches was 70F, wind was 12 mph, cloud cover was 40%, soil moisture was good, sugarbeet was in the 6 leaf stage, redroot pigweed was in the 6 to 8 leaf stage, prostrate spurge was 1 to 2.5 inches in diameter and wild buckwheat was 3 to 4 inches tall. 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. Lorsban insecticide at 1 pound per acre was applied to the entire plot area May 29. Sethoxydim+Prime Oil at 0.3 lb ai/A+1 qt/A was applied to the entire plot area June 12. Sugarbeet injury and redroot pigweed control were evaluated June 27 and July 9. Prostrate spurge and wild buckwheat control were evaluated June 27.

		June 27				July 9	
Treatment	Rate	Sgbt inj	Rrpw cntl	Prsp cntl	Wibw cntl	Sgbt inj	Rrpw cntl
	lb/A	%	%	%	%	%	%
EPTC+Cycloate (ppi)	1.5+2.5	0	63	96	18	0	55
EPTC+Cycloate (ppi)	0.88+1.5	0	54	83	10	0	18
Desmedipham/Desm	0.25/0.33	3	88	82	43	0	78
Desm+Clopyralid/	0.25+0.09						
Desm+Clopyralid	0.33+0.09	4	94	73	79	1	85
Desm+Triflusulfuron/	0.25+0.0156						
Desm+Triflusulfuron	0.33+0.0156	8	93	97	80	0	91
Desm+Clpy+Tfsu/	0.25+0.09+0.0156						
Desm+Clpy+Tfsu	0.33+0.09+0.0156	8	98	99	96	1	83
--/Des+Clpy+Tfsu/	0.25+0.09+0.0156						
Des+Clpy+Tfsu	0.33+0.09+0.0156	9	98	98	88	0	95
Desmedipham/	0.25						
Desm+Clpy+Tfsu/	0.25+0.09+0.0156						
Desm+Clpy+Tfsu	0.33+0.09+0.0156	23	97	100	99	25	96
Des+Clpy+Tfsu/	0.16+0.06+0.01						
Des+Clpy+Tfsu/	0.25+0.06+0.01						
Des+Clpy+Tfsu	0.25+0.06+0.01	13	97	100	99	5	98
Des&Phen&Etho/	0.25						
Des&Phen&Etho	0.33	3	69	83	100	3	35

Table continued on next page.

Soil applied plus postemergence herbicides, Fargo, 1995. (continued)

Treatment	Rate	June 27 Sgbt inj	June 27 Rrpw cntl	June 27 Prsp cntl	June 27 Wibw cntl	July 9 Sgbt inj	July 9 Rrpw cntl
	lb/A	%	%	%	%	%	%
Des&Phen&Etho+Clpy/	0.25+0.09						
Des&Phen&Etho+Clpy	0.33+0.09	4	71	84	100	5	50
Des&Phen&Etho+Tfsu/	0.25+0.0156						
Des&Phen&Etho+Tfsu	0.33+0.0156	6	97	98	99	1	90
D&P&E+Clpy+Tfsu/	0.25+0.09+0.0156						
D&P&E+Clpy+Tfsu	0.33+0.09+0.0156	6	98	100	93	3	91
De&Ph&Et+Clpy+Tfsu/	0.16+0.06+0.01						
D&P&E+Clpy+Tfsu/	0.25+0.06+0.01						
D&P&E+Clpy+Tfsu	0.33+0.06+0.01	6	98	100	99	1	95
EPTC+Cycloate (ppi)/	0.88+1.5						
Desmedipham/Desmed	0.16/0.25	6	94	98	100	3	87
EPTC+Cyloate (ppi)/	0.88+1.5						
Desm+Clopyralid/	0.16+0.09						
Desm+Clopyralid	0.25+0.09	5	99	94	100	5	96
EPTC+Cycloate (ppi)/	0.88+1.5						
--/Desm+Clopyralid/	0.16+0.09						
Desm+Clopyralid	0.25+0.09	13	99	98	98	9	96
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm+Triflusulfuron/	0.16+0.0156						
Desm+Triflusulfuron	0.25+0.0156	8	97	100	100	0	98
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm+Clpy+Tfsu/	0.16+0.06+0.01						
Desm+Clpy+Tfsu	0.25+0.06+0.01	9	99	100	100	4	98
EPTC+Cycloate (ppi)/	0.88+1.5						
--/Desm+Clpy+Tfsu/	0.16+0.06+0.01						
Desm+Clpy+Tfsu	0.25+0.06+0.01	8	100	100	100	3	99
EPTC+Cycloate (ppi)/	0.88+1.5						
De&Ph&Etho/De&Ph&Etho	0.16/0.25	5	97	98	100	3	87
EPTC+Cycloate (ppi)/	0.88+1.5						
--/De&Ph&Etho/De&Ph&Et	0.16/0.25	0	89	98	100	0	65
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm&Phen&Etho+Clpy/	0.16+0.09						
Desm&Phen&Etho+Clpy	0.25+0.09	0	91	100	100	3	78
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm&Phen&Etho+Tfsu/	0.16+0.0156						
Desm&Phen&Etho+Tfsu	0.25+0.0156	5	97	100	100	3	92
EPTC+Cycloate (ppi)/	0.88+1.5						
D&P&E+Clpy+Tfsu/	0.16+0.06+0.01						
D&P&E+Clpy+Tfsu	0.25+0.06+0.01	6	98	100	100	0	95
EPTC+Cycloate (ppi)/	0.88+1.5						
Desm+Clpy+Tfsu/	0.1+0.03+0.008						
Desm+Clpy+Tfsu/	0.2+0.03+0.008						
Desm+Clpy+Tfsu	0.3+0.03+0.008	8	100	100	100	5	99

Table continued on next page.

Soil applied plus postemergence herbicides, Fargo, 1995. (continued)

Treatment	Rate	June 27 Sgbt inj	June 27 Rrpw cntl	June 27 Prsp cntl	June 27 Wibw cntl	July 9 Sgbt inj	July 9 Rrpw cntl
	lb/A	%	%	%	%	%	%
Cycloate (ppi)	2.25	0	30	58	0	0	15
Cycloate (ppi)	4	0	35	80	0	0	38
Cycl(ppi)/Desm/Desm	2.25/0.16/0.25	3	93	91	100	0	84
Cycl (ppi)/Desm/Desm	4/0.16/0.25	4	100	99	100	0	92
Cycloate (ppi)/	2.25						
Desm+Clopyralid/	0.25+0.09						
Desm+Clopyralid	0.33+0.09	8	97	98	95	0	91
Cycloate (ppi)/	2.25						
Desm+Triflusulfuron/	0.25+0.0156						
Desm+Triflusulfuron	0.33+0.0156	8	100	100	100	3	96
Cycloate (ppi)/	2.25						
Desm+Clpy+Tfsu/	0.16+0.06+0.01						
Desm+Clpy+Tfsu	0.25+0.06+0.01	10	99	99	100	5	96
Cycloate (ppi)/	2.25						
Desm+Clpy+Tfsu/	0.1+0.03+0.008						
Desm+Clpy+Tfsu/	0.2+0.03+0.008						
Desm+Clpy+Tfsu	0.3+0.03+0.008	4	99	100	94	0	98
C.V. %		91	13	8	13	220	12
LSD 5%		7	17	11	15	8	14
LSD 1%		10	22	14	20	10	19
# OF REPS		4	4	4	4	4	4

Summary

Desmedipham followed by two applications of desmedipham + clopyralid + triflusulfuron at 0.25/0.25+0.09+0.0156/0.25+0.09+0.0156 lb/A gave more sugarbeet injury than the other treatments and similar weed control compared to desmedipham + clopyralid + triflusulfuron applied three times at 0.16+0.06+0.01/0.25+0.06+0.01 lb/A. Postemergence treatments including desmedipham or triflusulfuron gave better control of redroot pigweed than desmedipham & phenmedipham & ethofumesate. Postemergence treatments including triflusulfuron tended to give better control of prostrate spurge than other postemergence treatments. Adding clopyralid or triflusulfuron to desmedipham improved wild buckwheat control and adding both to desmedipham gave further improvement. Desmedipham & phenmedipham & ethofumesate gave excellent control of wild buckwheat. PPI EPTC + cycloate did not give good weed control even at full rates. However, reduced rates of PPI EPTC + cycloate or cycloate followed by reduced rates of postemergence herbicides generally gave good weed control.

Pennsylvania smartweed control, Mahnomen, 1995. Preplant incorporated herbicides were applied in 17 gpa water at 40 psi through 8002 nozzles to the center four rows of six row plots and incorporated with a rototiller set four inches deep 1:40 PM May 22 when the air temperature was 55F, relative humidity was 65%, soil temperature at six inches was 54F, wind was 17 mph, cloud cover was 100% and soil moisture was good. 'Beta 2010' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 11. 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 June 12 when the air temperature was 78F, relative humidity was 37%, soil temperature at six inches was 68F, wind was 4 mph, cloud cover was 100%, soil moisture was good, sugarbeet was in the 2 leaf stage, redroot pigweed was in the cotyledon to 4 leaf stage and Pennsylvania smartweed was in the cotyledon to 3 leaf stage. The second postemergence herbicide application was 3:00 PM June 19 when the air temperature was 90F, relative humidity was 47%, soil temperature at six inches was 77F, wind was 15 mph, cloud cover was 5%, soil moisture was good, sugarbeet was in the 4 to 6 leaf stage, redroot pigweed was 2 to 4 inches tall and Pennsylvania smartweed was 2 to 6 inches tall. The third postemergence herbicide application was 2:15 PM June 28 when the air temperature was 79F, relative humidity was 75%, soil temperature at six inches was 73F, wind was 9 mph, cloud cover was 90%, soil moisture was good, sugarbeet was in the 6 to 8 leaf stage and redroot pigweed and Pennsylvania smartweed were 4 to 12 inches tall. 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. Sugarbeet injury, redroot pigweed control and Pennsylvania smartweed control were evaluated July 13.

Treatment	Rate	Sgbt inj	Rrpw cntl	Pesw cntl
	lb/A	%	%	%
Desmedipham/Desmedipham	0.25/0.33	0	91	21
Desm&Phen/Desm&Phen	0.25/0.33	0	60	29
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	0	70	48
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	0	85	45
Desm&Phen+Clopyralid/	0.25+0.09			
Desm&Phen+Clopyralid	0.33+0.09	0	76	59
Desm&Phen+Endothall/	0.25+0.25			
Desm&Phen+Endothall	0.33+0.33	0	45	99
Desm&Phen&Etho+Endothall/	0.25+0.25			
Desm&Phen&Etho+Endothall	0.33+0.33	0	48	99
Desm&Phen&Etho+Clopyralid/	0.25+0.09			
Desm&Phen&Etho+Clopyralid	0.33+0.09	0	76	53
Desm&Phen+Triflusulfuron/	0.25+0.0156			
Desm&Phen+Triflusulfuron	0.33+0.0156	3	98	98
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156			
Desm&Phen&Etho+Triflusulfuron	0.33+0.0156	3	97	99
Desm&Phen+Clpy+Tfsu/	0.25+0.09+0.0156			
Desm&Phen+Clpy+Tfsu	0.33+0.09+0.0156	3	98	99
Desm&Phen+Clpy+Tfsu/	0.16+0.06+0.01			
Desm&Phen+Clpy+Tfsu/	0.25+0.06+0.01			
Desm&Phen+Clpy+Tfsu	0.25+0.06+0.01	0	96	99
Desm&Phen+Clopyralid/	0.25+0.09			
Desm&Phen+Clpy/Endothall	0.33+0.09/0.5	0	82	99

Table continued on next page.

Pennsylvania smartweed control, Mahnomen, 1995. (continued)

Treatment	Rate	Sgbt inj	Rrpw cntl	Pesw cntl
	lb/A	%	%	%
--/--/Endothall	0.5	8	28	97
EPTC+Cycloate (PPI)	0.88+1.5	0	54	25
EPTC+Cycloate (PPI)/	0.88+1.5			
Desm&Phen+Endothall/	0.16+0.16			
Desm&Phen+Endothall	0.25+0.25	16	90	97
EPTC+Cycloate (PPI)/	0.88+1.5			
--/Desm&Phen+Endothall/	0.16+0.25			
Desm&Phen+Endothall	0.25+0.33	18	84	95
EPTC+Cycloate (PPI)/	0.88+1.5			
Desm&Phen&Etho/Desm&Phen&Etho	0.16/0.25	15	95	79
EPTC+Cycloate (PPI)/	0.88+1.5			
--/Des&Phen&Etho/Des&Phen&Etho	0.16/0.25	0	91	66
EPTC+Cycloate (PPI)/	0.88+1.5			
--/Desm&Phen+Clopyralid/	0.16+0.09			
Desm&Phen+Clopyralid	0.25+0.09	5	82	49
--/--/Endothall	0.75	15	33	99
C.V. %		97	13	12
LSD 5%		6	14	13
LSD 1%		7	19	17
# OF REPS		4	4	4

Summary

Endothall at 0.5 or 0.75 lb/A and EPTC + cycloate followed by desmedipham & phenmedipham + endothall caused significant sugarbeet injury. EPTC + cycloate followed by desmedipham & phenmedipham & ethofumesate applied June 12 and June 19 gave more sugarbeet injury than EPTC + cycloate followed by desmedipham & phenmedipham & ethofumesate applied June 19 and June 28 so delaying the first postemergence treatment reduced sugarbeet injury. However, control of Pennsylvania smartweed also was reduced. Desmedipham gave better control of redroot pigweed than desmedipham & phenmedipham or desmedipham & phenmedipham & ethofumesate. Addition of triflusulfuron to desmedipham & phenmedipham or desmedipham & phenmedipham & ethofumesate improved redroot pigweed control but addition of endothall reduced redroot pigweed control. EPTC + cycloate at the reduced rate of 0.88 + 1.5 lb/A followed by desmedipham & phenmedipham & ethofumesate at 0.16/0.25 lb/A gave 95% redroot pigweed control compared to 54% control from EPTC + cycloate alone or 70% from desmedipham & phenmedipham & ethofumesate at 0.25/0.33 lb/A. The low rate of EPTC + cycloate apparently sensitized the redroot pigweed to the postemergence herbicides. All treatments that included endothall or triflusulfuron gave excellent control of Pennsylvania smartweed.

Postemergence broadleaf herbicides, Crookston, 1995. 'Beta 2010' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 1. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first herbicide application was 10:30 AM June 6 when the air temperature was 74F, relative humidity was 74%, soil temperature at six inches was 67F, wind was 5-10 mph, cloud cover was 90%, soil moisture was good, sugarbeet was in the 2 leaf stage, redroot pigweed, prostrate pigweed and common lambsquarters were in the cotyledon to 4 leaf stage and wild mustard and wild buckwheat were in the cotyledon to 2 leaf stage. The second herbicide application was 1:00 PM June 13 when the air temperature was 82F, relative humidity was 43%, soil temperature at six inches was 72F, wind was 10-15 mph, cloud cover was 75%, soil moisture was good, sugarbeet was in the 2 to 4 leaf stage, redroot pigweed was in the 2 to 6 leaf stage, prostrate pigweed was in the 2 leaf stage to 1 inch in diameter, common lambsquarters was in the 4 leaf stage to 1.5 inches tall, wild mustard was in the 2 to 6 leaf stage and wild buckwheat was in the 2 to 4 leaf stage. The third herbicide application was 12:30 PM June 19 when the air temperature was 89F, relative humidity was 50%, soil temperature at six inches was 76F, wind was 10 mph, cloud cover was 0%, soil moisture was good, sugarbeet was in the 6 to 8 leaf stage, redroot pigweed was in the 4 leaf stage to 1.5 inches tall, prostrate pigweed was 2 to 5 inches in diameter, common lambsquarters was 2 to 4 inches tall, wild mustard was in the 6 to 8 leaf stage and wild buckwheat was 1.5 to 2 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. Sethoxydim + crop oil at 0.2 lb ai/A + 1 qt/A was applied to the entire plot area June 22. Sugarbeet injury, prostrate pigweed, common lambsquarters, wild mustard and wild buckwheat control were evaluated June 28 and July 19. Redroot pigweed control was evaluated July 19.

		June 28				July 19					
Treatment	Rate	Sgbt inj	Prpw cntl	Colq cntl	Wibw cntl	Sgbt inj	Rrpw cntl	Prpw cntl	Colq cntl	Wimu cntl	Wibw cntl
	lb/A	%	%	%	%	%	%	%	%	%	%
Desm&Phen&Etho/	0.25										
Desm&Phen&Etho	0.33	56	95	100	93	0	86	73	97	92	85
Desm&Phen&Etho/	0.33										
Desm&Phen&Etho	0.4	78	90	100	94	30	88	61	96	99	94
Desmedipham/	0.25										
Desmedipham	0.33	54	96	100	84	0	96	70	98	98	54
Desmedipham/	0.33										
Desmedipham	0.4	66	94	100	79	21	83	73	91	96	55
De&Ph&Et+Des/	0.21+0.04										
De&Ph&Et+Des	0.28+0.05	53	95	100	95	5	87	76	94	96	80
De&Ph&Et+Des/	0.28+0.05										
De&Ph&Et+Des	0.33+0.07	65	89	100	80	14	94	75	93	91	84
De&Ph&Et+Des/	0.17+0.08										
De&Ph&Et+Des	0.22+0.11	45	94	100	91	0	98	84	96	94	71
De&Ph&Et+Des/	0.22+0.11										
De&Ph&Et+Des	0.27+0.13	74	96	100	97	26	87	76	97	91	84
De&Ph&Et+Des/	0.13+0.12										
De&Ph&Et+Des	0.17+0.16	58	94	100	84	0	89	80	97	94	69

Table continued on next page.

Postemergence broadleaf herbicides, Crookston, 1995. (continued)

Treatment	Rate	June 28				July 19					
		Sgbt inj	Prpw cntl	Colq cntl	Wibw cntl	Sgbt inj	Rrpw cntl	Prpw cntl	Colq cntl	Wimu cntl	Wibw cntl
	lb/A	%	%	%	%	%	%	%	%	%	%
De&Ph&Et+Des/	0.17+0.16										
De&Ph&Et+Des	0.2+0.2	64	88	100	88	20	84	79	87	85	70
De&Ph&Et+Des/	0.25+0.04										
De&Ph&Et+Des	0.33+0.05	59	94	100	96	10	89	75	92	96	83
De&Ph&Et+Des/	0.33+0.05										
De&Ph&Et+Des	0.4+0.07	75	97	99	94	24	96	79	95	97	75
Glufosinate/	0.18										
Gluf/Gluf	0.18/0.18	100	100	90	100	100	98	99	65	100	99
Glufosinate/--/--	0.27	97	64	35	48	96	60	45	25	40	24
Glufosinate/--/--	0.36	100	70	55	48	97	85	63	25	65	35
--/--/Glufosinate	0.27	98	98	86	94	91	94	79	70	95	73
--/--/Glufosinate	0.36	100	100	96	100	98	97	88	86	100	69
--/--/Glufosinate	0.75	100	99	93	99	99	99	98	85	100	92
Gluf/--/Gluf	0.18/0.18	100	100	80	96	100	98	96	41	100	80
Gluf/--/Gluf	0.27/0.27	100	100	98	100	100	100	97	92	100	97
Gluf/--/Gluf	0.36/0.36	100	100	99	99	100	100	96	97	100	99
--/Gluf/Gluf	0.27/0.27	100	99	98	100	100	95	89	93	100	100
--/Gluf/Gluf	0.36/0.36	99	100	100	100	100	100	98	98	100	99
Glyphosate/--/--	0.56	100	88	100	92	98	71	45	87	71	67
--/Glyphosate/--	0.56	100	96	100	100	99	81	63	93	99	87
--/--/Glyphosate	0.56	100	100	99	100	100	100	99	100	100	100
--/Glyt/Glyt	0.28/0.28	100	100	99	99	100	100	96	99	100	98
--/Glyt/Glyt	0.375/0.375	100	100	99	99	100	98	97	99	100	99
Desm+Clpy/	0.25+0.09										
Desm+Clpy	0.33+0.09	43	98	100	100	5	96	85	100	99	99
Desm+Tfsu/	0.25+0.0156										
Desm+Tfsu	0.33+0.0156	46	98	100	90	0	99	94	94	100	71
Des+Clp+Tfs/	.16+.06+.01										
Des+Clp+Tfs/	.25+.06+.01										
Des+Clp+Tfs	.25+.06+.01	35	100	100	99	0	100	100	100	100	100
C.V. %		14	5	7	12	10	9	11	13	11	16
LSD 5%		16	7	9	15	8	12	12	16	15	18
LSD 1%		21	9	12	20	10	16	16	21	19	24
# OF REPS		4	4	4	4	4	4	4	4	4	4

Summary

All treatments caused significant sugarbeet injury on June 28. Injury was less on July 19 but five treatments of sugarbeet herbicides still caused over 20% injury. As expected, glyphosate and glufosinate killed nearly all the sugarbeets since the seeded variety was not resistant. Sugarbeet injury from desmedipham & phenmedipham & ethofumesate + desmedipham was closely related to rate applied. Glufosinate at 0.18 lb/A applied twice gave good control of all weeds except common lambsquarters. Glufosinate applied twice at 0.36 lb/A gave good control of all weeds. Glyphosate at 0.56 lb/A applied on June 19 gave better weed control than when applied on June 13 or June 6 probably because weeds germinated and emerged after the early applications. Adding desmedipham to desm&phen&etho had little impact on pigweed spp. control.

Postemergence broadleaf herbicides, Milan, 1995. 'ACH 198' sugarbeet was seeded May 2. The first herbicide application was 2:00 PM May 18 when the air temperature was 60F, relative humidity was 40%, wind was 5 mph, soil moisture was good and sugarbeet and Pennsylvania smartweed were in the cotyledon stage. The second herbicide application was 4:30 PM May 25 when the air temperature was 75F, relative humidity was 55%, wind was 0 mph, soil moisture was good, sugarbeet was in the 2 leaf stage and Pennsylvania smartweed was in the cotyledon stage to 2 inches tall. The third postemergence herbicide application was 3:00 PM June 1 when the air temperature was 80F, relative humidity was 60%, wind was 15 mph, soil moisture was good, sugarbeet was in the 4 leaf stage and Pennsylvania smartweed was 2 to 6 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 Pennsylvania smartweed control were evaluated two weeks after the third herbicide application.

Table on next page.

Summary

Desmedipham&phenmedipham&ethofumesate gave better control of smartweed than desmedipham or desmedipham + clopyralid. Smartweed apparently emerged late since desmedipham + clopyralid + triflusulfuron applied on May 18 and May 25 gave less control than the same treatment applied on May 25 and June 1. Only two selective treatments gave over 90% control: desmedipham & phenmedipham + clopyralid + triflusulfuron applied three times and desmedipham followed by two applications of desmedipham + clopyralid + triflusulfuron. Glyphosate and glufosinate gave excellent control of smartweed but killed the sugarbeet since transgenic sugarbeet lines were not used.

Postemergence broadleaf herbicides, Milan, 1995. (continued)

Treatment	Rate	Sgbt inj	Pesw cntl
	lb/A	%	%
Desmedipham/Desmedipham	0.25/0.33	3	13
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	10	61
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	3	40
Desm&Phen&Etho+Clopyralid/	0.25+0.09		
Desm&Phen&Etho+Clopyralid	0.33+0.09	11	73
Desm+Tfsu/Desm+Tfsu	0.25+0.0156/0.33+0.0156	15	60
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156		
Desm&Phen&Etho+Triflusulfuron	0.33+0.0156	14	64
Desm+Clpy+Triflusulfuron/	0.25+0.09+0.0156		
Desm+Clpy+Triflusulfuron	0.33+0.09+0.0156	11	61
Desm+Clpy+Triflusulfuron/	0.16+0.06+0.01		
Desm+Clpy+Triflusulfuron/	0.25+0.06+0.01		
Desm+Clpy+Triflusulfuron	0.25+0.06+0.01	13	85
--/Desm+Clpy+Triflusulfuron/	0.25+0.09+0.0156		
Desm+Clpy+Triflusulfuron	0.33+0.09+0.0156	10	86
--/Desm&Phen&Etho+Clopyralid/	0.25+0.09		
Desm&Phen&Etho+Clopyralid	0.33+0.09	11	84
Desm&Phen&Etho+Clpy+Tfsu/	0.25+0.09+0.0156		
Desm&Phen&Etho+Clpy+Tfsu	0.33+0.09+0.0156	14	87
Desm&Phen+Clpy+Tfsu/	0.16+0.06+0.01		
Desm&Phen+Clpy+Tfsu/	0.25+0.06+0.01		
Desm&Phen+Clpy+Tfsu	0.25+0.06+0.01	14	94
Desm&Phen&Etho+Desmedipham/	0.17+0.08		
Desm&Phen&Etho+Desmedipham	0.22+0.11	5	51
Desm&Phen&Etho+Desmedipham/	0.13+0.12		
Desm&Phen&Etho+Desmedipham	0.17+0.16	15	47
Desm/Desm+Clpy+Tfsu/	0.25/0.25+0.09+0.0156		
Desm+Clpy+Tfsu	0.33+0.09+0.0156	11	96
Desm/Desm&Phen&Etho+Clpy/	0.25/0.25+0.09		
Desm&Phen&Etho+Clopyralid	0.33+0.09	14	83
--/--/Glyphosate	0.56	100	92
--/Glyphosate/Glyphosate	0.375/0.375	100	100
--/--/Glufosinate	0.36	100	98
--/Glufosinate/Glufosinate	0.18/0.18	100	99
C.V. %		21	16
LSD 5%		9	16
LSD 1%		12	22
# OF REPS		4	4

Postemergence broadleaf herbicides, Benson, 1995. 'Hilleshog 5135' sugarbeet was seeded May 8. The first herbicide application was 2:00 PM May 23 when the air temperature was 65F, relative humidity was 40%, wind was 10-15 mph, soil moisture was good, cloud cover was 40%, sugarbeet was in the cotyledon stage, velvetleaf was in the cotyledon stage and redroot pigweed was in the cotyledon to 2 leaf stage. The second herbicide application was 4:00 PM May 30 when the air temperature was 70F, relative humidity was 60%, wind was 10 mph, soil moisture was good, cloud cover was 20%, sugarbeet was in the 2 leaf stage, velvetleaf was in the cotyledon stage to one inch tall and redroot pigweed was in the 2 to 4 leaf stage. The third herbicide application was 1:00 PM June 6 when the air temperature was 80F, relative humidity was 65%, wind was 0-5 mph, soil moisture was good, cloud cover was 50%, sugarbeet was in the 4 leaf stage, velvetleaf was 1 to 2 inches tall and redroot pigweed was in the 2 to 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 velvetleaf and redroot pigweed control were evaluated two weeks after the third herbicide application.

Table on next page.

Summary

Glyphosate and glufosinate gave nearly total weed control and sugarbeet injury. Desmedipham & phenmedipham & ethofumesate gave greater sugarbeet injury and velvetleaf control than desmedipham. Treatments including triflusulfuron generally gave the best control of velvetleaf among the selective treatments while treatments including clopyralid and triflusulfuron generally gave the best control of redroot pigweed.

Postemergence broadleaf herbicides, Benson, 1995. (continued)

Treatment	Rate	Sgbt inj	Vele cntl	Rrpw cntl
	lb/A	%	%	%
Desmedipham/Desmedipham	0.25/0.33	0	30	56
Desm&Phen&Etho/Desm&Phen&Etho	0.25/0.33	16	50	65
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	3	43	74
Desm&Phen&Etho+Clopyralid/	0.25+0.09			
Desm&Phen&Etho+Clopyralid	0.33+0.09	16	58	61
Desm+Tfsu/Desm+Tfsu	0.25+0.0156/0.33+0.0156	14	68	80
Desm&Phen&Etho+Triflusulfuron/	0.25+0.0156			
Desm&Phen&Etho+Triflusulfuron	0.33+0.0156	24	82	89
Desm+Clpy+Triflusulfuron/	0.25+0.09+0.0156			
Desm+Clpy+Triflusulfuron	0.33+0.09+0.0156	9	88	88
Desm+Clpy+Triflusulfuron/	0.16+0.06+0.01			
Desm+Clpy+Triflusulfuron/	0.25+0.06+0.01			
Desm+Clpy+Triflusulfuron	0.25+0.06+0.01	18	91	98
--/Desm+Clpy+Triflusulfuron/	0.25+0.09+0.0156			
Desm+Clpy+Triflusulfuron	0.33+0.09+0.0156	14	95	98
--/Desm&Phen&Etho+Clopyralid/	0.25+0.09			
Desm&Phen&Etho+Clopyralid	0.33+0.09	16	70	81
Desm&Phen&Etho+Clpy+Tfsu/	0.25+0.09+0.0156			
Desm&Phen&Etho+Clpy+Tfsu	0.33+0.09+0.0156	19	85	92
Desm&Phen+Clpy+Tfsu/	0.16+0.06+0.01			
Desm&Phen+Clpy+Tfsu/	0.25+0.06+0.01			
Desm&Phen+Clpy+Tfsu	0.25+0.06+0.01	25	98	98
Desm&Phen&Etho+Desmedipham/	0.17+0.08			
Desm&Phen&Etho+Desmedipham	0.22+0.11	13	58	89
Desm&Phen&Etho+Desmedipham/	0.13+0.12			
Desm&Phen&Etho+Desmedipham	0.17+0.16	9	54	89
Desm/Desm+Clpy+Tfsu/	0.25/0.25+0.09+0.0156			
Desm+Clpy+Tfsu	0.33+0.09+0.0156	11	93	97
Desm/Desm&Phen&Etho+Clpy/	0.25/0.25+0.09			
Desm&Phen&Etho+Clopyralid	0.33+0.09	18	84	95
--/--/Glyphosate	0.56	100	100	100
--/Glyphosate/Glyphosate	0.375/0.375	100	100	100
--/--/Glufosinate	0.36	100	100	99
--/Glufosinate/Glufosinate	0.18/0.18	100	100	99
C.V. %		20	15	8
LSD 5%		9	16	10
LSD 1%		12	22	13
# OF REPS		4	4	4

Postemergence broadleaf herbicides, Minto, 1995. 'Beta 2010' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 23. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first herbicide application was 12:00 PM June 12 when the air temperature was 78F, relative humidity was 37%, soil temperature at six inches was 68F, wind was 4 mph, cloud cover was 0%, soil moisture was good, sugarbeet was in the cotyledon to 2 leaf stage and redroot pigweed was in the cotyledon to 4 leaf stage. The second herbicide application was 10:00 AM June 19 when the air temperature was 81F, relative humidity was 65%, soil temperature at six inches was 73F, wind was 2 mph, cloud cover was 5%, soil moisture was good, sugarbeet was in the 6 to 8 leaf stage and redroot pigweed was in the 4 to 6 leaf stage. The third herbicide application was 10:30 AM June 28 when the air temperature was 74F, relative humidity was 82%, soil temperature at six inches was 70F, wind was 8 mph, cloud cover was 95%, soil moisture was good, sugarbeet was in the 8 to 12 leaf stage and redroot pigweed was 2 to 12 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 redroot pigweed control were evaluated July 11.

Table on next page.

Summary

Glyphosate and glufosinate killed most of the sugarbeet plants since the variety was not resistant. Desmedipham + clopyralid gave more sugarbeet injury and more pigweed control than desmedipham or desmedipham & phenmedipham & ethofumesate. Desmedipham & phenmedipham & ethofumesate gave less pigweed control than desmedipham. Adding desmedipham to desmedipham & phenmedipham & ethofumesate resulted in improved pigweed control. Desmedipham + clopyralid + triflusulfuron or desmedipham + phenmedipham + ethofumesate + clopyralid applied on June 12 and June 19 gave more sugarbeet injury than the same treatments applied on June 19 and June 28. All treatments that included triflusulfuron gave 98% or 99% control of redroot pigweed.

Postemergence broadleaf herbicides, Minto, 1995. (continued)

Treatment	Rate	Sugarbeet injury	Redroot Pigweed control
	lb/A	%	%
Desmedipham/Desmedipham	0.25/0.33	23	90
Desm&Phen&Ethofumesate/	0.25		
Desm&Phen&Ethofumesate	0.33	21	81
Desmedipham+Clopyralid/	0.25+0.09		
Desmed+Clopyralid	0.33+0.09	35	97
Desm&Phen&Etho+Clpy/	0.25+0.09		
Desm&Phen&Etho+Clpy	0.33+0.09	26	93
Desm+Triflusulfuron/	0.25+0.0156		
Desm+Triflusulfuron	0.33+0.0156	25	97
Desm&Phen&Etho+Tfsu/	0.25+0.0156		
Desm&Phen&Etho+Tfsu	0.33+0.0156	16	99
Desm+Clpy+Tfsu/	0.25+0.09+0.0156		
Desm+Clpy+Tfsu	0.33+0.09+0.0156	31	99
Desm+Clpy+Tfsu/	0.16+0.06+0.01		
Desm+Clpy+Tfsu/	0.25+0.06+0.01		
Desm+Clpy+Tfsu	0.25+0.06+0.01	16	99
--/Desm+Clpy+Tfsu/	0.25+0.09+0.0156		
Desm+Clpy+Tfsu	0.33+0.09+0.0156	10	98
--/Desm&Phen&Etho+Clpy/	0.25+0.09		
Desm&Phen&Etho+Clpy	0.33+0.09	14	87
De&Ph&Et+Clpy+Tfsu/	0.25+0.09+0.0156		
De&Ph&Et+Clpy+Tfsu	0.33+0.09+0.0156	29	98
De&Ph&Et+Clpy+Tfsu/	0.16+0.06+0.01		
De&Ph&Et+Clpy+Tfsu/	0.25+0.06+0.01		
De&Ph&Et+Clpy+Tfsu	0.25+0.06+0.01	20	99
Desm&Phen&Etho+Desm/	0.17+0.08		
Desm&Phen&Etho+Desm	0.22+0.11	25	89
Desm&Phen&Etho+Desm/	0.13+0.12		
Desm&Phen&Etho+Desm	0.17+0.16	14	95
Desmedipham/	0.25		
Desm+Clpy+Tfsu/	0.25+0.09+0.0156		
Desm+Clpy+Tfsu	0.33+0.09+0.0156	18	99
Desmedipham/	0.25		
Desm&Phen&Etho+Clpy/	0.25+0.09		
Desm&Phen&Etho+Clpy	0.33+0.09	23	96
--/--/Glyphosate	0.56	100	100
--/Glyphosate/Glyphosate	0.375/0.375	100	100
--/--/Glufosinate	0.36	97	95
--/Glufosinate/Glufosinate	0.18/0.18	100	96
C.V. %		15	3
LSD 5%		8	5
LSD 1%		10	6
# OF REPS		4	4

Grass control with postemergence herbicides, Fargo, 1995. 'Foster' barley at 65 lb/A, 'NewDak' oats at 50 lb/A, 'Agri I' navy bean, 'Van der Have H66156' sugarbeet, 'Sunup' white proso millet at 60 lb/A and 'Manta' Siberian foxtail millet at 60 lb/A were seeded in 4 foot strips across the herbicide plots May 30. The first half of split application treatments was at 8:00 AM June 20 when the air temperature was 79F, relative humidity was 68%, wind velocity was 5-10 mph, sky was clear, soil temperature at six inches was 72F and soil moisture was fair. All single application treatments and the second half of the three day split applied treatments were at 12:00 PM June 23 when the air temperature was 79F, relative humidity was 72%, wind velocity was 9 mph, cloud cover was 90%, soil temperature at six inches was 76F, soil moisture was good, barley, oats, foxtail millet and proso millet were 6 to 7 inches tall, sugarbeet was in the 2 to 6 leaf stage, navy bean was in the 1 to 3 trifoliolate stage and yellow foxtail was 2 to 5 inches tall. The second half of all other split applied treatments was at 1:00 PM June 29 when the air temperature was 72F, relative humidity was 69%, wind velocity was 10 mph, cloud cover was 100%, soil temperature at six inches was 68F and soil moisture was good. 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, yellow foxtail, proso millet and foxtail millet were evaluated July 17.

Treatment*	Rate	Barl	Oats	Nabe	Sgbt	Yeft	Prmi	Fomi
	lb/A	--------		percent		control		--------
--/Sethoxydim-P+Scoil	0.2+1.5%	99	99	0	0	99	99	99
--/Sethoxydim-U+Scoil	0.2+1.5%	99	99	6	0	98	99	99
--/Sethoxydim-P+Des&Phen	0.2+0.33	50	64	9	0	74	85	89
--/Sethoxydim-U+Des&Phen	0.2+0.33	38	56	5	0	78	78	82
--/Seth-P+Des&Phen+Scoil	0.2+0.33+1.5%	63	69	10	0	94	91	92
--/Seth-U+Des&Phen+Scoil	0.2+0.33+1.5%	71	83	6	3	94	91	92
--/Sethoxydim-U+Des&Phen	0.3+0.33	63	71	6	0	96	95	97
--/Sethoxydim-P+Des&Phen	0.3+0.33	49	70	8	0	87	91	95
--/Seth-U+Des&Phen&Etho	0.2+0.33	51	73	6	0	86	85	93
--/Seth-U+De&Ph&Et+Scoil	0.2+0.33+1.5%	78	83	14	3	95	95	96
--/Seth-U+Des&Phen&Etho	0.3+0.33	59	75	6	0	95	91	97
--/Seth-U+Clpy+Scoil	0.2+0.09+1.5%	99	99	94	0	98	99	99
--/Seth-P+Tfsu+De&Ph+Scoil	0.2+0.0156+0.33+1.5%	63	70	49	5	89	86	88
--/Seth-P+Tfsu+Des&Phen	0.2+0.0156+0.33	55	64	36	0	64	68	81
--/Seth-P+Tfsu+Scoil	0.2+0.0156+1.5%	78	99	70	3	97	97	98
--/Seth-P+Triflusulfuron	0.2+0.0156	58	88	45	0	94	95	96
Tfsu+De&Ph/3 days/Seth-P+Scoil	0.0156+0.33/0.2+1.5%	90	98	44	0	99	98	99
--/Tfsu+Seth-P+Scoil	0.0156+0.3+1.5%	94	99	36	0	98	99	99
--/Tfsu+Seth-P+De&Ph+Scoil	0.0156+0.3+0.33+1.5%	73	93	62	13	98	97	98
--/Tfsu+Qufp+Scoil	0.0156+0.041+1.5%	96	95	50	0	50	78	97
--/Tfsu+Qufp+De&Ph+Scoil	0.0156+0.041+0.33+1.5%	97	65	38	0	41	93	96

Table continued on next page.

Grass control with postemergence herbicides, Fargo, 1995. (continued)

Treatment*	Rate	Barl	Oats	Nabe	Sgbt	Yeft	Prmi	Fomi
	lb/A	--------		percent		control		--------
--/Tfsu+Qufp+Scoil	0.0156+0.055+1.5%	97	96	45	8	53	88	97
--/Tfsu+Qufp+De&Ph+Scoil	0.0156+0.055+0.33+1.5%	98	79	50	0	59	90	94
Tfsu+De&Ph/3 days/Qufp+Scoil	0.0156+0.33/0.055+1.5%	98	97	45	3	86	91	90
--/Tfsu+Qufp+Scoil	0.0156+0.083+1.5%	99	98	41	0	83	96	98
--/Tfsu+Qufp+De&Ph+Scoil	0.0156+0.083+0.33+1.5%	95	80	48	0	30	94	97
--/Tfsu+Seth-P+R-11	0.0156+0.2+0.25%	56	98	43	3	97	96	97
--/Tfsu+Seth-P+De&Ph+R-11	0.0156+0.2+0.33+0.25%	53	56	48	0	78	86	91
--/Sethoxydim-P+R-11	0.2+0.25%	63	87	0	0	95	95	95
--/Quizalofop+Scoil	0.055+1.5%	98	98	0	0	92	96	98
--/Tfsu+Des&Phen+Scoil	0.0156+0.33+1.5%	59	15	58	0	20	23	21
--/Clethodim-P+Scoil	0.094+1.5%	99	99	3	0	99	99	98
--/Clethodim-P+Scoil	0.125+1.5%	99	99	0	0	99	99	99
--/Clet-P+Des&Phen+Scoil	0.094+0.33+1.5%	95	98	12	0	94	94	95
--/Clet-P+Des&Phen+Scoil	0.094+0.5+1.5%	85	98	24	5	97	97	97
--/Clet-P+Des&Phen+Scoil	0.094+0.75+1.5%	71	98	26	0	92	97	95
--/Clet-P+Desm+Scoil	0.094+0.5+1.5%	87	95	21	0	96	97	92
--/Clet-P+Clpy+Scoil	0.094+0.18+1.5%	99	99	98	0	99	99	99
Seth-P+Bentazon+Scoil/ Seth-P+Bentazon+Scoil	0.2+0.4+1.5% 0.2+0.4+1.5%	88	95	0	99	99	99	99
Clet-P+Bentazon+Scoil/ Clet-P+Bentazon+Scoil	0.094+0.4+1.5% 0.094+0.4+1.5%	99	99	1	99	99	99	99
Clet-P+Bentazon+Scoil/ Clet-P+Bentazon+Scoil	0.059+0.4+1.5% 0.059+0.4+1.5%	95	98	0	98	99	98	99
Quizalofop+Bent+Scoil/ Quizalofop+Bent+Scoil	0.07+0.4+1.5% 0.07+0.4+1.5%	99	99	0	99	99	97	99
--/Seth-P+Lorsban+Scoil	0.2+1+0.5%	88	99	1	3	96	99	99
C.V. %		10	7	30	37	13	7	5
LSD 5%		11	8	11	5	16	8	6
LSD 1%		14	11	15	7	21	11	8
# OF REPS		4	4	4	4	4	4	4

* Sethoxydim-P = Poast, 1.5 lb ai/gal formulation from BASF.
Sethoxydim-U = Ultima, 1.3 lb ai/gal formulation from BASF.
Clethodim-P = Prism, 0.94 lb ai/gal formulation from Valent.
Scoil = methylated seed oil from Agsco.
R-11 = non-ionic surfactant from Wilbur-Ellis.
Quizalofop = Assure II, 0.88 lb ai/gal formulation from DuPont.

Experiment continued on next page.

Summary

Addition of desmedipham & phenmedipham to sethoxydim, clethodim or quizalofop generally reduced control of oats and barley and sometimes reduced control of yellow foxtail and millets. Clethodim, on average, was antagonized less than quizalofop or sethoxydim. Triflusulfuron antagonized barley control from sethoxydim and yellow foxtail control from quizalofop. Desmedipham & phenmedipham + triflusulfuron antagonized sethoxydim similar to desmedipham & phenmedipham. Triflusulfuron did not contribute to grass control in the combinations with grass herbicides. Sethoxydim + R-11 gave less grass control than sethoxydim + Scoil. Increasing the rate of sethoxydim from 0.2 to 0.3 lb/A did not totally overcome antagonism from desmedipham & phenmedipham. Sethoxydim + desmedipham & phenmedipham & ethofumesate gave better grass control than sethoxydim + desmedipham & phenmedipham. Sethoxydim or quizalofop plus desmedipham & phenmedipham + triflusulfuron gave better grass control when Scoil was used as an adjuvant compared to no adjuvant but control was still less than from sethoxydim + Scoil or quizalofop + Scoil. Three days between the application of broadleaf herbicides and the application of sethoxydim or quizalofop nearly eliminated the antagonism. Clethodim + bentazon + Scoil and quizalofop + bentazon + Scoil applied twice gave nearly total grass control. Sethoxydim + bentazon + Scoil applied twice gave less barley control than sethoxydim + Scoil applied once.

Herbicides and sugarbeet yield, Fargo, 1995. Preplant incorporated herbicides 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 5 when the air temperature was 63F, soil temperature at six inches was 48F, relative humidity was 26%, wind velocity was 10 mph, sky was clear and soil moisture was good. Incorporation was with a rototiller set four inches deep for treatments containing EPTC or cycloate and two inches deep for ethofumesate. 'ACH 196' sugarbeet was seeded 1.25 inches deep in 22 inch rows at a 5 inch spacing May 5. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. The first application of split applied postemergence treatments was 2:30 PM May 31 when the air temperature was 88F, soil temperature at six inches was 60F, relative humidity was 30%, wind velocity was 16 mph, cloud cover was 25%, soil moisture was good, sugarbeet and redroot pigweed were in the cotyledon to 2 leaf stage and kochia was 0.25 to 1 inch rosette diameter. The second application of split applied postemergence treatments was 7:00 PM June 6 when the air temperature was 87F, soil temperature at six inches was 74F, relative humidity was 51%, wind velocity was 0-5 mph, cloud cover was 60%, soil moisture was good, sugarbeet was in the 4 leaf stage, redroot pigweed was in the 4 to 6 leaf stage and kochia was 1 inch rosette diameter to 2 inches tall. The third application of split applied postemergence treatments was 4:00 PM June 15 when the air temperature was 89F, soil temperature at six inches was 71F, relative humidity was 47%, wind velocity was 26 mph, sky was clear, soil moisture was fair and sugarbeet was in the 6 to 8 leaf stage. All postemergence herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Lorsban insecticide at 1 lb ai/A was applied to entire plot area May 29. Sethoxydim + Dash at 0.3 lb ai/A + 1 qt/A was applied to all plots May 29 and June 12. Super Tin 80WP at 5 oz product/A was applied to the entire plot area July 23, August 6, and August 20. Row crop cultivation was June 14, June 22 and June 28 to all plots. Sugarbeet was counted from 56 feet of the center two rows of each plot June 20. Each 60 foot long plot was divided into two 28 foot plots. The center four rows from one of the two 28 foot plots for each treatment was hand weeded June 23 and July 18. The time to weed each plot was recorded. Sugarbeet injury, redroot pigweed and kochia control were evaluated in the no hand weeding plots June 12 and July 7. Sugarbeet from the center two rows of 28 foot long plots was counted and harvested September 20.

Experiment continued on next page.

Herbicides and sugarbeet yield, Fargo, 1995. (continued)

Table 1. Treatment effect on sugarbeet, redroot pigweed, kochia and time of hand weeding.

Treatment	Rate	June 12 Sgbt inj	June 12 Rrpw cntl	June 12 Kocz cntl	July 7 Sgbt inj	July 7 Rrpw cntl	July 7 Kocz cntl	6-20 Sgbt Popl	6-23 Time of weeding	7-18 Time of weeding	Total time
	lb/A	%	%	%	%	%	%	#/56'	min/plot		hr/A
Untreated Check	0	0	0	0	0	0	0	88	31.1	8.2	139.0
Tfsu+Desm&Phen/	0.0156+0.33										
Tfsu+Desm&Phen	0.0156+0.33	15	99	98	0	99	98	97	4.9	5.9	37.9
Tfsu+Desm&Phen/	0.0238+0.33										
Tfsu+Desm&Phen	0.0238+0.33	13	99	99	0	97	97	96	7.0	5.5	44.0
Tfsu+Desm&Phen/	0.0156+0.33										
Tfsu+D&P+Clpy	0.0156+0.33+0.09	13	99	98	0	98	96	95	3.9	5.2	31.9
Desmed&Phenmed/	0.25										
Desm&Phen+Clpy/	0.33+0.09										
Desm&Phen+Clpy	0.5+0.09	7	87	70	0	88	86	101	10.0	5.2	53.6
Desmed&Phenmed/	0.33										
Desmed&Phenmed	0.33	7	66	45	0	68	71	100	13.6	7.1	73.1
Cycloate (ppi)/	4										
Desmed&Phenmed/	0.33										
Desmed&Phenmed	0.33	17	98	76	1	96	82	105	4.1	3.5	27.0
Ethofumesate (ppi)/	3										
Desmed&Phenmed/	0.33										
Desmed&Phenmed	0.33	8	99	83	0	99	82	104	4.1	4.8	31.5
EPTC+Cycloate (ppi)/	1.5+2										
Desmed&Phenmed/	0.16										
Desmed&Phenmed	0.25	19	99	65	0	95	80	95	4.8	3.8	30.3
Cycloate (ppi)	4	0	75	6	0	77	1	89	12.4	6.0	65.2
Des&Phen+Etho/	0.25										
Des&Phen+Etho	0.33	2	64	68	0	72	77	107	16.7	7.6	85.9
Tfsu+D&P+Clpy/	0.01+0.25+0.06										
Tfsu+D&P+Clpy/	0.01+0.25+0.06										
Tfsu+D&P+Clpy	0.01+0.25+0.06	6	89	86	0	97	99	90	9.7	5.0	52.0
C.V. %		60	11	17	849	8	16	14	81.2	38.4	60.2
LSD 5%		6	10	13	NS	8	14	NS	9.6	2.5	39.0
LSD 1%		8	13	17	NS	10	18	NS	12.7	NS	51.9
# OF REPS		6	6	6	6	6	6	6	6	6	6

Summary

Time of hand weeding was more in the untreated check plots than in any of the herbicide treated plots. However, 27 hours per acre was the least hand weeding time and that would cost $189 per acre at $7 per hour. Only desmedipham & phenmedipham and desmedipham & phenmedipham & ethofumesate treated plots had significantly greater hand weeding than 27 hours per acre.

Experiment continued on next page.

Herbicides and sugarbeet yield, Fargo, 1995. (continued)

Table 2. Influence of herbicides and hand weeding on sugarbeet yield.

Herbicide Treatment	Rate	Hand Weed	9-20 Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A		#/56'	%	%	ton/A		lb/A
		Yes	81	15.7	1.7	22.8	820	6285
Untreated Check	0	No	69	15.7	1.7	12.5	795	3457
Tfsu+Desm&Phen/	0.0156+0.33	Yes	89	16.0	1.8	23.4	828	6521
Tfsu+Desm&Phen	0.0156+0.33	No	85	16.1	1.8	23.1	804	6533
Tfsu+Desm&Phen/	0.0238+0.33	Yes	87	15.4	1.8	24.0	882	6408
Tfsu+Desm&Phen	0.0238+0.33	No	76	16.3	1.7	23.7	769	6814
Tfsu+Desm&Phen/	0.0156+0.33	Yes	91	15.9	1.8	24.7	828	6861
Tfsu+D&P+Clpy	0.0156+0.33+0.09	No	83	15.7	1.8	24.3	856	6654
Desmed&Phenmed/	0.25							
Desm&Phen+Clpy/	0.33+0.09	Yes	92	16.0	1.8	22.7	800	6389
Desm&Phen+Clpy	0.5+0.09	No	87	15.6	1.8	20.8	852	5625
Desmed&Phenmed/	0.33	Yes	97	15.7	1.8	24.2	828	6642
Desmed&Phenmed	0.33	No	89	16.1	1.7	20.5	762	5839
Cycloate (ppi)/	4							
Desmed&Phenmed/	0.33	Yes	95	16.2	1.8	23.8	809	6759
Desmed&Phenmed	0.33	No	90	15.8	1.8	22.0	823	6113
Ethofumesate (ppi)/	3							
Desmed&Phenmed/	0.33	Yes	97	15.9	1.7	24.0	793	6697
Desmed&Phenmed	0.33	No	88	16.0	1.7	22.1	788	6224
EPTC+Cycloate (ppi)/	1.5+2							
Desmed&Phenmed/	0.16	Yes	83	16.1	1.7	24.0	798	6765
Desmed&Phenmed	0.25	No	83	15.6	1.8	23.1	831	6283
		Yes	93	16.0	1.8	24.0	831	6705
Cycloate (ppi)	4	No	85	15.6	1.8	19.5	835	5339
Des&Phen+Etho/	0.25	Yes	90	16.6	1.7	22.6	726	6660
Des&Phen+Etho	0.33	No	95	16.2	1.6	19.6	728	5621
Tfsu+D&P+Clpy/	0.01+0.25+0.06							
Tfsu+D&P+Clpy/	0.01+0.25+0.06	Yes	84	16.5	1.8	23.4	802	6764
Tfsu+D&P+Clpy	0.01+0.25+0.06	No	84	15.9	1.8	23.4	835	6491
C.V. %			13	4.2	7.5	9.0	10	10
LSD 5%			13	NS	NS	2.3	NS	694
LSD 1%			NS	NS	NS	3.1	NS	916
# OF REPS			6	6	6	6	6	6

Summary

Plots treated with desmedipham & phenmedipham plus desmedipham & phenmedipham + clopyralid applied twice; desmedipham & phenmedipham applied twice; cycloate; desmedipham & phenmedipham & ethofumesate applied twice; and the untreated check plots yielded more extractable sucrose when hand weeded than when unweeded. Hand weeded and unweeded plots yielded similarly with other treatments. All hand weeded plots had similar yield of extractable sucrose indicating no significant sugarbeet injury from the herbicides.

Multispecies evaluation of preplant incorporated and postemergence herbicides, Fargo, 1995. Preplant incorporated herbicides were applied in 17 gpa water at 40 psi through 8002 nozzles to the center 6.67 feet of 11 foot plots 5:30 May 24 when the air temperature was 64F, soil temperature at six inches was 60F, relative humidity was 61%, wind was 0 mph, cloud cover was 80% and soil moisture was good. Incorporation was with a rototiller set 2 inches deep. 'Interstate Payco 4X-85' corn, 'Ozzie' soybean, 'Agri 1' navy bean, 'Othello' pinto bean, 'Neche' flax, 'Seedex Monarch' sugarbeet, 'Laker' durum, 'Kirby' tame mustard, 'Meyer' crambe, tame buckwheat, 'Hybrid 7111' sunflower, 'Valley' oats, 'Hazen' barley and 'Pioneer 2371' wheat were seeded in strips across herbicide plots May 24. Glyphosate + ammonium sulfate + X-77 at 2 pt/A + 10 lb/100 gal + 0.25% was applied to the entire plot area May 29 before crop emergence. Postemergence herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center 6.67 feet of 11 foot plots 8:00 AM June 21 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, corn was in the 4 to 6 leaf stage (5 to 12 inches tall), redroot pigweed was in the 2 leaf stage to 2 inches tall, kochia was in the 0.25 inch rosette stage to 4 inches tall, soybean and navy bean were in the two trifoliolate stage, pinto bean was in the 2 to 3 trifoliolate stage, flax was 2 to 5 inches tall, sugarbeet was in the 4 to 6 leaf stage, durum was 4 to 6 inches tall, tame mustard was in the 4 to 6 leaf stage, crambe was in the 4 leaf stage to 4 inches tall, tame buckwheat was 5 to 8 inches tall, sunflower was in the 6 to 8 leaf stage, oats was 6 to 8 inches tall, barley was 10 inches tall, and wheat was 8 inches tall. Crop injury and weed control were evaluated June 29 in the preplant incorporated herbicide experiment and July 11 in the postemergence herbicide experiment.

Experiment continued on next page.

Multispecies evaluation of preplant incorporated and postemergence herbicides, Fargo, 1995. (continued)

Table 1. Preplant incorporated herbicides.

Treatment	Rate	Corn	Sobe	Nabe	Pibe	Flax	Sgbt	Cram	Tymu	Tabw	Sufl	Oats	Barl	Hrsw	Duru	Rrpw	Kocz
	lb/A	percent control															
Sulfentrazone	0.25	5	13	60	37	75	80	93	65	97	10	15	15	13	27	97	100
Sulfentrazone	0.375	22	37	67	38	43	100	96	90	100	47	27	25	20	42	100	100
Acetochlor-H	2.4	3	40	60	58	80	72	87	90	70	65	97	62	88	96	100	67
Acet&EPTC	4.5	0	50	37	42	80	82	77	93	91	72	100	93	97	99	100	87
Dimethenamid	1.25	3	13	42	45	70	37	53	50	42	33	50	42	68	77	97	50
Metolachlor-II	2	7	32	40	30	57	33	43	27	23	20	33	12	57	75	79	17
Flms&Clpy	0.26	8	100	99	99	100	100	100	99	96	100	17	15	23	38	100	100
Cloransulam	0.039	92	47	82	67	100	100	100	100	98	100	47	68	35	68	100	97
Halosulfuron	0.065	3	33	53	40	99	100	100	98	96	100	17	25	23	35	99	98
Thiafluamide	0.81	3	22	53	47	88	93	93	96	50	43	92	28	43	43	90	88
Isoxaflutole	0.117	32	78	98	98	98	100	98	97	87	98	37	32	33	82	97	100
C.V. %		59	39	36	45	19	17	10	11	12	17	16	40	24	17	7	10
LSD 5%		16	28	38	42	26	23	15	16	16	18	13	26	19	18	12	15
LSD 1%		22	38	NS	NS	35	32	20	22	22	24	17	35	26	25	NS	20
# OF REPS		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Experiment continued on next page.

Multispecies evaluation of preplant incorporated and postemergence herbicides, Fargo, 1995. (continued)

Table 2. Postemergence herbicides.

Treatment*	Rate	Corn	Sobe	Nabe	Pibe	Flax	Sgbt	Cram	Tymu	Tabw	Sufl	Oats	Barl	Hrsw	Duru	Rrpw	Kocz
	lb/A	percent control															
CGA-248757+R-11	0.0045+0.25%	3	37	22	12	32	68	88	62	30	32	2	7	5	3	55	70
CGA-277476+PO	0.07+0.25G	92	30	93	88	78	100	100	99	96	100	90	83	85	92	95	82
Prosulfuron+PO	0.0356+0.25G	3	97	98	98	58	100	100	100	98	100	13	3	2	3	97	92
Prosulf&Primisulf+PO	0.0357+0.25G	27	97	98	98	80	99	100	100	99	99	93	85	88	96	98	100
F-8426+R-11	0.015+0.25%	15	64	96	83	63	70	78	65	93	57	5	22	37	53	82	65
F-8426+R-11	0.031+0.25%	23	57	96	90	87	92	87	53	97	58	15	37	28	18	94	82
Halosulfuron-P+R-11	0.032+0.25%	23	93	12	20	40	99	99	100	86	100	27	50	33	35	90	81
Flumiclorac+R-11	0.027+0.25%	7	28	23	17	5	25	53	50	13	15	13	18	17	22	58	23
Imazamox+Sun-ItII	0.063+0.19G	99	45	47	32	77	100	97	100	96	99	97	94	93	98	100	100
Quinclorac+Sun-ItII	0.38+0.19G	58	60	90	68	93	71	38	32	35	77	23	25	10	17	15	53
Flms&Clpy&2,4-D+R-11	0.21+0.25%	7	99	95	92	38	99	98	98	79	93	20	12	0	8	87	80
Cloran+R-11+28%N	0.16+0.125%+0.25G	60	16	22	27	62	99	99	100	98	100	37	48	53	58	35	35
Tralkoxydim+Scoil	0.18+0.5%	81	0	0	0	0	0	23	0	3	4	80	27	13	20	0	0
Glufosinate	0.75	100	100	100	100	100	100	100	100	99	100	98	88	99	99	99	100
Glyphosate+R-11	0.5+0.25%	100	99	99	99	99	99	99	99	96	99	98	99	99	99	99	99
Pyridate	0.7	40	66	65	70	94	77	17	38	32	65	25	47	27	23	88	80
Fluroxypyr	0.0625	25	58	57	57	88	77	96	47	67	82	12	15	13	10	0	91
C.V. %		38	27	14	16	19	9	13	18	10	10	22	31	39	40	12	16
LSD 5%		30	28	16	17	21	12	18	22	12	12	17	24	28	32	14	19
LSD 1%		40	38	22	22	28	16	24	29	17	16	23	33	38	42	19	26
# OF REPS		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

* R-11 = non-ionic surfactant from Wilbur-Ellis; Sun-ItII = methylated seed oil from Agsco; PO = Mor-Act petroleum oil concentrate from Wilbur-Ellis; 28%N = nitrogen solution containing urea and NH_4NO_3; Scoil = methylated seed oil from Agsco

Summary

Soil moisture was adequate to good throughout the duration of the experiment. Bioassay specie[illegible] weed species stands were generally good throughout the experiment.

Late season new leaf removal effect on sugarbeet, Fargo, 1995. 'ACH 196' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5. Counter 15G insecticide at 12 pounds product per acre was applied in a five inch band over the row at planting. Lorsban insecticide at 1 lb ai/A was applied to the experiment May 29. Sethoxydim+Dash at 0.3 lb ai/A+1 qt/A was applied to the experiment May 29. Desmedipham + clopyralid + sethoxydim at 0.25+0.09+0.3 lb ai/A was applied to the experiment June 1. Sethoxydim+Prime Oil at 0.3 lb ai/A+1 qt/A was applied to the experiment June 12. Super Tin 80WP at 5 oz product per acre was applied to the experiment July 23, August 6, and August 20. Sugarbeet was thinned by hand to an eight inch spacing June 16. All plots were hand weeded June 16 and maintained weed free throughout the growing season by hand weeding and row-crop cultivation June 14, June 22 and June 28. Leaf removal one month before harvest was August 16 and September 1. Leaf removal two months before harvest was July 24, August 2, August 16 and September 1. The four newest leaves from each sugarbeet plant in the center four rows of six row plots were removed at each date. Sugarbeet from the center two rows of 40 foot plots was counted and harvested September 21.

Leaf Removal	Sept. 21 Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	plt/80'	%	%	ton/A		lb/A
No Leaf Removal	112	15.6	1.9	23.3	886	6288
Leaf removal August 16 and September 1	114	16.8	1.8	22.8	754	6791
Leaf removal July 24, August 2, August 16 and September 1	110	16.4	1.8	22.5	807	6466
C.V. %	5	3.3	9.8	3.0	14	6
LSD 5%	NS	0.9	NS	NS	NS	NS
LSD 1%	NS	NS	NS	NS	NS	NS
# OF REPS	4	4	4	4	4	4

Summary

Plots with leaves removed on August 16 and September 1 had a higher sugar content than plots with no leaf removal.

Sugarbeet tolerance to quizalofop, Fargo, 1995. 'ACH 196' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 2. Counter 15G at 12 pounds product per acre was applied modified in-furrow at planting. Herbicide treatments were applied 2:30 PM May 31, 12:30 PM June 14, and 1:00 PM June 2 when the air temperature was 88F, 89F and 72F respectively, soil temperature at six inches was 60F, 70F and 68F respectively, relative humidity was 30%, 52% and 69% respectively, wind velocity was 16, 12 and 10 mph respectively, soil moisture was good all three dates, cloud cover was 25%, 40% and 100% respectively and sugarbeet was in the 4 leaf stage, 6 to 8 leaf stage and 12 to 14 leaf stage respectively. Treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Desmedipham & phenmedipham + clopyralid at 0.25 + 0.09 lb ai/A was applied to all plots May 23 and June 1 to control broadleaf weeds. Lorsban insecticide at 1 lb ai/A was applied to all plots May 29 for cutworm control. Super Tin at 5 oz product/A was applied to all plots July 23, August 6 and August 20 for cercospora leaf spot control. Sugarbeet was hand thinned to an 8 inch spacing June 8. Sugarbeet was maintained weed free by hand weeding thoughout the growing season and row-crop cultivation June 5 and June 19. Sugarbeet injury was evaluated July 7. Sugarbeet from the center two rows of 30 foot plots was counted and harvested September 20.

Treatment*	Rate	Sgbt inj	Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	%	plt/60'	%	%	ton/A		lb/A
Quizalofop+R-11/	0.075+0.25%							
Quizalofop+R-11/	0.075+0.25%							
Quizalofop+R-11	0.075+0.25%	1	85	15.5	1.7	25.9	819	7021
Quizalofop+Mor-Act/	0.075+1%							
Quizalofop+Mor-Act/	0.075+1%							
Quizalofop+Mor-Act	0.075+1%	1	80	15.5	1.7	26.2	807	7145
Quizalofop+R-11/	0.15+0.25%							
Quizalofop+R-11/	0.15+0.25%							
Quizalofop+R-11	0.15+0.25%	1	82	15.4	1.8	26.5	855	7090
Quizalofop+Mor-Act/	0.15+1%							
Quizalofop+Mor-Act/	0.15+1%							
Quizalofop+Mor-Act	0.15+1%	0	84	15.5	1.7	26.0	821	7055
C.V. %		166	4	2.1	6.4	4.3	7	5
LSD 5%		NS	NS	NS	NS	NS	NS	NS
LSD 1%		NS	NS	NS	NS	NS	NS	NS
# OF REPS		4	4	4	4	4	4	4

* Mor-Act = petroleum oil concentrated from Wilbur-Ellis;
R-11 = non-ionic surfactant from Wilbur-Ellis

Summary

Quizalofop had no effect on sugarbeet yield.

Late season weed control, Fargo, 1995. 'Seedex Monarch' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 3. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. The first herbicide application was 12:30 PM June 14 when the air temperature was 89F, relative humidity was 52%, soil temperature at six inches was 70F, wind was 12 mph, cloud cover was 40%, soil moisture was good, sugarbeet was in the 6 to 8 leaf stage, redroot pigweed was in the 6 leaf stage to 3 inches tall and kochia was 3 to 4 inches tall. The second herbicide application was 8:00 AM June 20 when the air temperature was 79F, relative humidity was 68%, soil temperature at six inches was 72F, wind was 5-10 mph, cloud cover was 0%, soil moisture was fair, sugarbeet was in the 8 to 10 leaf stage, redroot pigweed was 2 to 5 inches tall and kochia was 4 to 5 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. Lorsban insecticide at 1 lb ai/A was applied to all plots May 29. Sethoxydim+Dash HC at 0.4 lb ai/A+1 pint/A was applied to all plots June 21. Sugarbeet injury and redroot pigweed and kochia control were evaluated July 8.

Treatment	Rate	Rrpw cntl	Kocz cntl	Sgbt inj
	lb/A	%	%	%
Desmedipham/Desmedipham	1/1	18	8	0
Desm&Phen&Etho/Desm&Phen&Etho	1/1	24	13	3
Desm+Etho+Endo+Clpy/	0.67+0.33+0.75+0.09			
Desm+Etho+Endo+Clpy	0.67+0.33+0.75+0.09	34	19	15
Desmedipham+Ethofumesate/	0.67+0.33			
Desmedipham+Ethofumesate	0.67+0.33	29	16	0
Desmedipham+Triflusulfuron+Clpy/	1+0.03+0.09			
Desmedipham+Triflusulfuron+Clpy	1+0.03+0.09	64	73	16
Desmedipham+Ethofumesate/	1+1			
Desmedipham+Ethofumesate	1+1	60	29	6
EXP MEAN		38	26	7
C.V. %		19	24	66
LSD 5%		11	10	7
LSD 1%		15	13	9
# OF REPS		4	4	4

Summary

These herbicide treatments were applied at unusually high rates but none of them gave weed control over 75%. The best treatment was desmedipham + triflusulfuron + clopyralid at 1 + 0.03 + 0.09 lb/A applied twice.

Carryover of soybean herbicides, Fargo (NW section 22), 1990-1995.

'McCall' soybean was seeded May 24, 1990. The entire plot area was treated with acifluorfen+sethoxydim at 0.25+0.2 lb ai/A plus Dash at 1 qt/A June 26, 1990. Herbicide treatments were applied in 8.5 gpa water at 38 psi through 8001 nozzles to the center 10 feet of 14 foot wide plots 9:15 AM June 29, 1990 when the air temperature was 75F, soil temperature at six inches was 69F, relative humidity was 78%, wind velocity was 2 to 4 mph, soil moisture was good, and soybean was in the 2 to 3 trifoliolate stage. Spring and fall tillage was with a field cultivator or chisel plow operated the same direction as the herbicide plots. A six foot strip of 'Butte' wheat at 88 lb/A, a six foot strip of 'Valley' oats at 60 lb/A, a four row strip of 'Interstate 3001' sunflower at 25,000 seeds per acre, and twelve 11 inch rows of 'Van Der Have Puressa II' sugarbeet were seeded across herbicide plots May 24, 1991. Sugarbeet, wheat, oats, and sunflower injury were evaluated June 24, 1991 and July 8, 1991. Kochia control was evaluated June 24, 1991. 'Seedex Monohikari' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 19, 1992. Seeding was done parallel and perpendicular to plots to ensure a dense sugarbeet population. Desmedipham&phenmedipham, sethoxydim, clopyralid and preemergence glyphosate were applied to the entire plot area as needed since 1992 for weed control. Sugarbeet injury was evaluated June 29 and July 10, 1992. 'Hilleshog 8277' was seeded 1.25 inches deep in 22 inch rows going two directions across the plot area May 18, 1993. Sugarbeet injury was evaluated July 9, 1993. 'Beta 2988' sugarbeet was seeded 1.25 inches deep in 22 inch rows parallel and perpendicular to herbicide plots May 13, 1994. Counter 15G insecticide at 6 pounds product per acre was applied modified in-furrow at planting going both directions. Sugarbeet injury was evaluated June 25, 1994. 'Beta 3712' sugarbeet was seeded May 24, 1995. Sugarbeet injury was evaluated June 27 and July 8, 1995.

Experiment continued on next page.

Carryover of soybean herbicides, Fargo (NW section 22), 1990-1995. (continued)

1990 Treatment	Rate	June 24, 1991					July 8, 1991				1992		1993	1994	1995	
		Sgbt	Wht	Oat	Sufl	Kocz	Sgbt	Wht	Oat	Sufl	6-29 Sgbt	7-10 Sgbt	7-9 Sgbt	6-25 Sgbt	6-27 Sgbt	7-8 Sgbt
	lb/A	% injury														
Chlorimuron	0.004	94	30	31	54	98	91	30	19	48	70	53	83	0	5	0
Chlorimuron	0.008	98	33	18	69	97	98	46	15	74	90	76	100	14	8	3
Nicosulfuron	0.125	63	10	23	31	80	59	21	20	19	0	3	0	0	0	0
Nicosulfuron	0.06	30	10	3	10	40	33	18	8	8	0	0	0	0	1	0
Nicosulfuron	0.03	14	0	0	3	20	18	10	3	8	3	5	0	0	4	0
Rimsulfuron+Nico	0.062+0.062	39	5	20	38	65	38	23	15	20	0	3	0	0	0	0
Primisulfuron	0.06	100	84	84	98	99	100	97	73	99	96	86	100	45	36	16
C.V. %		23	61	92	30	16	25	36	49	34	17	33	12	58	54	99
LSD 5%		22	22	35	19	17	24	18	16	20	9	16	7	7	6	4
LSD .1%		29	30	48	26	24	32	25	21	27	13	22	10	10	8	5
# OF REPS		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Summary

Sugarbeet was significantly injured in 1991 by all treatments applied in 1990 except nicosulfuron at 0.03 lb/A. Wheat was significantly injured in 1991 by chlorimuron and primisulfuron applied in 1990. Oats was significantly injured only by primisulfuron. Sunflower was significantly injured in 1991 by all treatments applied in 1990 except nicosulfuron at 0.06 and 0.03 lb/A. Sugarbeet was significantly injured in 1992 and 1993 by both rates of chlorimuron and primisulfuron applied in 1990. Sugarbeet injury from all three treatments was greater in 1993 than in 1992. Sugarbeet was significantly injured in 1994 by primisulfuron and chlorimuron at 0.008 lb/A. Primisulfron at 0.06 lb/A still caused sugarbeet injury in 1995.

Multispecies evaluation of soybean herbicide soil residual, Fargo (NW section 22), 1992-1995. 'McCall' soybean at 45 lb/A was solid seeded May 19, 1992 to the entire plot area. Preemergence herbicide treatments were applied in 17 gpa water at 40 psi through 8002 nozzles to the center 13 feet of 18 foot wide by 60 foot long plots 2:00 PM May 20, 1992 when the air temperature was 88F, soil temperature at six inches was 61F, relative humidity was 38%, wind velocity was 34 mph, and soil moisture was good. Postemergence herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center 13 feet of 18 foot wide plots 3:45 pm June 29, 1992 when the air temperature was 70F, soil temperature at six inches was 58F, relative humidity was 48%, wind velocity was 4 mph, soil moisture was good, and soybean was in the one to two trifoliolate stage. Desmedipham & phenmedipham, sethoxydim, clopyralid and preemergence glyphosate were applied since 1992 to control weeds in sugarbeet. Fall tillage each year was one pass with a chisel plow moving parallel with the herbicide plots. Spring tillage was one pass with a field cultivator. Six 22 inch rows of 'Hilleshog 8277' sugarbeet, four 30 inch rows of 'Interstate IS353' corn, and 'Interstate IS3311' sunflower, and a ten foot strip of 'NewDak' oats and 'Marshall' wheat were seeded across herbicide plots as bioassay strips May 19, 1993. A natural stand of wild mustard and kochia were in the plot area. Wild mustard, kochia, sugarbeet, sunflower, and corn control were evaluated July 5, 1993. Wheat and oats control were evaluated July 5 and July 26, 1993. 'Beta 2988' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 13, 1994. Seeding was done parallel and perpendicular to herbicide plots to ensure a dense sugarbeet population. Counter 15G at 6 pounds product per acre was applied modified in-furrow at planting each direction. Sugarbeet injury was evaluated June 25 and July 18, 1994. 'Beta 3712' and 'Beta 2010' sugarbeet was seeded in plot area May 26, 1995. Sugarbeet injury was evaluated June 29 and July 18, 1995.

Experiment continued on next page.

Multispecies evaluation of soybean herbicide soil residual, Fargo (NW section 22), 1992-1995.
(continued)

1992 Treatment	Method of Applic.	Rate	July 5, 1993							7-26-93		1994		1995
			Wimu cntl	Kocz cntl	Sgbt cntl	Wht cntl	Oats cntl	Sufl cntl	Corn cntl	Wht cntl	Oats cntl	6-25 Sgbt inj	7-18 Sgbt inj	7-18 Sgbt inj
		lb/A	%	%	%	%	%	%	%	%	%	%	%	%
Chlorimuron	post	0.004	100	60	100	5	3	55	10	4	4	40	23	0
Chlorimuron	post	0.008	100	74	100	16	10	74	13	29	8	83	81	35
Chlorimuron	post	0.01	100	74	100	29	20	78	25	40	6	90	86	41
MON 12000	post	0.03	100	75	100	3	6	83	3	6	3	21	8	0
MON 12000	post	0.09	100	79	100	19	34	100	17	12	20	61	53	10
Triasulfuron	post	0.03	100	69	100	3	30	100	16	9	25	84	75	20
Thiazopyr	pre	0.25	0	0	0	26	26	0	5	19	18	0	0	0
Thiazopyr	pre	0.5	25	10	15	75	65	0	58	68	56	0	5	0
Flumetsulam+ Metolachlor	pre	0.064+ 2.34	0	60	0	0	0	0	0	13	13	0	0	0
Flumetsulam+ Metolachlor	pre	0.128+ 4.67	29	74	10	0	0	0	0	0	0	3	0	0
C.V. %			16	22	12	41	50	19	78	61	89	19	30	131
LSD 5%			15	18	11	10	14	13	16	18	20	10	14	22
LSD 1%			21	24	14	14	19	18	22	24	26	14	19	29
# OF REPS			4	4	4	4	4	4	4	4	4	4	4	4

Summary

Chlorimuron at 0.004 lb/A applied in 1992 significantly injured all species in 1993 except wheat, oats, and corn. Chlorimuron at 0.01 lb/A injured all species but oats recovered by 7/26. MON 12000 at 0.03 lb/A injured all species except wheat, oats, and corn but 0.09 lb/A injured all species. Triasulfuron injured all species except wheat. Thiazopyr at 0.25 lb/A injured wheat and oats while 0.5 lb/A injured wild mustard, wheat, oats, and corn. Flumetsulam+metolachlor only injured wild mustard and kochia even at the high rate. Sugarbeet was significantly injured in 1994 by chlorimuron, MON 12000 and triasulfuron. Chlorimuron at 0.008 and 0.01 lb/A caused significant sugarbeet injury in 1995. MON 12000 at 0.09 lb/A and triasulfuron at 0.03 lb/A caused a visible effect in only one and two replications, respectively. Variable effects from replication to replication is common with carryover experiments.

Carryover of soybean herbicides, Fargo (NW section 22), 1993-1995. '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 was evaluated June 29 and July 18, 1995 and redroot pigweed control was evaluated July 18, 1995.

Experiment continued on next page.

Carryover of soybean herbicides, Fargo (NW section 22), 1993-1995. (continued)

Treatment*	Rate	June 25, 1994					July 18, 1994					July 18, 1995	
		Sgbt inj	Sunf inj	Wht inj	Oats inj	Cano inj	Sgbt inj	Sunf inj	Wht inj	Oats inj	Cano inj	Sgbt inj	Rrpw cntl
	lb/A	%	%	%	%	%	%	%	%	%	%	%	%
Untreated Check	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
Imep+Sun-ItII + 28%N	0.063	96	5	0	0	53	95	0	0	0	65	3	23
Imep+Sun-ItII + 28%N	0.125	99	18	0	5	81	99	19	5	8	84	13	18
AC299263+Sun-ItII + 28%	0.032	0	0	0	0	0	0	0	0	0	0	0	10
AC299263+Sun-ItII + 28%	0.063	0	0	0	0	0	0	0	0	0	0	0	4
AC299263+Sun-ItII + 28%	0.125	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
Flum+Meto (pre)	0.03+0.93	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
C.V. %		15	282	0	632	84	14	295	632	404	53	541	304
LSD 5%		6	10	NS	NS	20	6	8	NS	4	15	NS	NS
LSD 1%		8	NS	NS	NS	27	7	11	NS	NS	20	NS	NS
# OF REPS		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. Sugarbeet injury from imazethapyr was absent one year earlier than with other experiments conducted at Section 22. Rainfall was adequate to excessive in 1993 throught 1995 on this experiment which may have hastened the degradation of imazethapyr.

Methanol on sugarbeet, Fargo, 1995. 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5. Desmedipham + clopyralid + Poast at 0.25 + 0.09 + 0.3 lb ai/A was applied to all plots June 1. Lorsban insecticide at 1 lb ai/A was applied to sugarbeet May 29 for cutworm control. Sethoxydim + Prime Oil at 0.3 lb ai/A + 1 qt/A and Sethoxydim + Dash HC at 0.4 lb ai/A + 1 pt/A was applied to sugarbeet June 12 and July 1 respectively. Sugarbeet was hand thinned to an 8 inch spacing June 16. Sugarbeet was maintained weed free throughout the growing season by hand weeding and cultivation June 5, June 19, and July 7. Super Tin WP at 5 oz/A was applied to all plots July 23, August 6 and August 20 to control cercospora leaf spot. Treatments were applied 9:40 AM August 8, 10:45 AM August 10 and 10:00 AM August 14 when the air temperature was 78F, 65F and 71F respectively, soil temperature at six inches was 78F, 74F and 67F respectively, relative humidity was 87%, 47% and 57% respectively, wind velocity was 15-20 mph, 5 mph and 15-20 mph respectively, cloud cover was 100%, 5% and 0% respectively and soil moisture was fair during the three application dates. All treatments were applied to a full sugarbeet canopy in 17 gpa water at 40 psi through 8002 nozzles to the center four rows of six row plots. Sugarbeet from the center two rows of each 32 foot plot was counted and harvested September 21.

Methanol	28%N	FE-EDTA	T-x-100	Glycine	Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
					plt/64'	%	%	ton/A		lb/A
0	0	0	0	0	83	16.7	1.6	24.0	693	7154
0	0.4%	0.008%	0.25%	0.1%	82	17.1	1.5	21.9	647	6786
20%	0	0	0.25%	0	83	16.7	1.5	22.3	680	6669
20%	0.4%	0.008%	0.25%	0.1%	86	16.8	1.6	24.5	676	7402
30%	0	0	0.25%	0	85	17.2	1.5	22.8	641	7094
30%	0.4%	0.008%	0.25%	0.1%	88	17.1	1.5	23.0	648	7109
C.V. %					6	2.4	4.1	3.6	5	5
LSD 5%					NS	NS	NS	1.3	NS	NS
LSD 1%					NS	NS	NS	1.7	NS	NS
# OF REPS					4	4	4	4	4	4

Summary

Methanol had no significant effect on sugarbeet yield.

Imazethapyr carryover, Fargo (NW section 22), 1994-1995. 'McCall' soybean at 60 lb/A was solid seeded in 7 inch rows, row seeded in 30 inch rows or not seeded in 20 by 50 foot plots May 18, 1994. Two rates of imazethapy were applied early when soybean had 3 trifoliolates and late when soybean had 6 trifoliolates. Herbicide was applied to the center 13.33 feet of each 20 foot wide plot. No tillage was done in the fall of 1994 due to wet soil conditions. Spring tillage in 1995 was one pass with an 'Alloway RTS' field cultivator parallel to the herbicide plots. Six rows of imazethapyr resistant corn, six rows of corn, three rows of sugarbeet and an 8 foot strip of wheat was seeded across herbicide plots in 1995. Glyphosate + AMS + X-77 at 2 pt/A + 10 lb/100 gal + 0.25% was applied to the entire plot area May 29, 1995 to control emerged weeds before the seeded crops emerged. The corn and sugarbeet was row-crop cultivated June 14, 1995. Corn, sugarbeet and wheat injury and redroot pigweed control were evaluated June 16, 1995.

1994 Imazethapyr Rate	1994 Date of Application	1994 Seeding Method	1995 Evaluation IR Corn inj	Corn inj	Sgbt inj	Wheat inj	Rrpw cntl
lb/A			%	%	%	%	%
0	---	None	0	0	0	0	0
0	---	Rows	0	0	0	0	0
0	---	Solid	0	0	0	0	0
0.0625	Early	None	0	3	81	11	90
0.0625	Early	Rows	0	0	86	8	91
0.0625	Early	Solid	0	1	85	15	95
0.1875	Early	None	0	16	99	9	100
0.1875	Early	Rows	0	3	99	14	99
0.1875	Early	Solid	0	6	99	31	99
0.0625	Late	None	0	5	97	34	86
0.0625	Late	Rows	0	0	85	14	81
0.0625	Late	Solid	0	0	86	14	85
0.1875	Late	None	0	9	99	9	99
0.1875	Late	Rows	0	1	97	11	99
0.1875	Late	Solid	0	5	95	30	94
C.V. %			0	139	8	98	14
LSD 5%			NS	6	9	19	15
LSD 1%			NS	9	12	25	20
# OF REPS			4	4	4	4	4

Summary

Sugarbeet injury and redroot pigweed control was greater from imazethapyr at 0.1875 lb/A than from 0.0625 lb/A. Seeding method and date of application had little effect on crop injury. IR corn was injured less than non-IR corn.

Imazethapyr carryover, Prosper, 1993-1995. Soybean at 60 lb/A was solid seeded in 7 inch rows, row seeded in 30 inch rows or none seeded in 20 by 50 foot plots May 18, 1993. The early application of imazethapy was 10:00 AM July 9 when the air temperature was 70F, relative humidity was 81%, wind velocity was 38 mph, soil temperature at six inches was 62F, soil moisture was good and soybean was in the 3 trifoliolate stage. The late application of imazethapy was July 20 when the air temperature was 82F, relative humidity was 76%, wind velocity was 15 mph, soil temperature at six inches was 70F, soil moisture was good and soybean was in the 6 trifoliolate stage. Herbicide was applied to the center 13.33 feet of each 20 foot wide plot. Six rows of imazethapyr resistant corn, six rows of corn and an 8 foot strip of wheat was seeded across herbicide plots in 1994. Fall tillage was one pass with a disk and one pass with a chisel plow parallel with herbicide plots. Spring tillage was one pass with an 'Alloway RTS'. 'ACH 192' sugarbeet was seeded across all plots May 31, 1995. Counter 15G insecticide was applied in a 5 inch band over the row at planting. Sugarbeet injury and redroot pigweed and common lambsquarters control were evaluated July 8, 1995.

1993 Imazethapyr Rate	1993 Date of Application	1993 Seeding Method	1995 Evaluation: Redroot Pigweed control	1995 Evaluation: Sugarbeet injury	1995 Evaluation: Common Lambsquarters control
lb/A			%	%	%
0	---	None	25	15	0
0	---	Rows	45	35	0
0	---	Solid	5	0	0
0.0625	July 9	None	43	8	0
0.0625	July 9	Rows	65	70	13
0.0625	July 9	Solid	18	3	0
0.1875	July 9	None	77	63	46
0.1875	July 9	Rows	57	55	40
0.1875	July 9	Solid	49	50	38
0.0625	July 20	None	63	39	18
0.0625	July 20	Rows	56	49	0
0.0625	July 20	Solid	21	23	5
0.1875	July 20	None	91	73	56
0.1875	July 20	Rows	60	60	3
0.1875	July 20	Solid	83	73	25
C.V. %			71	90	155
LSD 5%			51	53	36
LSD 1%			NS	NS	NS
# OF REPS			4	4	4

Summary

Variability in the experiment was high in 1995, two years after the herbicide was applied. However, imazethapyr applied July 20, 1993 generally caused more sugarbeet injury and gave more pigweed control in 1995 than imazethapyr applied July 9.

Wild oat control, Fargo 1995. No crop was seeded due to the excess moisture during the regular planting season. Treatments were applied to 1- to 3.5-leaf wild oats, 1- to 2-leaf wild buckwheat, 2- to 8-leaf wild mustard, and 4- to 6-leaf common lambsquarters on May 30 with 75 F, 32% RH, clear sky, and 10- to 15-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 30 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were wild oat 100/ft^2, wild mustard and wild buckwheat 10/m^2, and common lambsquarters 20/m^2 on June 8.

Treatment	Rate	6/08				6/29	
		Wioa	Wimu	Wibu	Colq	Wioa	KOCZ
	oz/A	%					
Diclofop+PO	16+0.12G	80	0	0	0	83	0
Diclofop+Brox	16+4	74	96	86	99	68	65
Imazamethabenz(LC)+X-77	5+0.25%	86	96	76	5	96	56
Imazamethabenz(LC)+X-77	6+0.25%	80	99	58	0	91	72
Immb(LC)+Thif&Trib+X-77	5+0.22+0.25%	83	99	71	94	90	96
Difenzoquat	12	83	0	5	0	93	11
Dife+Thif&Trib+X-77	12+0.22+0.25%	81	99	90	99	85	99
Tralkoxydim+TF8035	2+0.5%	86	0	0	0	85	8
Tral+Brox&MCPA+TF8035	2+8+0.5%	83	99	97	99	83	92
Tiller	9.3	83	98	6	99	86	63
Cheyenne+Thif&Trib	7.3+0.22	82	99	95	99	88	99
Untreated	0	0	0	0	0	0	0
C.V. %		9	4	16	7	9	32
LSD 5%		9	4	11	5	10	25
# OF REPS		4	4	4	4	4	4

Summary

All herbicides were effective in controlling wild oats. The absence of crop competition probably reduced the control with all herbicides compared to what would have occurred with a vigorous crop. The inclusion of bromoxynil with diclofop reduced wild oat control which is contrary to previous results or results from other locations. Thifensulfuron & tribenuron did not influence wild oat control when applied with imazamethabenz or difenzoquat. Bromoxynil & MCPA did not influence wild oat control for tralkoxydim.

Wild oat control, Hettinger 1995. 'Grandin' hard red spring wheat was seeded April 24. Treatments were applied to 3.5-leaf wheat, 2- to 3.5-leaf wild oat, and 1- to 2-leaf wild buckwheat on May 29 with 49 F, 92% RH, clear sky, and 1- to 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.

Treatment	Rate	6/12 Wht	6/12 Wioa	8/9 Yield
	oz/A	— % —		bu/A
Diclofop+PO	16+0.12G	3	88	28
Diclofop+Brox	16+4	1	88	29
Imazamethabenz(LC)+X-77	5+0.25%	3	72	19
Imazamethabenz(LC)+X-77	6+0.25%	0	82	22
Immb(LC)+Thif&Trib+X-77	5+0.22+0.25%	0	75	20
Difenzoquat	12	4	83	20
Dife+Thif&Trib+X-77	12+0.22+0.25%	6	85	21
Tralkoxydim+TF8035	2+0.5%	3	80	25
Tral+Brox&MCPA+TF8035	2+8+0.5%	2	76	22
Tiller	9.3	1	81	23
Cheyenne+Thif&Trib	7.3+0.22	2	91	25
Untreated	0	0	0	10
C.V. %		177	11	21
LSD 5%		NS	12	7
# OF REPS		4	4	4

Summary

Wild oat density was more than 500 plants per square yard. Ratings were visable wild oat control, but in most plots wild oat was present within the crop canopy. The inclusion of herbicides for broadleaf control did not influence wild oat control or injury to wheat. Imazamethabenz tended to be more effective at 6 than 5 oz/A.

Wild oat control, Minot 1995. 'Amidon' hard red spring wheat was seeded June 5. Treatments were applied to 4- leaf wheat and wild oats on July 10 with 75 F, 3- to 5-mph wind, and no precipitation within 24 h. 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	8/15 Wht	8/15 Wioa	9/26 Wheat yield	9/26 Test weight
	oz/A	— % —		bu/A	lb/bu
Diclofop+PO	16+0.12G	2	97	15	56
Diclofop+Brox	16+4	1	97	16	56
Immb(LC)+X-77	5+0.25%	0	99	13	56
Immb(LC)+X-77	6+0.25%	0	98	13	57
Immb(LC)+Thif&Trib+X-77	5+0.22+0.25%	0	96	16	57
Dife	12	1	98	14	56
Dife+Thif&Trib+X-77	12+0.22+0.25%	2	96	14	57
Tral+TF8035	2+0.5%	1	92	17	56
Tral+Brox&MCPA+TF8035	2+8+0.5%	1	96	17	57
Tiller	9.3	0	98	18	56
Cheyenne+Thif&Trib	7.3+0.22	3	97	17	55
Untreated	0	0	0	13	57
C.V. %		180	3	16	2
LSD 5%		NS	3	4	NS
# OF REPS		4	4	4	4

Summary

Wild oats were effectively controlled by all herbicides. Wild oats were late season emerged plants because by the late seeding of wheat. Seeding of wheat was late due to the excessive moisture received during the planting season.

Wild oat control in wheat, Williston 1995. '2375' wheat was seeded May 2. Treatments were applied to 5- to 5.5-leaf wheat, 5-leaf wild oats, 1- to 3-inch Russian thistle and 1- to 2-inch common lambsquarters on June 5 with 72 F, 76% RH, , partly cloudy sky, and 3 mph wind. The treatments were applied with a bicycle wheel type plot sprayer mounted on a G-Allis Chalmers tractor with wind shield delivering 8.5 gpa at 32 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 7 by 24 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were wild oats 20 to 30 plants/ft^2 for replicates 1 and 2 and 10 to 15 plants/ft^2 for replicates 3 and 4; Russian thistle 0.5 to 1 plant/ft^2; kochia 5 to 8 plants/ft^2; and common lambsquarters 2 to 3 plants/ft^2.

		7/18					8/21	
Treatment	Rate	Wht	Wioa	Ruth	Colq	Kocz	Wheat yield	Test weight
	oz/A			%			bu/A	lb/bu
Diclofop+PO	16+0.12G	1	94	0	25	0	27	60
Diclofop+Bromoxynil	16+4	5	74	99	93	93	28	60
Imazamethabenz(LC)+X-77	5+0.25%	0	82	78	69	4	23	61
Imazamethabenz(LC)+X-77	6+0.25%	0	93	89	72	5	24	61
Immb(LC)+Thif&Trib+X-77	5+0.22+0.25%	1	85	98	98	96	26	61
Difenzoquat	12	14	83	59	69	44	24	61
Dife+Thif&Trib+X-77	12+0.22+0.25%	34	83	98	98	94	18	61
Tralkoxydim+TF8035	2+0.5%	6	83	23	23	13	22	61
Tral+Brox&MCPA+TF8035	2+8+0.5%	9	92	98	98	94	27	61
Tiller	9.3	25	88	97	99	78	18	61
Cheyenne+Thif&Trib	7.3+0.22	14	83	99	99	96	21	61
Untreated	0	0	0	0	0	0	16	61
C.V. %		172	12	27	44	32	23	
LSD 5%		NS	13	27	45	23	8	
# OF REPS		4	4	4	4	4	4	1

Summary

Hard red sping wheat '2375' gave injury symptoms when treated with difenzoquat, Tiller®, or Cheyenne®, but not statistically significant. However, these herbicide treatments gave more than 80% wild oat control, as well as control of most broadleaf weeds without increasing wheat yield. Diclofop + bromoxynil, imazamethabenz + thifensulfuron & tribenuron, and tralkoxydim + bromoxynil & MCPA gave greater than 74% wild oat and 90% broadleaf weed control and increased wheat yield by 10 bu/A or more. Diclofop + petroleum oil gave greater wild oat control than diclofop + bromoxynil. Bromoxynil has not been antagonistic to diclofop phytotoxicity and the petroleum oil adjuvant probably accounts for the greater wild oats control from diclofop applied without bromoxynil.

Tralkoxydim for wild oat control, Fargo 1995. No crop was seeded due to the excess moisture during the regular planting season. Treatments were applied to 1- to 3.5-leaf wild oats, 1- to 2-leaf wild buckwheat, 2- to 8-leaf wild mustard, and 4- to 6-leaf common lambsquarters on May 30 with 75 F, 32% RH, clear sky, and 10- to 15-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 30 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density was about 100 plants/ft^2.

Treatment	Rate	6/09			6/29			
		Wioa	Wibu	Wimu	Wioa	Wimu	Wibu	Colq
	oz/A	%						
Tralkoxydim+TF8035	2.9+0.5%	94	0	0	95	0	0	0
Tralkoxydim+Brox+TF8035	2.9+4+0.5%	95	93	94	93	63	89	85
Tralkoxydim+Brox&MCPA+TF8035	2.9+8+0.5%	93	94	95	90	95	93	98
Tralkoxydim+MCPA-ioe+TF8035	2.9+8+0.5%	95	30	97	93	97	8	99
Tralkoxydim+TF8035+AMS	2.9+0.5%+24	89	0	0	96	0	0	0
Diclofop+PO	12+0.12G	75	0	0	79	0	0	0
Diclofop	16	69	0	0	77	0	0	0
Tiller	9.3	85	40	98	88	99	23	99
Tiller+Brox	9.3+3	85	98	98	86	99	92	99
Tiller+Brox&MCPA	9.3+6	88	98	98	83	99	91	99
Tiller+F8426	9.3+0.25	88	99	99	89	98	94	99
Cheyenne+Thif&Trib	7.4+0.22	82	98	99	86	99	98	99
Imazamethabenz+X-77	7.5+0.25%	89	63	98	96	95	73	9
Imazamethabenz+X-77	5+0.25%	91	53	99	96	87	59	5
Immb+Brox&MCPA+Thif&Trib+X-77	5+6+0.22+0.25%	89	99	99	92	98	96	98
Untreated	0	0	0	0	0	0	0	0
C.V. %		4	8	3	4	5	16	9
LSD 5%		7	9	5	5	5	12	7
# OF REPS		2	2	2	4	4	4	4

Summary

Tralkoxydim alone or in mixture with other herbicides and imazamethabenz gave the greatest wild oat control and diclofop the least control. Ammonium sulfate (AMS) tended to reduce tralkoxyim effectiveness for wild oat. Diclofop gave equal wild oat control applied alone at 16 oz/A as 12 oz/A with petroleum oil adjuvant (PO). Broadleaf weeds were controlled when treatments contained bromoxynil, bromoxynil & MCPA, F-8426, or the thifensulfuron & tribenuron, without any reduction in wild oat control.

Tralkoxydim with surfactants, Fargo 1995. No crop was seeded due to excess moisture during the regular planting season. Treatments were applied to 1- to 3.5-leaf wild oat on May 30 with 75 F, 32% RH, clear sky, and 10- to 15-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 30 ft plots. Spray carrier was Fargo water (Fgo) and Fargo water to which sodium bicarbonate was added at 3.6 g/L. The experiment was a randomized complete block design with four replicates. Wild oats density exceeded 75 plants/ft^2.

Treatment	Rate	6/09 Wioa	6/29 Wioa
	oz/A	%	
Tralkoxydim+MC191c-5(Fgo)	2+1%	93	94
Tralkoxydim+MC191c-5-8(Fgo)	2+1%	92	93
Tralkoxydim+DASH(Fgo)	2+1%	91	95
Tralkoxydim+Scoil(Fgo)	2+1%	90	90
Tralkoxydim+Armablend600(Fgo)	2+0.5%	51	30
Tralkoxydim+TF8035(Fgo)	2+0.5%	93	96
Tralkoxydim+Scoil II(Fgo)	2+1%	93	91
Tralkoxydim+MC-191b(Fgo)	2+1%	92	94
Tralkoxydim+MC191c-5(NaHCO3 3.6 g/L)	2+1%	91	88
Tralkoxydim+MC191c-5-8(NaHCO3 3.6 g/L)	2+1%	91	88
Tralkoxydim+DASH(NaHCO3 3.6 g/L)	2+1%	20	0
Tralkoxydim+Scoil(NaHCO3 3.6 g/L)	2+1%	87	77
Tralkoxydim+Armablend600(NaHCO3 3.6 g/L)	2+0.5%	13	0
Tralkoxydim+TF8035(NaHCO3 3.6 g/L)	2+0.5%	72	46
Tralkoxydim+Scoil II(NaHCO3 3.6 g/L)	2+1%	85	72
Tralkoxydim+MC-191b(NaHCO3 3.6 g/L)	2+1%	92	88
Untreated	0	0	3
C.V. %		9	16
LSD 5%		9	16
# OF REPS		4	4

Summary

The objective was to determine the influence of adjuvants and minerals in the spray carrier on tralkoxydim phytotoxicity to wild oats. Tralkoxydim gave 90% or more wild oats control when applied in Fargo water carrier, except when with Armablend 600 adjuvant. Sodium bicarbonate was antagonistic to tralkoxydim, except when applied with 191 type surfactants. Scoil adjuvant also appeared to overcome sodium bicarboante antagonism of tralkoxydim phytotoxicity to wild oats. However, DASH did not overcome sodium bicarbonate antagonism of tralkoxydim phytotoxicity.

Adjuvants with tralkoxydim in distilled (DW), $NaHCO_3$ or Valley City (MW) Water, Fargo 1995. No crop was seeded due to excess moisture during regular planting season. Treatments were applied to 1- to 3.5-leaf wild oat on June 1 with 74 F, 54% RH, mostly sunny sky, and 8-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 30 ft plots. The experiment was a randomized complete block design with four replicates. Wild oats density exceeded 75 plants/ft^2.

Treatment	Rate	6/09 Wioa	6/29 Wioa
	oz/A	%	
Tralkoxydim+TF8035(MW)	2+0.5%	78	70
Tralkoxydim+TF8035(MW)	3+0.5%	78	89
Tralkoxydim+AMS+TF8035(MW)	2+32+0.5%	85	93
Tralkoxydim+AMS+TF8035(MW)	3+32+0.5%	86	97
Tralkoxydim+WF2329(MW)	2+0.5%	54	41
Tralkoxydim+WF2329(MW)	3+0.5%	48	46
Tralkoxydim+WF2353(MW)	2+0.5%	43	23
Tralkoxydim+WF2353(MW)	3+0.5%	46	23
Tralkoxydim+TF8035(DW)	2+0.5%	88	87
Tralkoxydim+TF8035(DW)	3+0.5%	81	95
Tralkoxydim+AMS+TF8035(DW)	2+32+0.5%	83	92
Tralkoxydim+AMS+TF8035(DW)	3+32+0.5%	84	97
Tralkoxydim+WF2329(DW)	2+0.5%	40	9
Tralkoxydim+WF2329(DW)	3+0.5%	16	5
Tralkoxydim+WF2353(DW)	2+0.5%	30	10
Tralkoxydim+WF2353(DW)	3+0.5%	21	10
Tralkoxydim+TF8035(NaHCO3 3.6 g/L)	2+0.5%	43	14
Tralkoxydim+TF8035(NaHCO3 3.6 g/L)	3+0.5%	64	39
Untreated	0	0	0
C.V. %		20	24
LSD 5%		16	17
# OF REPS		4	4

Summary

The objective was to determine wild oats control from tralkoxydim as influenced by spray carrier water quality and adjuvants. The water from Valley City area high in calcium did not antagonize wild oats control from tralkoxydim. However, ammonium sulfate (AMS) tended to enhance wild oats control when in the Valley City water. Sodium bicarbonate was highly antagonistic to wild oats control from tralkoxydim. Ammonium sulfate was not included in the sodium bicarbonate solution, but has overcome antagonism from sodium bicarbonate with other herbicides.

Difenzoquat formulations, Fargo 1995. No crop was seeded due to excess moisture during the regular planting season. Treatments were applied to 1- to 3.5-leaf wild oat, 4- to 10-leaf common lambsquarters, 1- to 2-leaf wild buckwheat on June 1 with 74 F, 54% RH, mostly sunny sky, and 8-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 30 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density exceeded 75 plants/ft^2.

Treatment	Rate	7/10 Wioa	7/10 Colq	7/10 Wibu
	oz/A		%	
Difenzoquat(L)+X-77	12+0.25%	91	0	0
Difenzoquat-SG+X-77	12+0.25%	85	0	0
Difenzoquat-SG+Immb-LC+X-77	8+3.7+0.25%	84	2	20
Difenzoquat-SG+ImmbSG+X-77	8+3.7+0.25%	81	0	8
Difenzoquat-SG+MCPA-ioe	12+8+0.25%	88	98	28
Difenzoquat-SG+Brox&MCPA+X-77	12+8+0.25%	85	98	83
Difenzoquat-SG+24-Dbee+X-77	12+8+0.25%	91	99	83
Dife-SG+Thif&Trib+MCPA-ioe+X-77	12+0.1+4+0.25%	85	98	83
DifeSG+ImmbLC+Thif&Trib+MCPA+X77	8+3.7+0.1+4+0.25%	79	99	97
Difenzoquat-SG+Scoil	12+0.25G	85	0	0
Difenzoquat-SG+Scoil+28N	12+0.25G+2%	92	0	0
Difenzoquat-SG+ScoilII	12+0.25G	90	0	0
Difenzoquat-SG+MC191b	12+0.25G	89	0	0
Difenzoquat-SG+ND-4	12+1%	85	0	0
Dife(L)+Brox&MCPA+Thif&Trib+X-77	12+6+0.125+0.25%	84	99	95
Untreated	0	0	0	0
C.V. %		5	3	42
LSD 5%		5	2	18
# OF REPS		4	4	4

Summary

Wild oats control was greater from difenzoquat liquid than the granular formulation applied with X-77. Scoil + 28N and Scoil II increased wild oats control from granular difenzoquat formulation to equal that of the liquid. Also, 2,4-Dbee + X-77 enhanced the granular formulation of difenzoquat. Tank mixtures of difenzoquat-SG with MCPAioa, bromoxynil & MCPA, 2,4-Dbee did not influence wild oats control. Difference in wild oats control with formulation of difenzoquat as imazamethabenz were small.

Imazamethabenz formulations, Fargo 1995. No crop was seeded due to the excess moisture during the regular planting season. Treatments were applied to 1- to 3.5-leaf wild oat, 1- to 2-leaf wild buckwheat, and 0.25- to 2-inch kochia on May 30 with 75 F, 32% RH, clear sky, and 10- to 15-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 30 ft plots. The experiment was a randomized complete block design with four replicates. Wild oats density exceeded 75 plants/ft^2.

Treatment	Rate	6/09			6/28
		Wioa	Wibu	KOCZ	Wioa
	oz/A			%	
Imazamethabenz(LC)+X-77	5+0.25%	79	70	48	89
Imazamethabenz(LC)+X-77	6+0.25%	89	75	55	94
Imazamethabenz-SG+X-77	5+0.25%	86	65	42	93
Imazamethabenz-SG+X-77	6+0.25%	85	55	47	96
Immb(LC)+Dife(L)+X-77	3.7+8+0.25%	91	75	47	89
Immb(LC)+Dife(L)+X-77(17gpa)	3.7+8+0.25%	91	79	62	92
Imazamethabenz(LC)+Dife(L)+X-77	3.7+8+0.5%	92	74	63	92
Immb(LC)+Dife(L)+MCPA-ioe+X-77	3.7+8+4+0.25%	89	80	57	91
Imazamethabenz-SG+Dife-SG+X-77	3.7+8+0.25%	88	71	37	87
Imazamethabenz-SG+Dife(L)+X-77	3.7+8+0.25%	91	76	45	88
Imazamethabenz-SG+MCPA-ioe+X-77	5+8+0.25%	80	50	53	93
Imazamethabenz-SG+Brox&MCPA+X-77	5+8+0.25%	76	98	98	87
Imazamethabenz-SG+24-Dbee+X-77	5+8+0.25%	74	75	80	92
Imazamethabenz-SG+Thif&Trib+X-77	5+0.1+0.25%	82	85	80	94
Immb-SG+Thif&Trib+MCPA-ioe+X-77	5+0.1+4+0.25%	76	92	97	91
Immb-SG+Thif&Trib+Brox&MCPA+X-77	5+0.1+8+0.25%	76	99	99	84
Tiller	9.3	82	56	68	79
Tiller+Brox	9.3+3	83	92	90	80
Tiller+Brox&MCPA	9.3+6	77	93	91	60
Diclofop	16	69	0	0	74
Difenzoquat(L)	12	87	3	3	95
Cheyenne+Thif&Trib	7.3+0.22	81	96	98	73
Untreated	0	0	0	0	0
C.V. %		8	18	20	10
LSD 5%		9	17	19	11
# OF REPS		4	4	3	4

Summary

All imazamethabenz formulations and mixtures with other herbicides effectively controlled wild oats with only small differences among various treatments. Wild oats control by Tiller was reduced when MCPA was a component of the tank mixture. Control of broadleaf weed exceeded 90% when bromoxynil or thifensulfuron & tribenuron were in the treatment.

Herbicide 3-way mixture for broadleaf weed control, Fargo 1995. '2371' hard red spring wheat was seeded May 2. Treatments were applied to 3- to 5-leaf tillering wheat, 5- to 7-leaf wild mustard, 2- to 4-inch kochia, and 2-leaf vining wild buckwheat on June 5 with 75 F, 66% RH, cloudy sky, and 14-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 30 ft plots. The experiment was a randomized complete block design with four replicates.

		6/13				7/31			8/17
Treatment	Rate	Wht	Wimu	KOCZ	Wibu	Wht	KOCZ	Wibu	Yield
	oz/A				%				bu/A
Thif&Trib+24-Dbee+NIS	0.225+4.0+0.125%	0	98	96	93	1	98	71	32
Thif&Trib+24-Dbee	0.225+4.0	1	96	94	90	2	96	48	31
Thif&Trib+MCPA-ioe+NIS	0.225+4.0+0.125%	2	98	93	92	2	94	62	33
Thif&Trib+24-Dbee+Dica-dma+NIS	0.225+4.0+1.0+0.125%	5	97	97	93	6	99	71	31
Thif&Trib+MCPA-ioe+Dica-dma	0.225+4.0+1.0+0.125%	4	98	95	93	4	99	76	31
Thif&Trib+24-Dbee+Picloram+NIS	0.225+4.0+0.18+0.125%	3	96	93	92	2	95	89	31
Thif&Trib+24-Dbee+Picloram+NIS	0.225+4.0+0.25+0.125%	4	98	95	95	4	99	89	30
Thif&Trib+Brox&MCPA+NIS	0.225+6.0+0.125%	1	99	98	97	6	94	93	32
Thif&Trib+Brox&MCPA	0.225+6.0	1	99	98	98	4	97	96	34
Thif&Trib+Brox&MCPA+NIS	0.225+8.0+0.125%	1	99	99	97	3	99	97	33
Trib+24-Dbee+NIS	0.09375+4.0+0.125%	1	97	94	87	3	98	37	34
Trib+MCPA-ioe+NIS	0.09375+4.0+0.125%	1	97	94	87	6	97	21	32
Trib+24-Dbee+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	4	94	94	85	8	99	40	31
Trib+24-Dbee+Dica-dma	0.09375+4.0+1.0	7	97	94	85	6	99	40	30
Trib+MCPA-ioe+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	5	97	93	87	3	99	41	32
Trib+MCPA-ioe+Dica-dma	0.09375+4.0+1.0	6	97	95	88	8	99	28	32
Trib+Brox&MCPA+NIS	0.09375+6.0+0.125%	0	99	96	98	1	97	88	29
Trib+Brox&MCPA	0.09375+6.0	0	99	95	97	5	97	87	32
Trib+Brox&MCPA+NIS	0.09375+8.0+0.125%	0	99	96	98	3	98	86	33
Trib+24-Dbee+Picloram+NIS	0.09375+4.0+0.1875+0.125%	1	99	94	87	3	97	77	31
Trib+24-Dbee+Picloram+NIS	0.09375+4.0+0.25+0.125%	1	97	93	82	3	99	76	31
24-Dbee+Dica-dma	4.0+1.0	8	91	91	81	8	98	49	30
MCPA-ioe+Dica-dma	4.0+1.0	5	90	89	76	6	96	27	30
24-Dbee+Picloram	4.0+0.25	2	87	41	33	1	35	30	24
Brox&MCPA	8.0	2	99	97	97	0	94	89	32
Untreated	0	0	0	0	0	0	0	0	22
C.V. %		51	2	4	4	79	7	21	9
LSD 5%		2	3	5	5	4	9	18	4
# OF REPS		4	4	4	4	4	4	4	4

Summary

Weed densities were: wild mustard 5/yd^2, kochia 20/yd^2, and wild buckwheat 10/yd^2. All treatments containing thifensulfuron & tribenuron or tribenuron gave 85% or more control of all broadleaf weeds, at the 6/13/95 evaluation. At the late evaluation wild buckwheat control exceeded 85% only for treatments containing bromoxynil or picloram with thifensulfuron. Kochia was controlled by all herbicides treatments, except 2,4-D + picloram. Injury to wheat was of no importance.

Herbicide 3-way mixture for broadleaf weed control, Carrington 1995. 'Kulm' hard red spring wheat was seeded May 18. Treatments were applied to 3- to 4-leaf wheat, 1-inch redroot pigweed, 2- to 3-inch common lambsquarters, 2-inch wild buckwheat, and 1- to 2-inch kochia on June 13 with 73 F, 55% RH clear sky, and 8 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	7/15				
		Wht	Rrpw	Colq	Wibu	KOCZ
	oz/A	%				
Thif&Trib+24-Dbee+NIS	0.225+4.0+0.125%	5	98	99	99	99
Thif&Trib+24-Dbee	0.225+4.0	3	98	99	97	99
Thif&Trib+MCPA-ioe+NIS	0.225+4.0+0.125%	0	99	98	97	99
Thif&Trib+24-Dbee+Dica-dma+NIS	0.225+4.0+1.0+0.125%	0	18	99	13	20
Thif&Trib+MCPA-ioe+Dica-dma	0.225+4.0+1.0+0.125%	3	98	99	96	99
Thif&Trib+24-Dbee+Picloram+NIS	0.225+4.0+0.18+0.125%	1	99	99	98	99
Thif&Trib+24-Dbee+Picloram+NIS	0.225+4.0+0.25+0.125%	3	98	99	99	99
Thif&Trib+Brox&MCPA+NIS	0.225+6.0+0.125%	3	99	99	99	99
Thif&Trib+Brox&MCPA	0.225+6.0	4	96	98	97	99
Thif&Trib+Brox&MCPA+NIS	0.225+8.0+0.125%	1	98	99	96	99
Trib+24-Dbee+NIS	0.09375+4.0+0.125%	4	99	99	98	99
Trib+MCPA-ioe+NIS	0.09375+4.0+0.125%	3	79	99	65	99
Trib+24-Dbee+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	1	97	99	98	99
Trib+24-Dbee+Dica-dma	0.09375+4.0+1.0	0	98	99	84	99
Trib+MCPA-ioe+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	3	96	99	98	99
Trib+MCPA-ioe+Dica-dma	0.09375+4.0+1.0	0	93	99	83	99
Trib+Brox&MCPA+NIS	0.09375+6.0+0.125%	4	82	99	82	99
Trib+Brox&MCPA	0.09375+6.0	3	82	99	99	99
Trib+Brox&MCPA+NIS	0.09375+8.0+0.125%	3	71	99	99	98
Trib+24-Dbee+Picloram+NIS	0.09375+4.0+0.1875+0.125%	3	98	99	99	99
Trib+24-Dbee+Picloram+NIS	0.09375+4.0+0.25+0.125%	0	92	99	94	99
24-Dbee+Dica-dma	4.0+1.0	1	94	94	80	99
MCPA-ioe+Dica-dma	4.0+1.0	0	87	99	89	99
24-Dbee+Picloram	4.0+0.25	6	99	99	97	99
Brox&MCPA	8.0	1	64	99	70	99
Untreated	0	0	0	0	1	1
C.V. %		170	14	2	16	4
LSD 5%		NS	16	3	19	6
# OF REPS		4	4	4	4	3

Summary

Weed density was high (>10 plants/yd^2) for all species except kochia. Redroot pigweed control exceeded 85% with all herbicide treatments except for tribenuron with MCPA for MCPA & bromoxynil and bromoxynil & MCPA alone. The area received a hail storm which caused more than 50% damage to the wheat.

Herbicide 3-way mixture for broadleaf weed control, Dickinson, 1995. 'Stoa' hard red spring wheat was seeded April 26. Treatments were applied to 4- to 4.5-leaf wheat on May 30 with 62 F and 0- to 10-mph wind. 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	7/13				8/15	
		Wht	Roma	Colq	Rrpw	Wheat yield	Test weight
	oz/A			%		bu/A	lb/bu
Mets+2,4-Dbee+NIS	0.063+4.0+0.125%	0	62	99	99	46	59
Mets+2,4-Dbee	0.063+4.0	0	80	99	97	44	59
Mets+MCPA-ioe+NIS	0.063+4.0+0.125%	2	89	96	98	43	59
Mets+2,4-Dbee+Dica-dma+NIS	0.063+4.0+1.0+0.125%	0	92	99	98	44	60
Mets+MCPA-ioe+Dica-dma+NIS	0.063+4.0+1.0+0.125%	0	63	99	99	45	59
Mets+2,4-Dbee+Picloram+NIS	0.063+4.0+0.18+0.125%	0	83	99	99	45	59
Mets+2,4-Dbee+Picloram+NIS	0.063+4.0+0.25+0.125%	2	98	99	99	43	59
Mets+Brox&MCPA+NIS	0.063+6.0+0.125%	0	99	99	99	47	59
Mets+Brox&MCPA	0.063+6.0	1	84	99	99	43	59
Mets+Brox&MCPA+NIS	0.063+8.0+0.125%	1	63	99	99	46	58
Trib+2,4-Dbee+NIS	0.09375+4.0+0.125%	1	85	99	87	46	59
Trib+MCPA-ioe+NIS	0.09375+4.0+0.125%	0	63	99	88	47	59
Trib+2,4-Dbee+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	0	54	99	99	47	59
Trib+2,4-Dbee+Dica-dma	0.09375+4.0+1.0	1	76	99	97	45	59
Trib+MCPA-ioe+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	0	72	99	99	46	59
Trib+MCPA-ioe+Dica-dma	0.09375+4.0+1.0	0	58	99	89	44	60
Trib+Brox&MCPA+NIS	0.09375+6.0+0.125%	0	70	99	89	47	59
Trib+Brox&MCPA	0.09375+6.0	0	87	96	94	45	58
Trib+Brox&MCPA+NIS	0.09375+8.0+0.125%	0	76	99	94	46	59
Trib+2,4-Dbee+Picloram+NIS	0.09375+4.0+0.1875+0.125%	0	53	99	92	46	59
Trib+2,4-Dbee+Picloram+NIS	0.09375+4.0+0.25+0.125%	0	70	99	89	45	59
2,4-Dbee+Dica-dma	4.0+1.0	1	81	99	99	43	59
MCPA-ioe+Dica-dma	4.0+1.0	0	78	99	96	46	58
2,4-Dbee+Picloram	4.0+0.25	3	83	98	94	43	59
Brox&MCPA	8.0	0	69	96	98	48	59
Untreated	0	0	0	0	0	46	59
C.V. %		385	27	2	10	7	1
LSD 5%		NS	32	3	13	NS	NS
# OF REPS		4	3	3	4	4	1

Summary

Weed density was low and somewhat variable. Common mallow occurred most uniformly of the weeds. Treatments containing metsulfuron were generally more effective than tribenuron treatments for control of common mallow and redroot pigweed.

Herbicide 3-way mixture for broadleaf weed control, Hettinger 1995. 'Bowman' barley was seeded May 5. Treatments were applied to 4-leaf barley, 2-leaf wild buckwheat, 2-inch common lambsquarters, and 0.5- to 1-inch kochia on June 1 with 58 F, 89% RH, clear sky, and 0- to 2-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.

Treatment	Rate	7/11 Barley	7/11 Wibu	7/11 Colq	7/11 KOCZ	8/1 Yield
	oz/A		%			bu/A
Metsulfuron+2,4-Dbee+NIS	0.063+4.0+0.125%	0	95	99	93	38
Metsulfuron+2,4-Dbee	0.063+4.0	0	94	99	90	40
Metsulfuron+MCPA-ioe+NIS	0.063+4.0+0.125%	0	91	99	96	38
Mets+2,4-Dbee+Dica-dma+NIS	0.063+4.0+1.0+0.125%	0	97	99	97	40
Mets+MCPA-ioe+Dica-dma+NIS	0.063+4.0+1.0+0.125%	1	98	99	99	34
Mets+2,4-Dbee+Picloram+NIS	0.063+4.0+0.18+0.125%	0	94	99	86	36
Mets+2,4-Dbee+Picloram+NIS	0.063+4.0+0.25+0.125%	1	99	99	97	35
Metsulfuron+Brox&MCPA+NIS	0.063+6.0+0.125%	0	99	99	99	39
Metsulfuron+Brox&MCPA	0.063+6.0	0	99	99	99	39
Metsulfuron+Brox&MCPA+NIS	0.063+8.0+0.125%	1	99	99	99	40
Tribenuron+24-Dbee+NIS	0.09375+4.0+0.125%	0	83	99	99	34
Tribenuron+MCPA-ioe+NIS	0.09375+4.0+0.125%	1	92	99	99	35
Trib+2,4-Dbee+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	0	98	99	99	37
Trib+2,4-Dbee+Dica-dma	0.09375+4.0+1.0	1	96	99	99	32
Trib+MCPA-ioe+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	0	96	99	99	36
Trib+MCPA-ioe+Dica-dma	0.09375+4.0+1.0	0	84	99	99	34
Tribenuron+Brox&MCPA+NIS	0.09375+6.0+0.125%	0	99	99	99	38
Tribenuron+Brox&MCPA	0.09375+6.0	1	96	99	99	39
Trib+Brox&MCPA+NIS	0.09375+8.0+0.125%	0	99	99	99	36
Trib+2,4-Dbee+Picloram+NIS	0.09375+4.0+0.1875+0.125%	0	99	99	99	36
Trib+2,4-Dbee+Picloram+NIS	0.09375+4.0+0.25+0.125%	1	97	99	89	35
2,4-Dbee+Dica-dma	4.0+1.0	0	87	99	93	34
MCPA-ioe+Dica-dma	4.0+1.0	0	97	99	98	33
2,4-Dbee+Picloram	4.0+0.25	0	97	99	82	34
Brox&MCPA	8.0	0	98	99	98	35
Untreated	0	0	0	0	0	31
C.V. %		389	8	0	9	10
LSD 5%		NS	11	0	12	5
# OF REPS		4	4	4	4	4

Summary

Weed density was moderate (5 plants/yd^2) but uniform. All treatments adequately controlled broadleaf weeds present. However, kochia control often was reduced when picloram was a treatment component.

Herbicide 3-way mixture for broadleaf weed control, Minot 1995. 'Amidon' hard red spring wheat was seeded June 5. Treatment were applied to 4- to 5-leaf wheat and 2- to 3-inch tall broadleaf weeds on July 14 with 70 F, 5- to 8 mph wind and no precipitation in the following 24 h period. The 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	8/14 Wht	9/26 Wheat yield	Test weight
	oz/A	%	bu/A	lb/bu
Thif&Trib+24-Dbee+NIS	0.225+4.0+0.125%	0	20	56
Thif&Trib+24-Dbee	0.225+4.0	0	26	55
Thif&Trib+MCPA-ioe+NIS	0.225+4.0+0.125%	0	22	56
Thif&Trib+24-Dbee+Dica-dma+NIS	0.225+4.0+1.0+0.125%	1	21	54
Thif&Trib+MCPA-ioe+Dica-dma	0.225+4.0+1.0+0.125%	3	23	56
Thif&Trib+24-Dbee+Picloram+NIS	0.225+4.0+0.18+0.125%	4	23	57
Thif&Trib+24-Dbee+Picloram+NIS	0.225+4.0+0.25+0.125%	5	19	56
Thif&Trib+Brox&MCPA+NIS	0.225+6.0+0.125%	1	21	56
Thif&Trib+Brox&MCPA	0.225+6.0	1	20	57
Thif&Trib+Brox&MCPA+NIS	0.225+8.0+0.125%	0	23	57
Trib+24-Dbee+NIS	0.09375+4.0+0.125%	1	21	55
Trib+MCPA-ioe+NIS	0.09375+4.0+0.125%	0	26	56
Trib+24-Dbee+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	4	19	55
Trib+24-Dbee+Dica-dma	0.09375+4.0+1.0	3	21	54
Trib+MCPA-ioe+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	0	21	55
Trib+MCPA-ioe+Dica-dma	0.09375+4.0+1.0	0	19	56
Trib+Brox&MCPA+NIS	0.09375+6.0+0.125%	0	18	56
Trib+Brox&MCPA	0.09375+6.0	0	26	56
Trib+Brox&MCPA+NIS	0.09375+8.0+0.125%	0	23	57
Trib+24-Dbee+Picloram+NIS	0.09375+4.0+0.1875+0.125%	3	22	55
Trib+24-Dbee+Picloram+NIS	0.09375+4.0+0.25+0.125%	0	16	55
24-Dbee+Dica-dma	4.0+1.0	3	17	56
MCPA-ioe+Dica-dma	4.0+1.0	0	21	57
24-Dbee+Picloram	4.0+0.25	5	23	57
Brox&MCPA	8.0	0	22	57
Untreated	0	0	22	56
C.V. %		133	20	3
LSD 5%		2	NS	NS
# OF REPS		4	4	4

Summary

Weeds density was to sparce for evaluation. However, none of the treatments caused important injury to wheat.

Herbicide 3-way mixture for broadleaf weed control, Williston 1995. '2375' hard red spring wheat was seeded May 2. Treatments were applied to 4.5-leaf wheat, 1- to 3-inch kochia, 1- to 3-inch Russian thistle, and emerging- to 2-leaf green foxtail on June 2 with 78 F, 55% RH, 3-mph wind, and clear sky. Treatments wer applied with a bicycle wheel type plot sprayer mounted on a G-Allis Chalmers tractor 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.

Treatment	Rate	7/13 Wht	7/13 KOCZ	8/21 Wheat yield	Test weight
	oz/A	— % —		bu/A	lb/bu
Metsulfuron+2,4-Dbee+NIS	0.063+4.0+0.125%	3	99	16	60
Metsulfuron+2,4-Dbee	0.063+4.0	2	95	18	61
Mets+MCPA-ioe+NIS	0.063+4.0+0.125%	1	97	20	61
Mets+2,4-Dbee+Dica-dma+NIS	0.063+4.0+1.0+0.125%	3	99	19	60
Mets+MCPA-ioe+Dica-dma+NIS	0.063+4.0+1.0+0.125%	5	99	16	61
Mets+2,4-Dbee+Picloram+NIS	0.063+4.0+0.18+0.125%	0	95	17	60
Mets+2,4-Dbee+Picloram+NIS	0.063+4.0+0.25+0.125%	1	94	18	60
Metsulfuron+Brox&MCPA+NIS	0.063+6.0+0.125%	1	98	19	60
Metsulfuron+Brox&MCPA	0.063+6.0	2	99	18	61
Metsulfuron+Brox&MCPA+NIS	0.063+8.0+0.125%	0	97	19	61
Tribenuron+2,4-Dbee+NIS	0.09375+4.0+0.125%	2	99	18	60
Tribenuron+MCPA-ioe+NIS	0.09375+4.0+0.125%	1	97	17	61
Trib+2,4-Dbee+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	3	99	18	60
Trib+2,4-Dbee+Dica-dma	0.09375+4.0+1.0	5	99	17	60
Trib+MCPA-ioe+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	4	99	16	60
Trib+MCPA-ioe+Dica-dma	0.09375+4.0+1.0	0	99	17	61
Tribenuron+Brox&MCPA+NIS	0.09375+6.0+0.125%	0	97	16	61
Tribenuron+Brox&MCPA	0.09375+6.0	2	99	19	61
Tribenuron+Brox&MCPA+NIS	0.09375+8.0+0.125%	6	99	18	61
Trib+2,4-Dbee+Picloram+NIS	0.09375+4.0+0.1875+0.125%	6	97	15	60
Trib+2,4-Dbee+Picloram+NIS	0.09375+4.0+0.25+0.125%	0	96	17	60
2,4-Dbee+Dicamba-dma	4.0+1.0	7	99	15	61
MCPA-ioe+Dicamba-dma	4.0+1.0	7	99	15	61
2,4-Dbee+Picloram	4.0+0.25	3	61	13	60
Brox&MCPA	8.0	0	95	16	60
Untreated	0	0	0	7	60
C.V. %		136	5	14	
LSD 5%		5	6	3	
# OF REPS		4	4	4	1

Summary

Kochia density exceeded 5 plants/ft^2. All treatments gave more than 90% control of kochia, except control was only 61% for 2,4-D applied with picloram. None of the treatments caused any important injury to wheat.

Phenoxy herbicides for broadleaf weed control, Fargo 1995. '2371' wheat was seeded May 2. Treatments were applied to 3.5- to 4-leaf wheat, 2- to 6-leaf wild mustard, 0.5- to 2.5-inch kochia, and 1- to 5-leaf wild buckwheat on June 2 with 78 F, 45% RH, clear sky, and 2- to 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. Kochia and wild buckwheat exceeded 20 plants/yd^2 and wild mustard less than 2/yd^2.

		6/13				7/31			8/17
Treatment	Rate	Wht	Wimu	KOCZ	Wibu	Wht	KOCZ	Wibu	Yield
	oz/A			%					bu/A
Bromoxynil	4	0	83	80	89	0	80	70	26
2,4-Ddma	6	0	92	35	50	0	21	25	25
MCPA-dma	6	0	93	11	19	0	10	13	23*
Dica-dma	2	4	88	92	89	3	95	85	24
2,4-D+Brox	4+4	1	97	91	95	0	56	69	22*
Brox&MCPA	8	0	99	94	97	1	82	70	24
MCPA-dma+Dica-dma	4+2	3	94	95	92	0	97	86	25
Thif&Trib+X-77	0.22+0.25%	1	99	97	96	2	90	74	22
Thif&Trib+Brox+X-77	0.22+8+0.25%	0	99	99	99	0	96	89	25
Thif&Trib+Dica-dma+X-77	0.22+1+0.25%	2	99	96	95	1	97	87	24
Thif&Trib+24-D+X-77	0.22+4+0.25%	0	99	98	93	1	94	71	25
Untreated	0	0	0	0	0	0	0	0	12
C.V. %		82	4	7	6	240	17	20	12
LSD 5%		1	4	7	6	NS	17	18	4
# OF REPS		4	4	4	4	4	4	4	4

*Represent yield from only two replicates (LSD does not apply) as kochia prevented harvest in replicates 3 and 4.

Summary

None of the herbicides caused any important injury to wheat. Both 2,4-D and MCPA alone gave greater than 90% wild mustard control and are important in mixture with dicamba or bromoxynil to enhance wild mustard control. Thifensulfuron & tribenuron also effectively controlled wild mustard. Alternative herbicides to 2,4-D or MCPA were generally more effective for the broadleaf weeds present, except for wild mustard.

Phenoxy herbicides for broadleaf weed control, Carrington 1995. 'Kulm' hard red spring wheat was seeded May 18. Treatments were applied to 3- to 4-leaf wheat, 1- to 2-inch kochia, 1-inch redroot pigweed, 2- to 3-inch common lambsquarters, 2-inch wild buckwheat, and 3-inch wild mustard on June 13 with 80 F, 43% RH, clear sky, and 13 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	7/15					
		Wht	KOCZ	Rrpw	Colq	Wibu	Wimu
	oz/A	%					
Bromoxynil	4	0	99	53	96	87	97
2,4-Ddma	6	1	65	55	97	48	97
MCPA-dma	6	1	40	68	99	15	99
Dicamba-dma	2	2	99	89	90	77	94
2,4-D+Brox	4+4	3	99	95	99	99	99
Brox&MCPA	8	1	-	72	99	71	99
MCPA-dma+Dica-dma	4+2	1	99	93	99	71	99
Thif&Trib+X-77	0.22+0.25%	4	99	96	99	99	99
Thif&Trib+Brox+X-77	0.22+8+0.25%	3	99	94	97	91	97
Thif&Trib+Dica-dma+X-77	0.22+1+0.25%	1	99	99	99	98	99
Thif&Trib+2,4-D+X-77	0.22+4+0.25%	4	99	97	99	94	99
Untreated	0	0	0	0	0	0	0
C.V. %		172	23	17	2	30	3
LSD 5%		NS	37	18	3	31	4
# OF REPS		4	2	4	4	4	4

Summary

None of the herbicides injured wheat. 2,4-D and MCPA were important in mixture with bromoxynil to enhance redroot pigweed control. Thifensulfuron & tribenuron alone or in mixture with other herbicides gave 90% or more control of all broadleaf weeds. These data indicate that alternate herbicides were equally or more effective than the phenoxys, however the phenoxys cost less.

Phenoxy herbicides on broadleaf weed control, Dickinson 1995. 'Stoa' hard red spring wheat was seeded April 26. Treatments were applied to 4- to 4.5 leaf wheat on May 30 with 62 F and 0- to 10- mph wind. 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	7/13				8/15	
		Wht	Coma	Colq	Rrpw	Wheat yield	Test weight
	oz/A	%				bu/A	lb/bu
Bromoxynil	4	2	56	99	99	46	58
2,4-Ddma	6	0	73	99	99	48	59
MCPA-dma	6	0	54	99	99	44	49
Dicamba-dma	2	0	67	94	99	50	50
2,4-D+Brox	4+4	0	82	99	99	45	59
Bromoxynil&MCPA	8	0	71	99	99	49	60
MCPA-dma+Dica-dma	4+2	0	65	99	99	45	58
Metsulfuron+X-77	0.063+0.25%	0	78	99	99	49	49
Metsulfuron+Brox+X-77	0.063+8+0.25%	0	98	99	99	52	59
Metsulfuron+Dica+X-77	0.063+1+0.25%	0	84	99	99	52	59
Metsulfuron+2,4-D+X-77	0.063+4+0.25%	0	98	99	99	48	59
Untreated	0	0	0	0	0	47	58
C.V. %		693	28	3	19	10	2
LSD 5%		NS	28	4	28	NS	NS
# OF REPS		4	4	4	3	4	1

Summary

None of the herbicides injured wheat. Metsulfuron + bromoxynil or + 2,4-D were the most effective herbicide treatments for common mallow control. Common lambsquarters and redroot pigweed were controlled by all herbicide treatments.

Phenoxy herbicides for broadleaf weed control, Hettinger, 1995. 'Bowman' barley was seeded May 5. Treatments were applied to 4-leaf barley, 2-leaf wild buckwheat, 2-inch common lambsquarters, and 0.5- to 1-inch kochia on June 1 with 54 F, 93% RH, clear sky, and 0- to 2-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.

Treatment	Rate	7/12				8/1
		Wht	Wibu	Colq	KOCZ	Yield
	oz/A			%		bu/A
Bromoxynil	4	0	97	99	99	43
2,4-Ddma	6	0	55	99	66	42
MCPA-dma	6	0	48	99	40	41
Dicamba-dma	2	0	94	99	99	43
2,4-D+Bromoxynil	4+4	0	89	99	89	43
Bromoxynil&MCPA	8	0	98	99	99	41
MCPA-dma+Dicamba-dma	4+2	0	91	99	98	40
Mets+X-77	0.063+0.25%	0	66	99	89	44
Metsulfuron+Brox+X-77	0.063+8+0.25%	0	99	99	99	40
Metsulfuron+Dicamba+X-77	0.063+1+0.25%	1	67	99	99	44
Metsulfuron+2,4-D+X-77	0.063+4+0.25%	0	61	99	85	44
Untreated	0	0	0	0	0	38
C.V. %		693	21	0	16	6
LSD 5%		NS	21	NS	22	4
# OF REPS		4	4	4	3	4

Summary

None of the herbicide treatments injured wheat. Common lambsquarters was controlled by all herbicide treatments. 2,4-D and MCPA were less effective than the other herbicides for controlling the weeds and in mixture did not enhance weed control provided by the other herbicides.

Phenoxy herbicides for broadleaf weed control, Minot 1995. 'Amidon' hard red spring wheat was seeded June 5. Treatments were applied to 4- to 5-leaf wheat and 2- to 3-leaf broadleaf weeds on July 14 with 70 F and 5- to 8-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	8/14 Wht	9/26 Wheat yield	Test weight
	oz/A	%	bu/A	lb/A
Bromoxynil	4	0	28	55
2,4-Ddma	6	0	31	57
MCPA-dma	6	0	27	56
Dicamba-dma	2	3	22	55
2,4-D+Bromoxynil	4+4	0	26	57
Bromoxynil&MCPA	8	0	25	57
MCPA-dma+Dicamba-dma	4+2	4	24	56
Thif&Trib+X-77	0.22+0.25%	0	24	57
Thif&Trib+Bromoxynil+X-77	0.22+8+0.25%	0	25	57
Thif&Trib+Dicamba-dma+X-77	0.22+1+0.25%	1	24	57
Thif&Trib+2,4-D+X-77	0.22+4+0.25%	0	26	57
Untreated	0	0	26	57
C.V. %		201	19	3
LSD 5%		2	NS	NS
# OF REPS		4	4	4

Summary

Weed density was not adequate to evaluate herbicide effectiveness. However, none of the herbicide treatments caused important injury to wheat.

Phenoxy herbicides for broadleaf weed control in wheat, Williston. 'Ernest' hard red spring wheat was seeded May 17. Treatments were applied to 3.5-leaf wheat, 1- to 3-inch kochia and Russian thistle, and 0.5- to 1.5-inch redroot pigweed on June 12 with 64 F, 64% RH, clear sky, and 2 mph wind. Treatments were applied with a bicycle type sprayer with wind shield mounted on G-Allis Chalmers tractor delivering 35 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 Russian thistle 4 plants/yd^2; kochia 5 to 10 plants/ft^2; and redroot pigweed 2 plants/yd^2.

Treatment	Rate	7/18				8/22	
		Wht	Kocz	Ruth	Rrpw	Wheat yield	Test weight
	oz/a	%				bu/A	lb/bu
Bromoxynil	4	0	11	63	31	23	61
2,4-D dma	6	0	65	95	93	25	61
MCPA dma	6	0	16	0	39	26	61
Dicamba dma	2	1	48	60	64	25	62
2,4-D + Bromoxynil	4+4	3	95	98	97	26	61
Bromoxynil + MCPA	8	3	80	97	76	25	61
MCPA dma +Dicamba dma	4+2	6	94	99	95	27	61
Metsulfuron + X-77	0.063+0.25%	3	97	99	99	26	61
Metsulfuron + Brom +X-77	0.063+8+0.25%	4	97	99	99	26	61
Metsulfuron+Dicamba+X-77	0.063+1+0.25%	5	97	99	98	27	61
Metsulfuron+2,4-D+X-77	0.063+4+0.25%	3	95	99	99	26	61
Untreated check	0	0	0	0	0	21	61
C.V. %		103	15	9	18	12	
LSD 5%		3	14	15	19	NS	
# OF REPS		4	4	2	4	4	1

Summary

None of the herbicides caused important injury to wheat, but treatments containing dicamba caused or tended to cause statistically significant more injury than other herbicide treatments. Wheat yields tended to be increased by all herbicide treatments and generally related positively to the degree of weed control. 2,4-D and MCPA in mixture with bromoxynil increased weed control compared to bromoxynil alone and redroot pigweed control was increased to a greater extent by 2,4-D than MCPA. MCPA in mixture with dicamba gave greater control of all weeds than either herbicide alone. Metsulfuron alone effectively controlled all weeds present so no benefit occurred from application with another herbicide. The phenoxys, MCPA and 2,4-D were important in mixture with bromoxynil or dicamba for effective control of many weeds in wheat. 2,4-D alone effectively controlled redroot pigweed and Russian thistle.

Dicamba+MCPA and $CaCl_2$ water for broadleaf weed control in wheat, Fargo 1995. '2371' hard red spring wheat was seeded May 2. Treatments were applied to 3.5- to 4.5-leaf wheat, cotyledon- to 6-leaf wild mustard, 0.25- to 1.5-leaf kochia, and 1- to 2-leaf wild buckwheat on June 1 with 78 F, 40% RH, sunny 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 25 ft plots. The experiment was a randomized complete block design with four replicates. Wild buckwheat and kochia density was moderate (20 to 50 plants/yd^2) and wild mustard less than 5 plants/yd^2.

		6/14				7/31			8/17
Treatment	Rate	Wht	Wimu	KOCZ	Wibu	Wht	KOCZ	Wibu	Yield
	oz/A				%				bu/A
Dica-dma+MCPA-dma	2+4	4	96	94	84	3	97	92	21
Dica-dma+MCPA-dma	1+4	1	96	83	68	3	73	61	23
Dica-dma+MCPA-dma($CaCl_2$ H_2O)	2+4	1	94	92	79	5	97	91	27
Dica-dma+MCPA-dma($CaCl_2$ H_2O)	1+4	0	97	88	65	4	81	60	28
Dica-dma+MCPA dma+X-77($CaCl_2$ H_2O)	2+4+0.25%	9	96	96	86	3	98	87	22
Dica-dma+MCPA-dma+X-77($CaCl_2$ H_2O)	1+4+0.25%	3	92	87	59	2	56	34	24
Dica-dma+MCPA dma+AMS($CaCl_2$ H_2O)	2+4+2%	4	97	93	80	2	97	82	28
Dica-dma+MCPA-dma+AMS($CaCl_2$ H_2O)	1+4+2%	1	97	90	68	3	94	56	26
Dica-dma+MCPA-dma+AMS+X-77	2+4+2%+0.25%	7	98	95	88	1	99	84	25
Dica-dma+MCPA-dma+AMS+X-77	1+4+2%+0.25%	5	98	94	77	1	93	65	24
Dica-dma+MCPA-dma+SurfateII($CaCl_2$ H_2O)	2+4+1%	9	98	96	84	3	93	88	26
Dica-dma+MCPA-dma+SurfateII($CaCl_2$ H_2O)	1+4+1%	4	95	93	74	3	80	60	24
Dica-dma+MCPA-dma+ND-4($CaCl_2$ H_2O)	2+4+1%	8	99	96	87	5	99	88	26
Dica-dma+MCPA-dma+ND-4($CaCl_2$ H_2O)	1+4+1%	7	98	95	78	3	97	63	25
Untreated	0	0	0	0	0	0	0	0	23
C.V. %		52	4	3	9	118	9	20	14
LSD 5%		3	5	4	9	NS	11	20	NS
# OF REPS		4	4	4	4	4	4	4	4

Summary

Calcium antagonism of weed control from dicamba + MCPA was not obvious, except for dicamba at 1 oz/A + MCPA and 4 oz/A applied with X-77 and calcium chloride. Previous experiments had indicated antagonism of kochia control by dicamba in the presence of calcium chloride.

FMC-8426 for broadleaf weed control in wheat, Fargo 1995. '2371' hard red spring wheat was seeded May 2. Treatments were applied to 3.5- to 4-leaf wheat, 2- to 6-leaf wild mustard, 0.5- to 2.5-leaf kochia, and 1- to 5-leaf wild buckwheat on June 2 with 78 F, 45% RH, clear sky, and 2- to 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. Kochia and wild buckwheat density were moderate (1 to 5 plants/ft^2) and wild mustard sparce at 1 to 3/yd^2.

Treatment	Rate	6/14				7/31			8/17
		Wht	Wimu	KOCZ	Wibu	Wht	KOCZ	Wibu	Yield
	oz/A	%				%			bu/A
F8426	0.38	1	83	84	51	2	62	38	21
F8426+X-77	0.38+0.25%	5	85	92	61	0	78	39	21
F8426+28N	0.38+4%	1	80	81	51	1	68	39	22
F8426+PO	0.38+1%	6	82	95	66	0	84	39	19
F8426+VO	0.38+1%	3	82	92	57	0	80	34	21
F8426+X-77+28N	0.38+0.25%+4%	5	79	92	62	0	90	50	22
F8426	0.5	2	76	84	45	1	76	24	20
F8426+X-77	0.5+0.25%	8	81	93	54	0	86	54	23
F8426+28N	0.5+4%	1	81	88	52	3	86	44	22
F8426+PO	0.5+1%	7	78	93	70	0	89	63	24
F8426+VO	0.5+1%	1	83	90	57	0	86	43	20
F8426+X-77+28N	0.5+0.25%+4%	8	80	92	78	0	91	53	22
F8426+24-Ddma+X-77	0.38+4+0.25%	3	97	95	82	0	65	50	24
F8426+24-Ddma+28N	0.38+4+4%	1	97	95	87	0	75	70	23
F8426+24-Ddma+PO	0.38+4+1%	4	98	97	85	0	82	61	26
F8426+24-Ddma+VO	0.38+4+1%	4	98	97	86	0	80	69	24
F8426+24-Ddma+X-77+28N	0.38+4+0.25%+4%	7	98	97	88	0	77	69	25
F8426+24-Ddma+X-77	0.5+4+0.25%	4	98	97	87	0	75	55	21
F8426+24-Ddma+28N	0.5+4+4%	2	98	96	82	0	75	73	24
F8426+24-Ddma+PO	0.5+4+1%	8	99	98	91	0	76	65	23
F8426+24-Ddma+VO	0.5+4+1%	6	98	96	88	1	73	61	24
F8426+24-Ddma+X-77+28N	0.5+4+0.25%+4%	8	98	95	87	0	68	73	25
Untreated	0	0	0	0	0	0	0	0	15
C.V. %		47	6	3	15	371	14	29	13
LSD 5%		3	7	4	15	NS	15	21	4
# OF REPS		4	4	4	4	4	4	4	4

Summary

Injury to wheat was minor and generally related to weed control. Wheat at evaluation had recovered from apparent earlier injury. F8426 required the presence of 2,4-D for effective wild mustard control. 2,4-D also was important for enhancement of kochia and wild buckwheat control. F8426 rate did not greatly influence weed control. Late evaluations were more variable than early evaluations possibly from presence of Canada thistle. All adjuvants enhanced weed control from F8426, but difference among adjuvants were small. Petroleum and vegetable oil and X-77 + 28%N generally were more effective than X-77 or 28%N.

Broadleaf weed control, Fargo 1995. '2371' hard red spring wheat was seeded May 2. Treatments were applied to 3.5- to 4-leaf wheat, 2- to 6-leaf wild mustard, 0.5- to 2.5-inch kochia, and 1- to 5-leaf wild buckwheat on June 2 with 78 F, 45% RH, clear sky, and 2- to 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. Weed densities on June 14 were 1/ft^2 for wild mustard, kochia, and wild buckwheat.

		6/14				8/01		8/17
Treatment	Rate	Wht	Wimu	KOCZ	Wibu	Kocz	Wibu	Yield
	oz/A			%				bu/A
Brox&MCPA	8	0	89	75	79	68	49	26
Brox&MCPA-gel	8	0	90	83	83	76	58	26
Brox&MCPA+Thif&Trib+X-77	6+0.125+0.25%	1	99	98	96	92	85	31
Brox&MCPA+MCPA-ioe	6+2	0	93	77	85	60	45	25
Brox&MCPA+F8426	6+0.25	3	98	98	90	90	46	28
Brox&MCPA+F8426	4+0.25	1	98	94	81	80	23	27
Thif&Trib+24-Dbee	0.37+8	3	99	98	95	97	83	28
Thif&Trib+24-Ddma	0.37+8	0	99	98	92	90	58	25
Thif&Trib+24-Ddma+AMS	0.37+8+40	0	99	97	91	91	66	28
Thif&Trib+24-Ddma+ND-4	0.37+8+1%	1	99	99	96	95	86	30
Thif&Trib+24-D(HI-DEP)	0.37+8	1	99	98	90	91	61	30
Untreated	0	0	0	0	0	0	0	14
C.V. %		170	4	6	6	10	29	10
LSD 5%		NS	5	7	7	11	23	4
# OF REPS		4	4	4	4	4	4	4

Summary

Herbicide treatment did not injure wheat. Bromoxynil & MCPA at 6 oz/A + thifensulfuron & tribenuron at 0.125 oz/A gave greater control of weeds than bromoxynil & MCPA at 8 oz/A. The highest control of all broadleaf weed tended to occur with thifensulfuron & tribenuron + 2,4-Ddma + ND-4.

Foxtail control in wheat, Fargo 1995. '2371' hard red spring wheat was seeded June 14. Treatments (2-3") were applied to 3- to 5-leaf wheat, 2- to 3-inch yellow foxtail, 3- to 5-leaf wild mustard, 4-leaf redroot pigweed, and 4- to 6-leaf common lambsquarters on June 14 with 78 F, 58% RH, clear sky, and 12-mph wind. Treatments (5-7") were applied to 5-leaf wheat, 5- to 7-inch yellow foxtail, 4- to 8-leaf common lambsquarters, and 3- to 5-inch wild mustard on June 19 with 84 F, 55% 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.

		6/26					7/20				
Treatment	Rate	Wht	Yeft	Wimu	Rrpw	Colq	Wht	Green/ Yeft	Colq	Wimu	8/13 Yield
	oz/A					%					bu/A
HX+R-11(2-3")	0.25+0.25%	7	83	99	40	8	2	51	13	99	17
HX+Scoil(2-3")	0.25+0.18G	12	94	99	60	30	8	75	16	99	18
HX+ND-4(2-3")	0.25+1%	10	90	99	45	10	6	65	15	98	17
HX+MON-818(2-3")	0.25+0.25%	7	83	99	38	13	5	55	15	99	17
HX+X-77+28N(2-3")	0.25+0.25%+2%	8	79	99	33	10	6	57	7	99	19
Prop-DF+MCPA-ioe+PO(2-3")	16+4+0.12G	2	61	99	90	99	0	34	99	98	12
Prop-DF+MCPA-ioe+PO(2-3")	21+4+0.12G	5	67	99	90	99	0	38	99	99	16
Prop-DF+MCPA-ioe+Brox+PO(2-3")	16+4+2+0.12G	4	69	99	96	99	1	38	99	98	15
Prop-DF+MCPA-ioe+Brox+PO(2-3")	21+4+2+0.12G	7	71	99	78	99	0	33	99	97	15
Diclofop+PO(2-3")	12+0.12G	0	68	0	0	0	3	43	13	34	14
HX+R-11(5-7")	0.25+0.25%	5	69	91	13	0	7	56	20	94	17
HX+R-11(5-7")	0.5+0.25%	7	66	91	20	0	10	69	43	98	15
HX+Scoil(5-7")	0.25+0.18G	10	78	95	23	8	8	73	39	99	17
HX+Scoil(5-7")	0.5+0.18G	12	82	97	25	3	8	73	29	74	16
HX+ND-4(5-7")	0.25+1%	12	80	97	31	0	10	68	29	95	17
HX+ND-4(5-7")	0.5+1%	18	82	96	42	0	11	78	52	99	18
Untreated	0	0	0	0	0	0	2	0	0	0	13
C.V. %		39	8	2	36	31	80	16	36	19	12
LSD 5%		4	8	2	26	12	6	12	21	24	3
# OF REPS		4	4	4	3	4	4	4	4	4	3

Summary

Late season rating (7/20) indicated less yellow foxtail control than early rating. Yellow foxtail stand appeared reduced, but surviving plants grew vigorously with the warm moist conditions. This was especially true for the propanil treatments. Weed control did not respond to propanil rate. Bromoxynil did not influence weed control by propanil. Yellow foxtail control by HX was enhanced more by Scoil or ND-4 than R-11 adjuvants.

Tralkoxydim for yellow foxtail control Fargo 1995. 'Lloyd' durum wheat was seeded May 23. Treatments were applied to 4- to 5-leaf durum, 5- to 6-leaf yellow foxtail, 3- to 5-inch wild mustard, and 4- to 8-leaf common lambsquarters on June 19 with 84 F, 55% 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.

		6/26					8/02				8/23
Treatment	Rate	Wht	Yeft	Wimu	Rrpw	Colq	Wht	Yeft	Rrpw	Wimu	Yield
	oz/A					%					bu/A
Tralkoxydim+TF8035	2.9+0.5%	2	56	0	0	0	0	55	0	0	18
Tral+Brox+TF8035	2.9+4+0.5%	4	76	95	60	96	0	66	48	85	22
Tral+Brox&MCPA+TF8035	2.9+8+0.5%	5	79	99	65	99	0	64	75	99	22
Tral+MCPA-ioe+TF8035	2.9+8+0.5%	5	63	98	53	99	0	77	40	99	22
Tral+TF8035+AMS	2.9+0.5%+32	0	54	5	0	0	0	63	0	0	20
Tralkoxydim+Scoil	2.9+1%	0	73	0	0	0	0	80	0	0	18
Tiller	6.6	26	73	96	65	98	61	80	58	95	16
Tiller+Brox&MCPA	6.6+6	25	72	99	65	99	63	53	63	99	14
Tiller+Brox	6.6+3	26	70	99	50	98	73	63	63	99	11
Dakota	7	45	78	96	57	99	81	89	43	99	6
Dakota+Trib	7+0.125	29	78	97	94	99	64	65	98	99	10
Difp+PO	16+0.12G	3	80	0	4	0	0	82	0	0	17
Propanil-dg+MCPA-ioe	18+4	21	61	99	91	99	3	51	78	99	18
Untreated	0	0	0	0	0	0	0	0	0	0	13
C.V. %		42	11	5	22	2	25	18	46	7	15
LSD 5%		8	11	5	14	2	9	16	40	6	3
# OF REPS		4	4	4	4	4	4	4	2	4	4

Summary

Tiller and Dakota severly injured wheat even when applied with MCPA or tribenuron known antagonists to fenoxaprop a component of both herbicides. Late season yellow foxtail control from tralkoxydim was greatest when applied with Scoil. Diclofop + petroleum oil adjuvant was one of the most effective treatments for yellow foxtail control. Foxtail densities were high and treatments that gave moderate control without significant injury to durum wheat increased yield by five or more bushels per acre. Herbicides containing fenoxaprop caused yield reducing injury to durum wheat.

Foxtail control in wheat with fenoxaprop herbicides, Fargo 1995. '2371' hard red spring wheat was seeded May 23. Treatments were applied to 3- to 4-leaf tillering wheat, 3- to 4-leaf yellow foxtail, 3- to 5-leaf wild mustard, and 4- to 6-leaf common lambsquarters on June 14 with 78 F, 58% RH, clear sky, and 12-mph wind. Treatments were applied with a shielded bicycle-wheel-type plot sprayer delivering 8.5 gpa at 3.5 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	6/26				8/02			8/23
		Wht	Yeft	Wimu	Colq	Wht	Yeft	Wimu	Yield
	oz/A	%				%			bu/A
Dakota	5.9	4	86	94	99	1	83	96	19
Dakota+Dica-dma	5.9+1	16	81	98	99	3	71	99	16
Dakota+Brox-gel	8+3	3	69	98	99	0	46	98	14
Dakota+Triasulfuron	8+0.21	4	82	99	99	0	71	99	18
Dakota+Trib	8+0.12	7	88	99	99	1	74	99	20
Dakota+Dica+Trib	7+0.75+0.09	9	84	99	99	1	53	99	16
Tiller+Trib	6.6+0.12	10	87	99	99	0	68	99	15
Tiller+Dica	5.4+1	14	78	99	99	2	66	99	16
Untreated	0	0	0	0	0	0	0	0	12
C.V. %		44	10	2	0	233	24	2	11
LSD 5%		5	11	3	NS	NS	20	3	3
# OF REPS		4	4	4	4	4	4	3	3

Summary

None of the herbicides injured wheat, at the late evaluation, indicating recovery for injury which was evident at the early evaluation date. Dicamba and bromoxynil-gel were antagonistic to yellow foxtail control by Dakota. Yellow foxtail density was high and common lambsquarters and wild mustard less than 1 plant/m^2. Wheat yield generally related to yellow foxtail control with an increase of up to 8 bu/A.

2,4-D formulation in wheat, Fargo 1995. '2371' hard red spring wheat was seeded May 2. Treatments were applied to 3.5- to 4-leaf wheat, 2- to 6-leaf wild mustard, 0.5- to 2.5-inch kochia, and 1- to 5-leaf wild buckwheat on June 2 with 78 F, 45% RH, clear sky, and 2- to 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. Weed densities on June 14 were 10/ft^2 wild mustard, 1/ft^2 wild buckwheat, and variable kochia.

		6/14				8/01		
Treatment	Rate	Wht	Wimu	KOCZ	Wibu	Wht	KOCZ	Wibu
	oz/A	%						
2,4-DSavage	8	0	89	45	54	0	30	20
2,4-Ddma	8	1	93	53	69	0	44	28
2,4-DSavage+Act-90	8+0.25%	2	93	63	46	0	49	20
2,4-Ddma+Act-90	8+0.25%	1	95	69	75	0	45	24
MCPA-PCC 126	8	0	88	22	30	0	20	3
MCPA-PCC 126+Act-90	8+0.25%	0	91	48	43	0	16	0
MCPA-dma	8	0	90	27	35	0	29	8
MCPA-dma+Act-90	8+0.25%	0	92	35	31	0	36	13
MCPA-PCC 126+Dica-Na	8+.5	1	94	68	68	0	62	38
MCPA-PCC 126+Dica-Na+Thif&Trib	8+.5+0.2	1	99	94	85	0	69	37
Dica-Na	2	4	72	88	76	1	81	88
Brox	4	0	60	67	85	0	60	51
Untreated	0	0	0	0	0	0	0	0
C.V. %		122	11	25	16	721	32	36
LSD 5%		1	13	22	12	NS	19	13
# OF REPS		4	4	3	4	4	4	4

Summary

Herbicides did not injure wheat. Wild mustard control was similar with all herbicides except control was or tended to be less with MCPA-PCC 126, dicamba - sodium, and bromoxynil than the other herbicide treatments. Kochia control was variable, but greatest when treatments contained dicamba or bromoxynil.

Green foxtail control in Durum, Fargo 1995. 'Lloyd' durum wheat was seeded May 23. Treatments were applied to 3- to 3.5-leaf durum, 3- to 4-leaf yellow foxtail, 4-leaf redroot pigweed, and 3- to 5-leaf wild mustard on June 14 with 78 F, 58% RH, clear sky, and 12-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. Experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/26				8/02				8/23
		Wht	Yeft	Wimu	Rrpw	Wht	Yeft	Rrpw	Wimu	Yield
	oz/A	%				%				bu/A
Dakota	8.0	76	87	99	30	53	77	23	99	14
Dakota+Tribenuron	8.0+0.12	30	85	99	91	1	73	99	99	22
OptionII	0.45	71	85	5	9	41	86	8	0	12
OptionII	0.90	85	76	20	10	92	97	0	0	8
HOE46360+HOE107892	0.45+0.22	5	73	0	0	1	90	0	0	18
HOE46360+HOE107892	0.90+0.44	10	86	0	0	1	98	0	0	15
HOE46360+HOE107892	0.45+0.11	16	95	0	0	4	94	0	0	17
HOE46360+HOE107892	0.90+0.22	15	93	0	0	1	99	0	0	17
Diclofop	16	0	74	0	0	0	81	0	0	16
Untreated	0	0	0	0	0	0	0	0	0	13
C.V. %		33	25	43	73	44	5	72	0	21
LSD 5%		15	27	14	15	12	6	13	NS	5
# OF REPS		4	4	4	4	4	4	4	4	4

Summary

The HOE46360 + HOE107892 mixtures all gave greater than 90% yellow foxtail control without important injury to durum wheat. Tribenuron greatly reduced injury from Dakota without reducing yellow foxtail control. Durum recovered from early injury caused by Dakota applied with tribenuron, but not from Dakota applied alone. Yellow foxtail control was similar from diclofop and Dakota, but diclofop did not injure durum wheat. Yellow foxtail density was high (> 500/m^2) and redroot pigweed moderate(< 20/m^2). Durum wheat yield related to weed control and injury from the herbicides. Yield increase was 9 bu/A from treatment with Dakota + tribenuron.

Tralkoxydim for green foxtail control in durum wheat, Minot 1995. 'Renville' durum wheat was seeded May 24. Treatments were applied to 5-leaf wheat and 2- to 3-leaf foxtail on June 23 with 63 F, 95% RH, and 6- to 8-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	7/14 Fxtl	7/14 Wht	8/14 Wht	8/30 Wheat yield	Test weight
	oz/A		%		bu/A	lb/A
Tralkoxydim+TF8035	2.9+.5%	78	0	0	33	59
Tralkoxydim+Bromoxynil+TF8035	2.9+4+.5%	80	0	0	31	59
Tralkoxydim+Brox&MCPA+TF8035	2.9+8+.5%	86	0	0	31	59
Tralkoxydim+MCPA-ioe+TF8035	2.9+8+.5%	85	0	0	36	59
Tralkoxydim+TF8035+AMS	2.9+.5%+32	80	0	0	35	59
Tralkoxydim+Scoil	2.9+1%	85	0	0	31	59
Tralkoxydim+Scoil+AMS	2.9+1%+32	91	0	0	36	59
Dakota	7	96	73	74	21	58
Dakota+Tribenuron	7+0.125	94	43	53	24	58
Diclofop+PO	16+0.125G	90	0	0	35	59
Untreated	0	0	0	0	30	59
C.V. %		8	24	5	10	1
LSD 5%		9	4	8	5	1
# OF REPS		4	4	4	4	4

Summary

Dakota and Dakota + tribenuron were both injurious to the durum wheat, however the presence of tribenuron reduced injury without reducing green foxtail control. Foxtail control tended to be greater when tralkoxydim was applied with bromoxynil and/or MCPAioe than when alone. Tralkoxydim also tended or was more effective when applied with Scoil or Scoil + ammonium sulfate than TF835.

Adjuvants with F8426, Fargo 1995. '2371' hard red spring wheat, 'Interstate 7001' sunflower, and tame yellow mustard were seeded in adjacent strips seeded May 30. Treatments were applied across the strips to 5- to 6-leaf wheat, 6- to 8-leaf sunflower, and 9- to 12-inch tame mustard on June 28 with 76 F, 66% RH, cloudy sky, and 16 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	7/11			7/28	
		Wht	Sufl	Tamu	Wht	Sufl
	oz/A			%		
F8426+28N	0.18+2%	1	83	80	0	32
F8426+28N	0.25+2%	1	81	57	0	41
F8426+X-77	0.18+0.25%	2	84	59	0	48
F8426+X-77	0.25+0.25%	1	92	74	0	79
F8426+X-77+28N	0.18+0.25%+2%	1	84	65	1	67
F8426+X-77+28N	0.25+0.25%+2%	3	86	73	1	67
F8426+X-77+AMN	0.18+0.25%+1%	2	88	69	1	62
F8426+X-77+AMN	0.25+0.25%+1%	2	93	73	0	74
F8426+Terg15-S-7+AMN	0.18+0.25%+1%	2	84	73	0	56
F8426+Terg15-S-7+AMN	0.25+0.25%+1%	2	90	78	0	75
F8426+Terg15-S-15+AMN	0.18+0.25%+1%	2	83	71	0	60
F8426+Terg15-S-15+AMN	0.25+0.25%+1%	1	90	68	1	74
F8426+ND-4	0.18+1%	2	87	73	0	66
F8426+ND-4	0.25+1%	4	92	81	0	73
F8426+VO	0.18+0.25G	3	84	79	0	53
F8426+VO	0.25+0.25G	2	89	80	1	75
F8426+PO	0.18+0.25G	2	91	74	1	81
F8426+PO	0.25+0.25G	4	93	79	2	78
F8426+Armablend600	0.18+0.25%	2	89	71	1	84
F8426+Armablend600	0.25+0.25%	2	96	78	1	88
F8426+Sun-itII	0.18+0.18G	3	94	74	1	85
F8426+Sun-itII	0.25+0.18G	4	97	77	3	86
C.V. %		87	6	12	203	17
LSD 5%		NS	8	13	2	16
# OF REPS		4	4	4	4	4

Summary

Considering all rates, dates of evaluation, and species, petroleum oil (PO), Armablend 600, and Sun-it II were the most effective adjuvants to enhance F8426 phytotoxicity. Injury to wheat from F8426 was not important at the evaluation times or observed earlier.

Triallate injury to hard red spring wheat varieties, Williston, 1995. Hard red spring wheat varieties were seeded May 15 with seeding rate adjusted to approximately one million viable seeds per acre. Treatments were soil incorporated twice with a disk within 10 minutes and once with a multiweeder. Treatments were applied with a farm type sprayer with wind cones mounted on a G-Allis Chalmers delivering 10 gpa at 30 psi to 6 by 35 ft plots. The experiment was a randomized split plot design with 3 replicates. Plots were sprayed with bromoxynil at 5 oz a.i./A to 4 to 4.5 leaf wheat on June 10. Harvest for yield was on September 1.

Variety	Treatment	Rate	Plant height	Stand	Test weight	Grain yield	Yield	Grain protien
		lbs/a	cms	%	lbs/bu	bus/A	% of ck	%
Amidon	Triallate	0.00	85.0	100.0	57.3	47.6	100.0	14.4
Amidon	Triallate	1.25	88.3	53.3	57.0	43.12	90.8	13.9
Amidon	Triallate	2.50	80.0	23.3	56.0	38.56	81.2	14.5
Stoa	Triallate	0.00	81.0	100.0	57.1	46.70	100.0	14.7
Stoa	Triallate	1.25	82.3	81.7	56.6	49.57	106.1	14.5
Stoa	Triallate	2.50	80.3	53.3	55.0	47.11	100.9	14.7
Gus	Triallate	0.00	68.7	100.0	56.2	46.80	100.0	15.5
Gus	Triallate	1.25	68.3	78.3	55.2	50.00	106.8	15.2
Gus	Triallate	2.50	74.3	45.0	54.1	46.83	100.0	15.3
Grandin	Triallate	0.00	73.0	100.0	58.5	47.90	100.0	14.7
Grandin	Triallate	1.25	80.3	88.3	58.4	41.30	107.1	14.6
Grandin	Triallate	2.50	71.7	60.0	56.2	47.67	99.5	14.6
Butte 86	Triallate	0.00	77.3	100.0	58.6	43.69	100.0	15.3
Butte 86	Triallate	1.25	76.0	81.7	58.7	46.47	106.4	14.9
Butte 86	Triallate	2.50	78.3	56.7	57.2	43.70	100.0	14.7
Kulm	Triallate	0.00	75.3	100.0	60.2	42.68	100.0	15.8
Kulm	Triallate	1.25	76.7	53.3	59.4	41.99	98.4	15.1
Kulm	Triallate	2.50	82.0	18.3	58.3	36.74	86.1	14.6
Ernest	Triallate	0.00	78.0	100.0	58.1	41.68	100.0	15.1
Ernest	Triallate	1.25	79.0	76.7	57.9	40.85	98.0	14.9
Ernest	Triallate	2.50	82.7	48.3	56.8	41.56	99.7	15.2
Sharp	Triallate	0.00	69.7	100.0	59.9	33.86	100.0	15.6
Sharp	Triallate	1.25	78.3	78.3	59.8	41.42	122.3	15.1
Sharp	Triallate	2.50	72.7	45.0	58.7	39.85	117.7	14.4
2375	Triallate	0.00	74.0	100.0	57.8	35.61	100.0	14.4
2375	Triallate	1.25	73.0	70.0	57.3	37.77	106.1	14.0
2375	Triallate	2.50	74.7	35.0	56.5	42.24	118.6	14.2
2371	Triallate	0.00	69.7	100.0	56.6	38.68	100.0	14.8
2371	Triallate	1.25	67.3	86.7	56.1	42.44	109.7	14.7
2371	Triallate	2.50	69.3	60.0	55.0	44.85	116.0	14.5

continued-Triallate injury to hard red spring wheat varieties

Variety	Treatment	Rate	Plant height	Stand	Test weight	Grain yield	Yield	Grain protien
		lbs/a	cms	%	lbs/bu	bus/A	% of ck	%
Sonja	Triallate	0.00	61.0	100.0	56.3	37.58	100.0	15.1
Sonja	Triallate	1.25	63.3	86.7	56.1	46.78	124.5	14.7
Sonja	Triallate	2.50	61.7	40.0	53.5	47.12	125.4	14.8
CDC Teal	Triallate	0.00	81.3	100.0	57.0	35.82	100.0	15.8
CDC Teal	Triallate	1.25	86.7	86.7	56.3	42.18	117.8	15.6
CDC Teal	Triallate	2.50	83.7	58.3	55.6	40.06	111.7	15.6
2398	Triallate	0.00	72.3	100.0	56.5	47.52	100.0	14.3
2398	Triallate	1.25	72.7	76.7	55.8	54.87	115.5	14.3
2398	Triallate	2.50	70.3	45.0	55.0	54.57	114.8	14.4
McNeal	Triallate	0.00	77.7	100.0	56.8	54.81	100.0	14.0
McNeal	Triallate	1.25	72.3	78.3	55.8	55.20	100.7	14.1
McNeal	Triallate	2.50	73.0	55.0	55.6	54.01	98.5	14.4
Bergen	Triallate	0.00	66.3	100.0	57.5	44.33	100.0	14.1
Bergen	Triallate	1.25	68.3	92.7	57.1	47.62	107.4	14.1
Bergen	Triallate	2.50	67.3	43.3	56.1	50.78	114.5	14.1
Dalen	Triallate	0.00	70.7	100.0	59.9	50.92	100.0	14.7
Dalen	Triallate	1.25	69.3	85.0	59.3	53.87	105.8	14.5
Dalen	Triallate	2.50	69.3	58.3	58.8	53.18	104.4	14.3
Russ	Triallate	0.00	73.0	100.0	58.7	47.67	100.0	14.4
Russ	Triallate	1.25	75.3	93.3	57.9	50.08	105.0	14.1
Russ	Triallate	2.50	79.3	46.7	56.7	50.39	105.7	14.1
Waldron	Triallate	0.00	88.7	100.0	57.5	38.85	100.0	15.4
Waldron	Triallate	1.25	88.7	61.7	56.4	40.96	105.4	14.9
Waldron	Triallate	2.50	91.7	25.0	55.9	34.55	88.9	14.7
C.V.			4.9	11.8	1.1	8.16	--	2.0
LSD 5%			5.9	14.2	1.0	5.95	--	0.5
# of Reps			3	3	3	3	--	3

Summary

Triallate at 1.25 lb/A reduced 'Amidon', 'Kulm', and 'Waldron' stand 40 to 50% but grain yield was not reduced compared to non-treated wheat. Amidon and Kulm grain yield was only reduced when grown in soil treated with 2.5 lb/A triallate. None of the other cultivar yields were reduced by triallate at 2.5 lb/A. Stand reduction of over 70% did not always cause a grain yield loss. These data indicate that wheat stands can be reduced without adversely reducing yield. Triallate injury had no important influence on test weight or protein.

Hard red spring wheat cultivar response to Avenge, Fargo and Casselton 1995. (Zollinger and Spilde). An experiment was conducted to determine HRSW cultivar response to Avenge and Avenge + Assert tankmix. Wheat cultivars were seeded at Fargo on April 31 and Prosper on May 20. At Fargo, Avenge was applied to 4.5- to 5-leaf wheat on June 5 with 80 F, 75% RH, 50% cloudy sky, and 3 to 5 mph wind. At Casselton, Avenge was applied to 4.5- to 5-leaf wheat on June 22 with 80 F, 60% RH, 30% 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 was a randomized complete block design with four replicates/treatment.

HRSW		Fargo			Casselton		
Cultivar	Rate	Inj	Yld	TW	Inj	Yld	TW
	lb/A	%	bu/A	lb/bu	%	bu/A	lb/bu
ND678	0	0	40	53	0	29	51
ND678	1	5	41	57	1	33	51
ND678	1.5	4	40	56	4	36	52
ND678	0.5+0.23	3	46	54	3	30	50
Russ	0	0	41	57	0	42	52
Russ	1	4	49	56	4	38	49
Russ	1.5	6	40	56	6	29	50
Russ	0.5+0.23	8	42	56	6	35	50
SD0010	0	0	42	56	0	40	53
SD0010	1	4	42	47	3	42	53
SD0010	1.5	8	34	56	4	35	52
SD0010	0.5+0.23	11	37	58	7	36	53
Verde	0	0	36	56	0	35	52
Verde	1	11	36	56	12	32	51
Verde	1.5	13	37	54	27	24	50
Verde	0.5+0.23	14	32	56	13	26	51
Sharp	0	0	43	56	0	37	54
Sharp	1	6	42	58	4	37	53
Sharp	1.5	9	36	57	5	38	52
Sharp	0.5+0.23	6	38	56	5	38	53
2371	0	0	37	57	0	30	49
2371	1	8	35	56	5	33	50
2371	1.5	17	29	54	12	30	51
2371	0.5+0.23	9	28	56	7	28	50
2375	0	0	41	56	0	35	53
2375	1	13	45	57	5	36	50
2375	1.5	18	29	56	9	37	52
2375	0.5+0.23	20	42	56	12	38	53
Kulm	0	0	39	57	0	26	52
Kulm	1	5	42	57	4	32	51
Kulm	1.5	10	37	57	4	30	53
Kulm	0.5+0.23	19	36	56	5	31	53

HRSW Variety	Rate	Fargo			Casselton		
		Inj	Yld	TW	Inj	Yld	TW
	lb/A	%	bu/A	lb/bu	%	bu/A	lb/bu
GluPro	0	0	31	56	0	20	48
GluPro	1	8	27	54	3	26	50
GluPro	1.5	8	29	54	7	25	47
GluPro	0.5+0.23	7	33	55	6	28	50
Ernst	0	0	36	53	0	19	47
Ernst	1	4	38	55	3	28	49
Ernst	1.5	4	33	54	4	24	48
Ernst	0.5+0.23	4	39	55	4	25	47
Trenton	0	0	44	55	0	39	52
Trenton	1	3	42	55	5	35	50
Trenton	1.5	12	32	52	16	29	51
Trenton	0.5+0.23	25	31	54	5	37	52
Sonya	0	0	44	54	0	29	46
Sonya	1	4	43	54	4	32	45
Sonya	1.5	12	36	54	8	32	46
Sonya	0.5+0.23	8	36	54	8	30	46
LSD (0.05)		9	6	2	5	4	2

Yld = Yield in bu/A, TW = Test weight in lb/bu

Visual injury was evaluated May 30 at Fargo and July 13 at Casselton. Weather conditions the first 2 weeks of May was cool and wet. Conditions turned hot (temperatures in the 90's) after the middle of May. Even though the Casselton location was planted approximately three weeks after the Fargo location and herbicides applied over 2 weeks later at the Casselton location wheat cultivar response was generally similar with some varieties.

Wheat cultivars which showed little effect from Avenge was: ND678, Russ, GluPro, Ernst, and Sonja (Casselton location).

Wheat cultivars which showed injury and/or yield reduction at at least one location was SD0010, Verde, Sharp, 2371, 2375, Kulm, Trenton, and Sonya. Differences in injury and yield reduction between locations may be due to environmental conditions before and after the herbicides were applied.

Seed weight was not reduced in some varieties where injury or yield reduction was observed.

Oat cultivar response to Harmony Extra, Prosper 1995. (Zollinger, McMullen, and Manthey) An experiment was conducted to evaluate oat cultivar response to Harmony Extra at labeled and twice labeled rate. Oat cultivars was seeded in the spring of 1995. Herbicide treatments were applied to 3- to 3.5-leaf oat on June 12 with 66 F, 40% RH, 10% 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 two reps/treatment.

		July 18				
Cultivar	Trt[a]	Inj	Head	Ht	TW	Yield
		%	DAP	cm	lb/bu	bu/A
Bay	0	0	48.5	97	30.5	101
Bay	1X	8	49.5	98	32.5	107
Bay	2X	14	51.5	101	29.3	91
AC Belmont	0	0	48.0	99	32.4	46
AC Belmont	1X	13	49.5	109	34.4	36
AC Belmont	2X	15	51.5	107	32.3	29
Brawn	0	0	48.5	95	30.2	86
Brawn	1X	2	48.0	99	33.1	99
Brawn	2X	5	49.5	98	31.9	96
Dumont	0	0	47.5	112	29.3	58
Dumont	1X	3	48.5	111	29.7	62
Dumont	2X	6	50.0	118	29.7	65
Hytest	0	0	43.0	111	38.7	85
Hytest	1X	3	43.5	110	37.6	80
Hytest	2X	3	44.0	115	37.2	88
Jerry	0	0	43.0	106	35.4	110
Jerry	1X	9	43.0	109	35.1	102
Jerry	2X	3	43.5	113	35.7	107
Milton	0	0	42.0	87	35.7	110
Milton	1X	13	42.5	94	36.3	115
Milton	2X	9	44.5	99	34.3	107
Newdak	0	0	43.5	101	31.9	98
Newdak	1X	9	44.0	103	31.4	96
Newdak	2X	5	45.5	106	31.8	86
Otana	0	0	46.0	109	28.1	58
Otana	1X	9	48.5	114	25.4	52
Otana	2X	7	50.5	117	24.8	46
Paul	0	0	48.0	113	46.1	88
Paul	1X	11	51.0	120	42.8	67
Paul	2X	15	51.5	119	44.2	72
Porter	0	0	48.0	107	28.8	84
Porter	1X	23	52.0	112	24.8	60
Porter	2X	23	54.0	107	23.4	52
Prairie	0	0	43.0	89	27.8	71
Prairie	1X	6	42.5	89	26.9	68
Prairie	2X	9	44.0	99	28.2	79
Premier	0	0	41.5	91	33.4	86
Premier	1X	18	43.5	93	28.8	71
Premier	2X	19	45.0	95	27.4	64
Riel	0	0	45.0	107	33.9	86
Riel	1X	3	46.0	112	33.5	76
Riel	2X	5	47.0	113	33.8	83

Cultivar	Trt[a]	July 18				
		Inj	Head	Ht	TW	Yield
		%	DAP	cm	lb/bu	bu/A
Robert	0	0	49.0	105	29.7	66
Robert	1X	5	50.0	108	29.0	65
Robert	2X	10	50.5	118	25.9	51
Settler	0	0	41.5	99	34.4	107
Settler	1X	3	41.0	101	33.4	97
Settler	2X	4	41.5	99	31.4	89
Troy	0	0	45.5	104	35.6	118
Troy	1X	8	47.0	121	34.3	94
Troy	2X	9	48.5	118	32.4	79
Valley	0	0	47.5	103	31.5	84
Valley	1X	15	50.0	113	27.3	60
Valley	2X	19	49.5	106	26.5	55
Whitestone	0	0	47.5	104	29.7	88
Whitestone	1X	21	49.5	109	26.6	72
Whitestone	2X	23	51.0	103	22.4	48
MN89127	0	0	39.5	96	35.9	112
MN89127	1X	13	39.5	99	35.8	114
MN89127	2X	9	40.0	96	33.8	78
ND880107	0	0	47.5	117	35.5	116
ND880107	1X	5	49.0	120	35.3	95
ND880107	2X	3	49.0	118	34.4	105
ND880224	0	0	52.0	113	28.6	57
ND880224	1X	13	53.5	114	26.6	56
ND880224	2X	10	55.0	117	24.8	44
ND900117	0	0	42.0	98	37.6	96
ND900117	1X	2	42.5	100	39.0	103
ND900117	2X	6	43.0	110	36.9	106
ND900697	0	0	48.5	122	33.1	101
ND900697	1X	6	49.5	124	33.4	98
ND900697	2X	6	50.5	125	29.2	91
ND910779	0	0	49.0	115	31.3	82
ND910779	1X	5	52.0	122	29.5	100
ND910779	2X	14	52.0	120	29.8	99
LSD (0.05)		NS	NS	NS	NS	NS

[a]0 = untreated, 1X = Harmony Extra + MCPA ester + X-77 at 0.225 oz product/A + 4 oz product/A + 0.125% v/v, and 2X = Harmony Extra + MCPA ester + X-77 at 0.45 oz product/A + 8 oz product/A + 0.125% v/v. Head = Heading days after planting, Ht = height in cm, TW = seed test weight. Refer to 'List of Herbicides Tested' for active ingredients of Harmony Extra.

The study had 2 replications so no statistical differences were detected in data within individual cultivars but there were statistical differences between cultivars. Late maturing cultivars = Bay, Dumont, Paul, Porter, Robert, Troy, Valley, Whitestone, ND 880224, ND900697, and ND 910779. Medium maturing cultivars = Brawn, Milton, Newdak, Otana, Prairie, Riel, Settler, MN89127, ND880107. Early maturing cultivars = Hytest, Jerry, Premier, ND900117. AC Belmont and Paul are naked or hull-less cultivars.

Far-Go granule formulations in wheat, Fargo 1995. W. H. Ahrens and M. G. Ciernia. This experiment was conducted on a silty clay with 4.5% organic matter and pH 7.8. The field was tilled 3 inches deep with a field cultivator on May 22. On May 23, treatments were applied using a Gandy airflow granule applicator with a 10-ft boom when air temperature was 57 F, wind 5-7 mph, RH 45%, the sky mostly sunny, and the soil surface slightly moist. Treatments were then incorporated 2 inches deep with 1 pass of a 10-ft field cultivator. On May 26 half the treatments received a second incorporation in the opposite direction. All plots were then seeded with Pioneer 2371 wheat using a Haybuster no-till drill set at 100 lb/A and 1.5 inch seeding depth. Visual estimates of percentage wild oat control were taken on July 24 and grain was harvested August 24 with a plot combine. Plot size was 11 by 33 ft and the experiment was a randomized complete block design with four replications.

Treatment	Formulation	Rate (lb/A)	Number of incorporations	Eval. 7/24 Wioa (%)	Grain yield (bu/A)
Untreated		0	2	0	9
Triallate-G	10%	1	2	86	19
MON 7901-G	9.8%	1	2	91	15
MON 7902-G	10.4%	1	2	79	13
MON 7986-G	10.3%	1	2	76	14
Triallate-G	10%	1.5	2	95	20
MON 7901-G	9.8%	1.5	2	96	20
MON 7902-G	10.4%	1.5	2	95	14
MON 7986-G	10.3%	1.5	2	86	13
Triallate-G	10%	1	1	89	16
MON 7901-G	9.8%	1	1	88	15
MON 7902-G	10.4%	1	1	84	14
MON 7986-G	10.3%	1	1	88	14
Triallate-G	10%	1.5	1	93	19
MON 7901-G	9.8%	1.5	1	87	19
MON 7902-G	10.4%	1.5	1	91	15
MON 7986-G	10.3%	1.5	1	90	15
C.V. %				7	15
LSD 5%				8	3

Post broadspectrum weed control on soybean, Casselton 1995. 'Ozzie' soybeans were seeded June 2. Treatments were applied to 3- to 5-inch soybeans on June 22 with 87 F, 46% RH, sunny sky, and 17-mph wind. Treatments after (/) were applied to 2nd trifoliolate soybeans, 3- to 6-leaf yellow foxtail, and 4- to 8-leaf common lambsquarters on June 27 with 85 F, 85% RH, cloudy sky, and 5- to 10-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.

Treatment	Rate	7/07	7/20		
		Sobe	Sobe	Fxtl	Colq
	oz/A		%		
AC 299,263+Sun-itII	.25+.18G	5	3	85	78
AC 299,263+Sun-itII+28N	0.25+0.18G+0.25G	9	3	89	82
AC 299,263+Sun-itII+28N	0.51+0.18G+0.25G	8	10	95	87
AC 299,263+Sun-itII+28N	0.64+0.18G+0.25G	21	13	90	84
AC 299,263+ND-4	0.25+1%	2	4	86	78
Imep+Sun-itII	0.75+0.18G	9	8	96	84
Imep+Thif+X-77+28N	0.75+0.05+0.25%+0.25G	11	19	96	93
Imep+Lact+X-77+28N	0.75+1.0+0.25%+0.25G	26	4	87	74
Bent&Acif+Scoil/Seth+Scoil	16+0.18G/3+0.18G	46	11	98	70
Lact+Thif+PO/Seth+Scoil	1.5+0.06+0.25G/3+0.18G	41	8	99	76
Clas+Thif+X-77+28N/Seth+Scoil	0.25+.03+.12%+2.5%/3+.18G	4	0	97	68
Clas+Acif+X-77+28N/Seth+Scoil	0.25+4+.12%+2.5%/3+.18G	13	5	99	59
Clas+Thif+X-77+28N/Seth+Scoil	0.12+.03+.12%+2.5%/3+.18G	1	0	94	66
Clas+Thif+Scoil/Seth+Scoil	0.12+.03+.18G/3+.18G	8	3	99	80
Cloransulam+Thif+ND-4/Seth+Scoil	0.12+.03+1%/3+.18G	1	5	99	68
C.V. %		37	108	6	17
LSD 5%		7	10	8	18
# OF REPS		4	4	4	4

Summary

Four plots of each replicate were in an area which had standing water several times causing injury to soybean and weeds causing variation in the data. Treatments containing lactofen or treatment with bentazon & acifluorfen severly injured soybeans shortly after treatment. AC 299,263 at 0.25 to 0.64 oz/A gave more than 84% green and yellow foxtail and 77% common lambsquarters control. AC 299,263 phytotoxicity to foxtail and common lambsquarters control only tended to be enhanced by cloransulam including 28% N with Sun-it II. Cloransulam + thifensulfuron tended to be more phytotoxic to common lambsquarters when applied with Scoil than X-77 + 28% N or ND-4. Common lambsquarters control was similar for cloransulam at 0.12 or 0.25 oz/A when with thifensulfuron at 0.03 oz/A.

Imazethapyr formulation and adjuvants, Casselton 1995. 'Ozzie' soybeans were seeded June 2. Treatments were applied to 2nd trifoliolate soybeans, 3- to 4-leaf green foxtail, and 4- to 6-leaf wild mustard on June 22 with 87 F, 46% RH, clear sky, and 17-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.

		7/19		
			Grft/	
Treatment	Rate	Sobe	yeft	Wimu
	oz/A		%	
Imazethapyr+X-77	0.3+0.25%	3	40	72
Imazethapyr-DS+X-77	0.3+0.25%	10	54	79
Imazethapyr+Sun-it II	0.3+.18G	19	85	85
Imazethapyr-DS+Sun-it II	0.3+0.18G	10	80	90
Imazethapyr+ND-4	0.3+1%	11	66	75
Imazethapyr-DS+ND-4	0.3+1%	9	76	85
Imazethapyr+Scoil	0.3+0.18%	6	53	71
Imazethapyr-DS+Scoil	0.3+0.18%	3	35	82
Imazethapyr-DS+Thif+28N+X-77	0.3+0.05+0.25G+0.25%	9	70	95
Imazethapyr-DS+Lact+28N+X-77	0.3+1.0+0.25G+0.25%	6	45	97
Imazethapyr-DS+Thif+ND-4	0.3+0.05+1%	6	66	98
Imazethapyr-DS+Lact+ND-4	0.3+1.0+1%	5	43	97
Untreated	0	0	0	0
C.V. %		79	23	10
LSD 5%		8	18	12
# OF REPS		4	4	4

Summary

Part of each replication had standing water several times which may account for the injury with certain treatments. Imazethapyr gave more than 90% wild mustard control when thifensulfuron or lactofen were included in the treatment. Lactofen was antagonistic to green and yellow foxtail control compared to imazethapyr applied with thifensulfuron. Imazethapyr DS was equally as efficacious as the liquid formulation for foxtail control when with X-77, Sun-itII, or ND-4, but less effective when with Scoil. The data indicate some possible important differences among adjuvants which need further consideration because flooding of certain plots may have influenced the results.

Soybean herbicides with ND-4 adjuvant, Casselton 1995. 'Ozzie' soybeans were seeded June 2. Treatments after (/) were applied to 3- to 6-inch soybeans, 3- to 4-leaf foxtail spp., and 4- to 5-leaf barnyard grass on June 22 with 87 F, 46% RH, clear sky, and 17-mph wind. Treatments were applied to 2nd trifoliolate soybeans, 4- to 8-leaf common lambsquarters, and 3- to 7-leaf foxtail spp. on June 27 with 72 F, 84% RH, cloudy sky, and 5- 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 25 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/20		
		Fxtl	Colq	Wimu
	oz/A		%	
Imazethapyr+Sun-itII	0.3+0.18G	51	36	54
Imazethapyr+ND-4	0.3+1%	50	35	71
Imazethapyr+Thif+Sun-itII	0.3+.05+.18G	53	78	93
Imazethapyr+Thif+ND-4	0.3+.05+1%	55	61	84
Bentazon+PO	12+0.25G	0	41	96
Bentazon+ND-4	12+1%	0	50	93
Bent&Acifluorfen+PO/Seth+Scoil	11+0.25G/3+.18G	88	28	72
Bent&Acifluorfen+ND-4/Seth+Scoil	11+1%/3+.18G	88	35	65
AC 299,263+Sun-itII	0.25+0.18G	68	33	94
AC 299,263+ND-4	0.25+1%	71	53	89
Thifensulfuron+X-77/Seth+Scoil	.06+.25%/3+.18G	89	48	36
Thifensulfuron+ND-4/Seth+Scoil	.06+1%/3+.18G	86	68	36
Acifluorfen+PO/Sethoxydim+Scoil	1.0+0.25G/3+.18G	86	23	41
Acifluorfen+ND-4/Sethoxydim+Scoil	1.0+1%/3+.18G	89	29	30
Lactofen+PO/Seth+Scoil	1.5+0.25G/3+.18G	85	35	74
Lactofen+ND-4/Sethoxydim+Scoil	1.5+1%/3+.18G	88	26	86
Clas+X-77+28N/Sethoxydim+Scoil	0.25+0.25%+2%/3+.18G	95	29	81
Clas+ND-4/Sethoxydim+Scoil	0.25+1%/3+.18G	94	19	79
C.V. %		11	43	18
LSD 5%		11	25	18
# OF REPS		4	4	4

Summary

ND-4 was equally as effective as the adjuvants used for comparison. The comparison adjuvants selected were based on high effectiveness found in previous research. Common lambsquarters and wild mustard control data were variable, but ND-4 tended to be more effective than Sun-it II with acifluorfen and less effective than Sun-it II with imazethapyr + thifensulfuron for common lambsquarters. Wild mustard control with ND-4 tended to be more effective than Sun-it II with imazethapyr, more effective than petroleum oil with lactofen and less effective than Scoil with acifluorfen.

AC 299,263 with adjuvants, Casselton 1995. 'Ozzie' soybean was seeded June 2. Treatments were applied to 2nd trifoliolate soybeans, 3- to 4-leaf foxtail spp., 4- to 6-leaf wild mustard, and 4- to 6-leaf common lambsquarters on June 22 with 87 F, 46% RH, clear sky, and 17-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.

Treatment	Rate	7/20			
		Sobe	Fxtl	Wimu	Colq
	oz/A	%			
AC 299,263	0.25	0	23	73	24
AC 299,263+X-77	0.25+0.25%	0	59	91	64
AC 299,263+X-77	0.5+0.25%	0	88	99	85
AC 299,263+PO	0.25+0.25G	3	90	99	88
AC 299,263+VO	0.25+0.25G	3	85	99	81
AC 299,263+Methyl ester Sun-itII	0.25+.18G	3	89	99	88
AC 299,263+Methyl ester Scoil	0.25+0.18G	0	87	99	83
AC 299,263+Silwet L-77	0.25+0.12%	0	59	97	65
AC 299,263+Armablend 600	0.25+0.25%	1	74	99	78
AC 299,263+X-77+28N	0.25+0.25%+2%	3	85	99	79
AC 299,263+ND-4	0.25+1%	4	80	97	78
AC 299,263+ND-4	0.25+2%	1	83	98	80
Untreated	0	0	0	0	0
C.V. %		253	10	4	12
LSD 5%		NS	10	6	11
# OF REPS		4	4	4	4

Summary

Part of each replicate was in an area flooded several times and may have influenced the results. Weed control increased as AC 299,263 rate increased from 0.25 to 0.5 oz/A when applied with X-77. Other adjuvants increased phytotoxicity of AC 299,263 so that 0.25 oz/A gave control equal to 0.5 oz/A with X-77. However, Silwet L-77 was not more effective than X-77, and Armablend 600 was intermediate between X-77 and the other adjuvants.

Bentazon with adjuvants, Prosper 1995. 'Ozzie' soybeans were seeded June 2. Treatments were applied to 2nd trifoliolate soybeans, 1- to 12-inch kochia, 4- to 10-leaf common lambsquarters, and 6- to 12-leaf redroot pigweed on June 20 with 93 F, 40% RH, cloudy sky, and 5- to 18-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.

Treatment	Rate	7/10			
		Sobe	KOCZ	Colq	Rrpw
	oz/A	%			
Bentazon	12	0	4	28	19
Bentazon+X-77	12+0.25%	0	43	55	30
Bentazon+X-77+28N	12+0.25%+2%	4	65	69	30
Bentazon+PO	12+0.25G	1	61	60	53
Bentazon+VO	12+0.25G	0	74	68	59
Bentazon+Methyl ester Scoil	12+0.18G	3	66	61	45
Bentazon+Silwet L-77	12+0.12%	0	63	73	56
Bentazon+Armablend 600	12+0.25%	0	55	48	41
Bentazon+ND-4	12+1%	1	74	76	60
Untreated	0	0	0	0	0
C.V. %		216	20	24	43
LSD 5%		NS	14	19	24
# OF REPS		4	4	4	4

Summary

Bentazon did not injure soybeans regardless of adjuvant. All adjuvants greatly increased kochia and common lambsquarters control. Silwet L-77, oils, and ND-4 surfactants generally were the most effective adjuvants for redroot pigweed control. ND-4 and vegetable oil (VO) tended to give the greatest enhancement of bentazon phytotoxicity when considering all species. Weed density was quite high and somewhat variable. Control was not complete, but would have been adequate with cultivation for the more effective treatments.

Regional experimental adjuvants with imazethapyr in soybeans, Casselton 1995. 'Ozzie' soybeans were seeded June 2. Treatments were applied to 2nd trifoliolate soybeans, 3- to 7-leaf foxtail spp., and 4- to 8-leaf common lambsquarters on June 27 with 72 F, 84% RH, cloudy sky, and 5- 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 25 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/20				7/28		
		Sobe	Fxtl	Wimu	Colq	Fxtl	Colq	Wimu
	oz/A	%						
Imazethapyr+N9401+28%N	0.37+0.25%+2%	3	74	98	65	63	33	95
Imazethapyr+N9402+28%N	0.37+0.25%+2%	1	71	99	73	59	34	96
Imazethapyr+N9403+28%N	0.37+0.25%+2%	4	71	99	49	59	34	98
Imazethapyr+N9404+28%N	0.37+0.25%+2%	3	68	99	49	61	39	99
Imazethapyr+N9405+28%N	0.37+0.25%+2%	**3**	**88**	**98**	**55**	**60**	**39**	**97**
Imazethapyr+N9406+28%N	0.37+0.25%+2%	1	73	99	50	63	34	97
Imazethapyr+N9407+28%N	0.37+0.25%+2%	1	71	99	65	58	30	96
Imazethapyr+N9408+28%N	0.37+0.25%+2%	3	72	99	68	64	40	98
Imazethapyr+N9409+28%N	0.37+0.25%+2%	0	67	99	63	55	33	98
Imazethapyr+N9410+28%N	0.37+0.25%+2%	**0**	**84**	**99**	**75**	**70**	**44**	**98**
Imazethapyr+N9411+28%N	0.37+0.25%+2%	0	74	98	68	61	36	96
Imazethapyr+N9412+28%N	0.37+0.25%+2%	0	71	99	65	67	43	99
Imazethapyr+E9401+28%N	0.37+0.25G+2%	0	74	98	68	64	41	98
Imazethapyr+E9402+28%N	0.37+0.25G+2%	0	73	99	70	65	43	96
Imazethapyr+E9403+28%N	0.37+0.25G+2%	0	73	99	69	64	35	97
Imazethapyr+ND-94	0.37+1%	1	86	99	78	85	49	99
Untreated	0	0	0	0	0	0	0	0
C.V. %		203	7	1	25	10	16	2
LSD 5%		NS	7	1	22	9	8	3
# OF REPS		4	4	4	4	4	4	4

Bold values=3 or 4 replicates in flooded area.

Summary

No conclusions can be drawn on specific adjuvants from this experiment as five to six plots of each replicaton on one end of the experiment were flooded several times during the summer. The flooded area greatly enhanced weed control. At the second rating an effort was made to compensate for the flooding. ND-4 tended to be an effective adjuvant for imazethapyr in this experiment, with only one replicate in the flooded area. Conditions were extremely wet immediately after treatment which probably reduced differences among adjuvants.

Weed control in soybean, Casselton 1995. (Zollinger) An experiment was conducted to evaluate weed control from established, recently registered, and herbicides in development for use in corn. 'McCall' soybean was seeded May 31. PPI treatments were applied on May 30 with 75 F, 40% RH, 5% cloudy sky and 10 to 13 mph wind. PRE herbicides were applied June 1 with 72 F, 65% H, 15% clouds, and 0 to 3 mph wind. POST herbicides were applied June 23 with 70 F, 90% RH, 100% cloudy sky, and 3-7 mph wind on 1-2 trifoliate soybean, 3-6 inch foxtail, 3-6 inch redroot pigweed, 2-4 inch common lambsquarters, 2-14 inch rosette, pre bolt wild mustard, and 2-4 inch kochia. 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 applied treatments. PPI plots were roto-tilled immediately after application with a small tractor mounted roto-tiller set at 1 to 1.5 inches. The experiment was a randomized complete block design with four replicates/treatment.

Treatment[a]	Rate	July 13				
		Fxtl	Rrpw	Colq	Wimu	Kocz
	lb/A	% control				
PPI						
Authority	0.375	53	45	23	28	55
Authority + Lasso MT	0.375+2	48	15	28	66	45
Authority + Lasso MT	0.375+2.5	50	15	38	63	63
Authority + Treflan	0.375+0.56	66	85	53	75	99
Authority + Treflan	0.375+0.75	78	99	93	77	99
Broadstrike + Treflan	1.03	83	95	79	99	99
Broadstrike + Dual	2.4	53	74	20	99	99
PRE						
Broadstrike + Dual	2.4	25	99	25	99	74
PRE/POST						
Dual II + Action + X-77	2+0.072	21	44	28	99	70
Dual II + CGA 277476 + X-77	2+1.13oz	90	99	77	99	85
Dual II + CGA 277476 + X-77	2+0.94oz	91	99	69	99	77
Untreated		0	0	0	0	0
LSD (0.05)		12	18	17	10	14
C.V. %		11	15	16	9	13

[a]X-77 was applied at 0.25% v/v. Refer to 'List of Herbicides Tested' for active ingredients in herbicides tested.

Authority + Treflan or Broadstrike + Treflan provided greatest weed control from PPI herbicides. Broadstrike + Dual applied PRE did resulted in lower weed control compared to the treatment applied PPI. CGA 277476 provided adequate redroot pigweed and wild mustard control but reduced common lambsquarters and kochia control.

Weed control in soybean from POST herbicides, Casselton 1995. (Zollinger) An experiment was conducted to evaluate weed control from registered and experimental herbicides used in soybean. 'Ozzie' soybean was seeded May 31. Treatments were applied on June 24 to 2 trifoliate soybean, 1-4 inch foxtail, rosette 8-12 inch wild mustard, 1-4 inch redroot pigweed, 2-4 inch common lambsquarters with 70 F, 45% RH, 90% cloudy sky and 8 to 12 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 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	July 13	
		Fxtl	Colq
	oz/A	% control	
Pursuit + Preference + 28%N	0.5	73	63
Pursuit + Preferenc + 28%N + PCC-700	0.5 + 10.7oz product/A	64	44
Pursuit + CL9506 + 28%N	0.5 + 0.25%	63	50
Pursuit + CL9502	0.5 + 2.5%	66	64
Pursuit + 17% COC + 28%N	0.5	81	66
Pursuit + Destiny + 28%N	0.5	69	56
Pursuit + Sun-It II + 28%N	0.5	74	58
Pursuit + Select + Sun-It II + 28%N	0.5 + 1.5	86	82
Basagran + Select + Sun-It II	0.75lb + 1.5	80	77
Galaxy + Select + Sun-It II	0.92lb + 1.5	75	84
Galaxy + Select + Sun-ItII + PCC-700	0.92lb + 1.5 + 10.7oz product/A	15	10
Cobra + Select + Sun-It II	2 + 1.5	96	64
Cobra + Select + Sun-It II	2.4 + 1.5	91	58
Pursuit + Cobra + Sun-It II	0.5 + 1	86	70
Pursuit + Cobra + Select + Sun-ItII + 28%N	0.5 + 1 + 1.5	85	60
Pursuit + Cobra + Sun-It II/Select + PO	0.5 + 1/1.5	87	50
Basagran + Cobra + Select + Sun-It II	0.5 + 1 + 1.5	78	58
Basagran + Cobra + Sun-It II/Select + PO	0.5 + 1/1.5	91	73
Basagran + Resource + Select + Sun-It II	0.5 + 0.67 + 1.5	68	51
Pursuit + Resource + Sun-It II	0.5 + 0.67	81	73
Pursuit + Pinnacle + Sun-It II	0.5 + 0.063	71	84
Pursuit + Resource + Select + Sun-It II	0.5 + 0.67 + 1.5	77	75
Pursuit + Resource + AssureII + Sun-It II	0.5 + 0.67 + 0.77	83	68
Pursuit + Resource + PoastPlus + Sun-It II	0.5 + 0.67 + 3	83	80
Pursuit + Resource + FusiladeDX + Sun-ItII	0.5 + 0.67 + 3	76	65
Pursuit + Resource + Cobra + Select + SuII	0.5 + 0.67 + 1 + 1.5	88	78
AC 299,263 + Sun-It II	0.25	70	58
AC 299,263 + Sun-It II	0.375	80	76
AC 299,263 + Sun-It II	0.5	85	81
Untreated		0	0
LSD (0.05)		17	12
C.V. %		16	9

[a]Preference was applied at 0.25% v/v, petroleum oil, 17% COC, Destiny, and Scoil was applied at 1.5 pt/A, and 28% UAN was applied at 1 qt product/A. Refer to 'Table of Herbicides Tested' for active ingredients of herbicides tested.

All treatments completely controlled wild mustard and redroot pigweed. PCC 700 caused crystalation of the spray solution and plugged the nozzles. Foxtail and common lambsquarters control was reduced when PCC-700 was added to any herbicide tankmixture. CL9502 did not completely go into solution. Pursuit + Pinnacle or AC 299263 provided greatest common lambsquarters control.

Weed control in soybean, Colfax 1995. (Zollinger) An experiment was conducted to evaluate weed control from soybean herbicides. 'Ozzie' soybean was seeded May 1. PPI treatments were applied on May 1 with 60 F, 53% RH, 100% cloudy sky and 1-2 mph wind and incorporated immediately after application with a small tractor mounted roto-tiller set at 1 to 1.5 inches. PRE treatments were applied immediately after planting under same conditions as PPI treatments. POST treatments were appied on June 8 with 65 F, 70% H, 70% cloudy sky, and 2-7 mph wind on 2-5 inch foxtail, 2-10 inch marshelder, 2-6 inch kochia, 2-4 inch redroot pigweed, 2-3 inch prostrate pigweed, 2-6 inch common lambsquarters, and 6-12 inch 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 applied treatments. The experiment was a randomized complete block design with four replicates/treatment.

Treatment[a]	Rate	July 10					
		Fxtl	Mael	Kocz	Rrpw	Prpw	Colq
PPI	oz/A	% control					
Authority	0.375lb	92	53	99	99	99	99
Authority + Lasso MT	0.375lb + 2lb	96	72	99	99	99	99
Authority + Treflan	0.375lb + 0.56lb	99	55	99	99	99	99
Broadstrike + Treflan	1.03lb	99	96	99	99	99	99
Broadstrike + Dual	2.4lb	99	98	99	99	99	99
PRE							
Broadsrike + Dual	2.4lb	99	95	99	78	74	81
POST							
Pursuit + Preference + 28%N	0.5	92	72	99	87	28	91
Pursuit + Mor-Act + 28%N	0.5	95	86	99	96	0	96
Pursuit + Sun-It II	0.5	96	74	99	98	46	56
Pursuit + Select + Sun-ItII + 28%N	0.5 + 1.5	95	97	96	92	66	80
Basagran + Select + Sun-It II	0.75lb + 1.5	74	98	33	0	0	80
Galaxy + Select + Sun-It II	0.92lb + 1.5	94	98	99	5	18	75
Cobra + Select + Sun-It II	2 + 1.5	63	99	89	94	75	91
Pursuit + Cobra + Sun-It II	0.5 + 1	74	96	98	97	84	78
Prst + Cobr + Slct + Sull + 28%N	0.5 + 1 + 1.5	80	99	80	89	46	74
Prst + Cobr + Sull/Slct + Mor-Act	0.5 + 1/1.5	99	98	86	91	11	74
Basagran + Cobra + Select + Sull	0.5lb + 1 + 1.5	70	92	82	77	42	82
Bsgrn + Cobr + Sull/Slct + Mor-Act	0.5lb + 1/1.5	99	99	71	77	25	81
Bsgrn + Resource + Select + Sull	0.5lb + 0.66 + 1.5	64	98	74	25	25	99
Pursuit + Pinnacle + Sun-It II	0.5 + 0.062	89	98	70	70	74	94
Pursuit + Resource + Preference	0.5 + 0.66	70	84	84	80	36	82
Pursuit + Resource + Sun-It II	0.5 + 0.66	72	87	82	72	30	92
Prst + Resource + Select + Sull	0.5 + 0.66 + 1.5	81	86	77	81	5	72
Prst + Rsrc + Assure II + Sull	0.5 + 0.66 + 0.77	71	79	83	88	0	67
Pursuit + Rsrc + PoastPlus + Sull	0.5 + 0.66 + 3	80	84	99	64	25	77
Prst + Rsrc + FusiladeDX + Sull	0.5 + 0.66 + 3	81	91	87	50	16	84
Prst + Rsrc + Cobr + Slct + Sull	0.5 + 0.66 + 1 + 1.5	85	96	99	99	74	91
AC 299,263 + Sun-It II	0.25	89	81	89	94	71	76
AC 299,263 + Sun-It II	0.38	99	87	92	98	68	92
AC 299,263 + Sun-It II	0.5	99	95	92	99	77	99
Untreated		0	0	0	0	0	0
LSD (0.05)		16	16	17	19	21	19
C.V. %		11	13	12	16	19	14

[a]Preference was applied at 0.25% v/v, Mor-Act and Sun-It II was applied at 1.5 pt/A, and 28%N was applied at 1 qt/A. Refer to 'Table of Herbicides Tested' for active ingredients in herbicides tested.

The study had a heavy infestation of marshelder (4-12 plant sq ft). All treatments gave 100% control of wild mustard. Weather was very hot from May 15 to 3 weeks after treatment. Authority gave 50% wild buckwheat control and poor wild mustard control in some plots. AC 299,263 caused 0-10% soybean injury. Pursuit + Cobra or Resource provided excellent common ragweed control, where as, Cobra or Basagran alone provided poor control. Basagran plots provided poor wild mustard control, presumable because Basagran controlled emerged wild mustard but other flushes emerged after application.

PPI and PRE herbicides in soybeans, Fargo 1995. W. H. Ahrens. The experiment was established on a conventionally-tilled silty clay with 4.5% organic matter and pH 7.8. PPI (preplant incorporated) treatments were applied May 24 using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 40 psi. Conditions at application were: 63 F, RH 27%, wind 2 to 4 mph, mostly cloudy, surface dry but very moist underneath. Volunteer sunflower seed was surface applied over the whole experiment and then the entire area was worked twice (opposite directions) to incorporate herbicide and sunflower seed. Inoculated Ozzie soybeans were seeded May 30 at 1.5 inches deep at about 200,000 seeds/A. PRE (preemergence) treatments were applied May 31 with methods indicated above and 65 F, 40% RH, wind 3 to 5 mph, sunny skies, and a dry and cloddy soil surface. Visual estimates of percentage crop injury (interveinal chlorosis and stunting) and weed control were taken June 30 and July 26. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications (three reps for some species due to prolonged standing water in rep 1).

		Evaluated June 30					Evaluated July 26			
Treatment[a]	Rate	Soyb inj	Yeft	Vosu	Colq	KOCZ	Soyb inj	Yeft	Vosu	KOCZ
	(lb ai/A)	(%)								
DE-565+SAN582(PPI)	0.03125+1.5	3	83	97	99	93	5	67	97	66
DE-565+SAN582(PPI)	0.0393+1.5	2	76	97	100	77	2	66	98	52
DE-565+Trif(PPI)	0.03125+1	5	98	98	100	100	13	95	98	100
DE-565+Acetochlor(PPI)	0.03125+2	3	91	99	99	80	6	74	99	65
DE-565+Acetochlor(PPI)	0.03125+2.4	11	94	99	100	98	18	89	99	96
Flumetsulam&Trif(PPI)	0.07&0.96	3	95	93	99	99	5	88	94	96
Flms&Trif+Trif(PPI)	0.05&0.69+0.31	1	94	82	98	93	1	77	60	82
Flumetsulam&Meto(PPI)	0.06&2.3	1	64	83	79	100	1	25	70	94
Metribuzin+Trif(PPI)	0.2+1	0	98	0	90	85	0	86	0	74
Imazethapyr+Acet(PPI)	0.0469+2	3	93	87	100	95	2	89	84	95
Suen+SAN582(PPI)	0.375+1.25	1	94	0	100	96	0	87	0	99
DE-565+SAN582(PRE)	0.03125+1.5	0	3	3	18	65	0	0	41	73
DE-565+SAN582(PRE)	0.0393+1.5	0	2	6	0	81	0	3	44	62
DE-565+Acetochlor(PRE)	0.03125+2.4	0	13	15	6	70	2	3	22	58
Flumetsulam&Meto(PRE)	0.06&2.3	0	0	0	0	100	0	0	0	95
Imazethapyr+Acet(PRE)	0.0469+2	0	6	0	17	96	0	13	0	95
Untreated	0	0	0	0	0	0	0	0	0	0
C.V. %		167	20	16	24	21	142	30	33	33
LSD 5%		4	16	11	23	30	8	21	25	42
Reps		4	4	4	4	3	3	4	4	57

[a]DE-565 = cloransulam; Flumetsulam&Trif = Broadstrike +Treflan; Flumetsulam&Meto = Broadstrike +Dual; Suen = sulfentrazone.

Comments. PPI treatments worked well despite the fact that the soil was too wet when herbicides were incorporated, leaving a cloddy surface. PRE treatments performed poorly. All soil-applied broadleaf control herbicides except metribuzin and sulfentrazone controlled volunteer sunflowers, although best control was achieved with DE-565.

Adjuvants with Galaxy in soybeans, Fargo 1995. W. H. Ahrens. The experiment was established on a conventionally tilled silty clay soil with 4.5% organic matter and pH 7.8. Volunteer sunflower seed (F1) was broadcast and incorporated with a field cultivator on May 26. Ozzie soybeans were planted 1.5 inches deep on May 30 with a John Deere 4-row flex planter set on 30-inch rows. The entire experiment was sprayed June 19 with 0.03 lb/A Asana XL for sunflower beetle control, and on June 21 with 1 pt/A Poast plus 1.5 pt/A Scoil to control annual grasses. All treatments were applied June 23 using a 4-nozzle bicycle wheel sprayer equipped with 8001 tips and delivering 8.5 gal/A at 40 psi. At that time air temperature was 78 F, wind was 8 to 10 mph (shield used), RH was 74%, and the growing conditions were becoming hot and dry. Soybeans were first trifoliolate and 3 to 4 inches tall, common lambsquarters was 2 to 4 inches tall, common sunflower was 7- to 8-leaf and 3 to 4 inches tall, and kochia was 4 to 7 inches tall. Visual estimates of soybean injury and weed control were taken July 8. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate[b]	Evaluated July 8			
		Soybean injury	Weed control		
			Colq	Vosu	KOCZ
	(lb/A)	(%)			
Bent&Acif	0.75&0.17	4	29	82	51
Bent&Acif+Nisul	0.75&0.17+2Q	7	42	63	59
Bent&Acif+Scoil+28%UAN	0.75&0.17+1pt+1G	36	59	81	88
Bent&Acif+AD-100	0.75&0.17+1.5pt	18	43	61	62
Bent&Acif+Silkin	0.56&0.13+1pt	4	32	52	46
Bent&Acif+Silkin+AD-100	0.56&0.13+1pt+1.5pt	16	34	64	65
Bent&Acif+2,4-DB	0.75&0.17+0.016	4	28	83	49
Bent&Acif+Activator90	0.75&0.17+0.25%	6	30	57	57
Bent&Acif+Activator90+28%UAN	0.75&0.17+0.25%+1G	15	46	60	69
Bent&Acif+Scoil	0.75&0.17+1.5pt	30	52	90	70
Bent&Acif+Scoil	0.75&0.17+1pt	22	43	84	69
Bent&Acif+Herbimax	0.75&0.17+1Q	19	50	87	66
Bent&Acif+LI-700	0.75&0.17+0.25%	3	27	59	44
C.V. %		38	23	20	22
LSD 5%		7	12	18	18

[a] Bent&Acif is Galaxy herbicide; 28%UAN is urea ammonium nitrate fertilizer.
[b] pt = pint/A; Q = quart/A; G = gal/A.

Comments: Weed control from Bentazon&Acifluorfen generally was greatest with Scoil and Herbimax. Soybean injury was greatest with Scoil, especially with the addition of 28% urea ammonium nitrate.

POST treatments for Roundup Ready soybeans, Fargo 1995. W. H. Ahrens and M. G. Ciernia. Roundup ready soybeans were seeded 1.5 inches deep into untilled wheat residue using a Hiniker 4-row no-till planter set on 30-inch rows. The entire area was treated with glyphosate to control emerged weeds present at planting. P1 treatments were applied July 20 with a 4-nozzle backpack sprayer. Conditions were as follows: air temperature 76 F, wind 5 mph, RH 45%, sky hazy and soil surface wet. Soybeans were 4 trifoliolate and 6 to 10 inches tall, common lambsquarters 4 to 6 inches tall, kochia 4 to 6 inches tall, and yellow foxtail 3 to 4 leaf and 4 to 5 inches tall. P2 treatments were applied July 24 with a 4-nozzle bicycle wheel plot sprayer and under the following conditions: air temperature 75 F, wind 5 to 7 mph (spray shield used), RH 40%, sunny sky, and dry soil surface. All treatments were applied at 8.5 gal/A with 8001 nozzles and 40 psi, using CO2 as the propellant. Visual estimates of percentage soybean injury and weed control were taken August 3. Plot size was 10 by 10 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate	Soybean injury	Colq	KOCZ	Yeft
	(lb ae/A)		(%)		
Glyphosate+Activator90(P1)	0.56+0.5%	4	100	100	100
Glyphosate+Activator90(P1)	0.56+0.125%	0	100	100	100
Glyphosate(P1)	0.75	0	100	100	100
Glyt+Acif+Activator90(P1)	0.25+0.19+0.5%	11	99	98	97
Glyphosate+Activator90(P2)	0.75+0.5%	3	100	100	100
Glyphosate(P2)	0.75	2	100	100	100
Glyphosate(P2)	1.125	6	100	100	100
Glyphosate(P2)	1.5	8	100	100	100
C.V. %		97	1	2	1
LSD 5%		6	NS	NS	1

[a]All treatments included Choice adjuvant (ammonium sulfate containing) at 0.5% v/v.

POST herbicides in conventional till soybeans, Fargo 1995. W. H. Ahrens and M. G. Ciernia. The experiment was conducted on a conventionally tilled silty clay with pH 7.8 and 4.5% organic matter. Preplant incorporated (PPI) treatments were applied May 30 with a 4-nozzle bicycle wheel sprayer equipped with 8002 tips and delivering 17 gal/A at 40 psi. At application, air temperature was 64 F, wind 5 mph, and the soil surface dry. These treatments were immediately incorporated with 2 passes in opposite directions using a 10 ft John Deere field cultivator. Later on May 30, Ozzie soybeans were seeded 1.5 inches deep with a 4-row John Deere flex planter set on 30-inch rows. Postemergence (PO) herbicides were applied June 19 with the bicycle sprayer using 8001 tips and delivering 8.5 gal/A at 40 psi when conditions were: air temperature 93 F; wind 5-10 mph (shield used); RH 37%; sky clear; growing conditions good; soybeans first trifoliolate; foxtail (70% yellow and 30% green) 3 inches tall; redroot pigweed and common lambsquarters 1 to 2 inches tall. Visual estimates of percentage soybean injury were taken June 28. Weed control was determined July 7. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate[b]	June 28 Soybean injury	July 7 Weed control		
			Fxtl	Rrpw	Colq
	(lb/A)		(%)		
Trifluralin(PPI)/CG277+Act90(PO)	0.75/0.071+0.25%	0	87	90	77
Trif(PPI)/CG277+CG248+Act90(PO)	0.75/0.059+0.004+0.25%	3	88	97	86
Trif(PPI)/CG248+Act90	0.75/0.005+0.25%	4	35	95	73
Trifluralin(PPI)	0.75	0	20	8	13
Imazethapyr+Act90+28%UAN(PO)	0.047+0.25%+0.5G	0	94	98	53
Imazethapyr+Scoil(PO)	0.047+0.19G	1	96	97	55
Imazethapyr+Scoil(PO)	0.031+0.19G	0	93	97	60
Imep+CG248+Act90+28%UAN(PO)	0.047+0.004+0.25%+0.5G	3	80	99	50
Imep+CG248+Act90+28%UAN(PO)	0.031+0.004+0.25%+0.5G	4	81	99	58
Untreated	0	0	0	0	0
C.V. %		62	9	4	19
LSD 5%		1	9	4	14

[a]CG277 = CGA-277476 from Ciba; CG248 = CGA-248757, Action by Ciba; Act90 is Activator90 surfactant; Trif = trifluralin; Imep = imazethapyr; 28%UAN = urea ammonium fertilizer solution.
[b]G = gal/A.

Comments. Treatments 3 and 4 showed poor foxtail control; these results suggest that there may have been an application error.

POST bentazon mixtures in soybeans, Fargo 1995. W. H. Ahrens and M. G. Ciernia. This experiment was established on a silty clay soil with 4.5% organic matter and pH 7.8. Ozzie soybeans were seeded 1.5 inches deep on May 29 using a John Deere flex planter set on 30-inch rows. Treatments were applied June 20 with a 4-row bicycle wheel sprayer equipped with 8001 tips and delivering 8.5 gal/A at 40 psi. At application, air temperature was 94 F, wind 10-15 mph (spray shield used), RH 36%, the sky sunny, the soil surface dry, soybeans were first trifoliolate and 4 to 5 inches tall, common lambsquarters and redroot pigweed were 2 to 3 inches tall, and kochia was 4 to 6 inches tall. The entire experiment was sprayed June 23 with 1 pt/A Poast plus 1.5 pt/A Scoil to control grasses. Visual estimates of soybean injury were made June 23, June 28, and July 7. Weed control was determined June 28, July 7, and July 18. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate[b]	Soybean injury		
		6/23	6/28	7/7
	(lb/A)		(%)	
Bent&Acif+POC	0.5&0.25+1Q	10	5	5
Chlorimuron+Thif+Activator90	0.0156+0.0156+0.25%	2	5	7
Bent&Acif+Thif+Act90+28%UAN	0.5&0.25+0.00781+0.25%+2Q	6	3	5
Bent&Acif+Clim+Thif+Act90+28%	0.5&0.25+0.0156+0.0156+0.25%+2Q	5	5	9
Bentazon+Acifluorfen+POC	0.5+0.125+1Q	-	5	5
Bentazon+Flumiclorac+POC	0.5+0.013+1Q	-	4	7
Bentazon+Imazethapyr+POC	0.5+0.03125+1Q	-	1	1
Bentazon+AC299263+POC	0.5+0.03125+1Q	-	0	1
Bentazon+Acifluorfen+Act90+28%UAN	0.5+0.125+0.25%+2Q	-	2	2
Bentazon+Flumiclorac+Act90+28%UAN	0.5+0.013+0.25%+2Q	-	0	1
Bentazon+Imazethapyr+Act90+28%UAN	0.5+0.03125+0.25%+2Q	-	0	0
Bentazon+AC299263+Act90+28%UAN	0.5+0.03125+0.25%+2Q	-	0	0
Untreated	0	0	0	0
C.V. %		30	63	67
LSD 5%		3	2	3

[a]Bent&Acif = Storm by BASF; Thif = thifensulfuron (Pinnacle by DuPont); Act90 = Activator 90 nonionic surfactant; Clim = chlorimuron (Classic by DuPont); 28%UAN = 28% urea ammonium nitrate solution; POC = petroleum oil adjuvant; Flmc = flumiclorac (Resource by Valent).

[b]Q = quarts per acre.

-- See additional data next page --

-- See previous page for experiment description --

Treatment[a]	Rate[b] (lb/A)	Weed control							
		Eval. 6/28		Eval. 7/7			Eval. 7/18		
		Colq	Rrpw	Colq	Rrpw	KOCZ	Colq	Rrpw	KOCZ
		(%)							
Bent&Acif+POC	0.5&0.25+1Q	4	-	40	92	97	38	88	95
Chlorimuron+Thif+A90	0.016+0.016+0.25%	39	84	90	98	96	94	99	91
Bent&Acif+Thif +Act90+28%UAN	0.5&0.25+0.008 +0.25%+2Q	61	-	73	-	71	76	99	72
Bent&Acif+Clim+Thif +Act90+28%UAN	0.5&0.25+0.016+0.016 +0.25%+2Q	75	-	84	99	83	92	99	81
Bent+Acifluorfen+POC	0.5+0.125+1Q	36	-	38	80	59	44	88	66
Bent+Flumiclorac+POC	0.5+0.013+1Q	41	49	34	51	66	32	44	54
Bent+Imazethapyr+POC	0.5+0.031+1Q	45	93	60	81	94	67	92	91
Bent+AC299263+POC	0.5+0.031+1Q	63	81	62	95	83	66	95	77
Bent+Acif+Act90+28%	0.5+0.125+0.25%+2Q	47	-	41	90	63	43	92	60
Bent+Flmc+Act90+28%	0.5+0.013+0.25%+2Q	35	32	43	33	59	23	31	26
Bent+Imep+Act90+28%	0.5+0.031+0.25%+2Q	53	90	56	79	85	63	86	82
Bent+AC299263+Act90	0.5+0.031+0.25%+2Q	49	92	57	97	80	55	97	59
Untreated	0	0	0	0	0	0	0	0	0
CV %		41	21	22	13	13	26	17	28
LSD 5%		27	20	16	14	14	20	19	31

[a]Bent&Acif = Storm (4 lb/gal) by BASF; Act90 or A90 = Activator90 nonionic surfactant; POC = petroleum oil adjuvant; 28% = urea ammonium nitrate fertilizer; Flmc = flumiclorac (Resource by Valent); Clim = chlorimuron (Classic by DuPont); Thif = thifensulfuron (Pinnacle by DuPont).

[b]Q = quarts per acre.

Dry bean cultivar tolerance to herbicides, Erie 1995. (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 was seeded May 25. Soil applied treatments were applied on May 24 with 62 F, 45% RH, 20% cloudy sky and 5-8 mph wind. PPI treatments were incorporated immediately after application with a field cultivator set at 2 to 2.5 inches. POST treatments were applied on May 21 to 2- to 3-trifoliate dry bean with 86 F, 65% RH, 60% cloudy sky and 3-7 mph wind. Treatments were applied to plots 20 ft wide by 50 ft long with a bicycle-wheel-type plot 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 four replicates/treatment.

Treatment[a]	Rate	June 21			
		Othello	Topaz	Upland	Montcalm
	lb/A	% injury			
PPI					
Broadstrike + Treflan	0.91	0	0	0	0
Broadstrike + Treflan	1.83	0	0	10	0
PPI/POST					
Treflan/Basagran + Mor-Act	0.75/0.75	0	0	0	0
Treflan/Pursuit + X-77	0.75/0.5oz	0	0	0	0
Untreated		0	0	0	0
LSD (0.05)		NS	NS	3	NS
C.V. %		-	-	5	-

Treatment[a]	Rate	Othello			Topaz			Upland			Montcalm		
		Mat	Yld	TW	Mat	Yld	TW	Mat	Yld	TW	May	Yld	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	91	1530	34.3	89	1974	37.0	94	1676	18.9	94	1658	53.6
Broadstrike + Treflan	1.83	91	1247	34.2	89	1832	37.9	94	1602	19.6	94	1515	53.3
PPI/POST													
Treflan/Basagran + Mor-Act	0.75/0.75	92	1476	34.5	89	2088	39.2	94	1697	19.0	95	1473	53.6
Treflan/Pursuit + X-77	0.75/0.5oz	92	1472	35.1	90	1830	38.0	94	1773	19.0	95	1598	54.9
Untreated		92	1532	34.5	89	1601	40.8	93	1593	18.4	94	1641	54.8
LSD (0.05)		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	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 July 21. The temperature for two 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 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.

Dry bean cultivar tolerance to herbicides, Hatton 1995. (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 was seeded June 6. Soil applied treatments were applied on June 6 with 70 F, 65% RH, 60% cloudy sky and 3-5 mph wind. PPI treatments were incorporated immediately after application with a field cultivator set at 2 to 2.5 inches. POST treatments were applied on July 7 to 2- to 3-trifoliate dry bean with 88 F, 65% RH, 65% cloudy sky and 3-7 mph wind. Treatments were applied to plots 20 ft wide by 50 ft long with a bicycle-wheel-type plot 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 four replicates/treatment.

Treatment[a]	Rate	June 30			
		Othello	Topaz	Upland	Montcalm
	lb/A	% injury			
PPI					
Broadstrike + Treflan	0.91	0	0	0	0
Broadstrike + Treflan	1.83	0	0	0	0
PPI/POST					
Treflan/Basagran+Mor-Act	0.75/0.75	0	0	4	0
Treflan/Pursuit + X-77	0.75/0.5oz	0	0	0	0
Untreated		0	0	0	0
LSD (0.05)		NS	NS	2	NS
C.V. %		-	-	3	-

Treatment[a]	Rate	Othello			Topaz			Upland			Montcalm		
		Mat	Yld	TW	Mat	Yld	TW	Mat	Yld	TW	May	Yld	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	91	1251	34.4	90	1462	36.9	93	1460	18.7	96	1813	57.4
Broadstrike + Treflan	1.83	91	1408	36.3	90	1508	34.6	93	1578	18.8	96	1623	56.2
PPI/POST													
Treflan/Basagran+Mor-Act	0.75/0.75	91	1367	36.1	90	1541	36.7	93	1671	18.7	95	1821	56.1
Treflan/Pursuit + X-77	0.75/0.5oz	90	1483	36.4	90	1578	34.9	92	1750	19.0	96	1775	57.6
Untreated		91	1587	35.5	90	1613	35.3	92	1743	18.9	96	1796	56.0
LSD (0.05)		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	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 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.

Dry bean cultivar response to herbicides, Minto 1995. (Zollinger) An experiment was conducted to evaluate dry bean varietal tolerance to established and herbicides under investigation. 'Othello', 'Topaz', and 'Nodak' dry bean was seeded May 23. Soil applied treatments were applied on May 23 with 58 F, 50% RH, 60% cloudy sky and 10-14 mph wind. PPI treatments were incorporated immediately after application with a small tractor mounted roto-tiller set at 1 to 1.5 inches. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot 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 four replicates/treatment.

Treatment[a]	Rate	June 23		
		Nodak	Topaz	Othello
	lb/A	---------- % injury ----------		
PPI				
Eptam + Sonalan	3+1.3	0	0	0
Broadstrike + Treflan	0.91	2	3	3
Broadstrike + Treflan	1.83	7	5	6
Authority	0.375	15	11	16
Authority + Treflan	0.375+0.75	7	12	16
Authority + Lasso MT	0.375+2	15	8	12
Authority + Frontier	0.375+1.2	10	5	13
PPI/POST				
Treflan/Basagran+Mor-Act	0.75/0.75	0	0	0
Treflan/Pursuit + X-77	0.75/0.5oz	3	3	3
PRE/POST				
Frontier/Basgran+Mor-Act	1.2/0.75	0	0	0
Frontier/Pursuit+X-77	1.2/0.5oz	2	3	3
Untreated		0	0	0
LSD (0.05)		3	2	4
C.V. %		14	16	14

[a]X-77 was applied at 0.25% v/v, Mor-Act was applied at 1 qt/A. Refer to 'Table of Herbicides Tested' for active ingredients of herbicides tested.

No crop injury was observed with any treatment when evaluated July 28. Very light weed pressure existed at this location and all herbicides gave 100% control foxtail, wild mustard, redroot pigweed, and volunteer wheat. Only crop injury was evaluated. Crop injury was observed as reduction in vegetative growth, slight leaf chlorosis on lower leaves only. Broadstrike + Treflan at 0.91 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. Most herbicides, except Authority had little effect on growth and development of the three dry bean pinto varieties.

Dry bean tolerance to AC 299,263 in combination with different spray additives, Glyndon 1995. (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 June 1. Treatments were applied June 28 to 2-3 trifoliate beans with 70 F, 85% RH, 100% cloudy sky and 3-7 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	Yield	% Injury		% Maturity	Yield
	lb/A	15 DAT	30 DAT		lb/A	15 DAT	30 DAT		lb/A
PURSUIT + X-77	0.032	4	3	79	2371	3	5	87	2942
AC 299,263 + X-77	0.032	11	3	68	2155	5	5	86	3143
AC 299,263 + X-77	0.063	18	5	32	2110	12	6	72	2952
PURSUIT + X-77 + 28%N	0.032	9	3	65	2183	4	4	84	3219
AC 299,263 + X-77 + 28%N	0.032	15	3	65	2087	7	4	78	3142
AC 299,263 + X-77 + 28%N	0.063	27	7	31	1857	13	6	71	3030
PURSUIT + MOR-ACT	0.032	10	4	69	1916	5	4	84	2794
AC 299,263 + MOR-ACT	0.032	19	5	45	1993	9	7	82	2860
AC 299,263 + MOR-ACT	0.063	40	10	18	1867	16	7	72	2820
PURSUIT + MOR-ACT + 28%N	0.032	16	3	43	2146	5	5	80	3082
AC 299,263 + MOR-ACT + 28%N	0.032	24	5	36	1914	11	7	83	2748
AC 299,263 + MOR-ACT + 28%N	0.063	47	13	11	1635	23	10	69	2610
PURSUIT + SUN-IT II	0.032	9	3	61	2039	4	5	85	2935
AC 299,263 + SUN-IT II	0.032	23	6	49	1816	9	6	81	2994
AC 299,263 + SUN-IT II	0.063	41	9	20	1894	16	8	66	2692
PURSUIT + SUN-IT II + 28%N	0.032	19	4	47	1910	7	5	80	2819
AC 299,263 + SUN-IT II + 28%N	0.032	31	7	32	1516	13	7	80	2869
AC 299,263 + SUN-IT II + 28%N	0.063	49	17	17	1676	28	12	68	2086
CHECK, UNTREATED		0	0	100	2066	0	0	100	2478
LSD (0.05)		8	4	17	425	1	2	3	225

[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, and reduced yield of Upland navy bean compared to Topaz pinto bean. AC 299,263 when applied with X-77 caused less injury, delayed maturity 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 and reduced yields more than AC 299,263 applied with Mor-Act or X-77, with the exception of Upland navy bean maturity. The addition of 28% urea ammonium nitrate reduced Upland navy bean yield while reducing delayed maturity. AC 299,263 at 0.032 lb/A caused more injury, caused greater delay in maturity and reduced Upland navy bean yield more than Pursuit at 0.032 lb/A.

Dry bean tolerance to AC 299,263 in combination with different spray additives, Rothsay 1995. (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 June 5. Treatments were applied June 30 to 2-3 trifoliate beans with 80 F, 65% RH, 30% cloudy sky and 5-10 mph wind. Treatments were applied to plots 10 ft wide by 40 ft long with a Tractor mounted plot sprayer delivering 10 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		Yield	% Injury		Yield
	lb/A	15 DAT	30 DAT	lb/A	15 DAT	30 DAT	lb/A
PURSUIT + X-77	0.032	12	4	1763	6	4	2384
AC 299,263 + X-77	0.032	12	4	1764	9	4	2167
AC 299,263 + X-77	0.063	15	7	2060	9	4	2356
PURSUIT + X-77 + 28%N	0.032	15	11	2205	7	6	1881
AC 299,263 + X-77 + 28%N	0.032	17	5	1838	7	4	2112
AC 299,263 + X-77 + 28%N	0.063	25	8	2078	21	7	2282
PURSUIT + MOR-ACT	0.032	6	4	1871	4	5	2332
AC 299,263 + MOR-ACT	0.032	12	5	1767	6	4	2084
AC 299,263 + MOR-ACT	0.063	14	6	1942	14	6	2350
PURSUIT + MOR-ACT + 28%N	0.032	14	4	2360	4	3	2080
AC 299,263 + MOR-ACT + 28%N	0.032	18	5	2117	10	3	2586
AC 299,263 + MOR-ACT + 28%N	0.063	28	15	2101	20	10	1917
PURSUIT + SUN-IT II	0.032	22	7	1941	10	5	2114
AC 299,263 + SUN-IT II	0.032	17	7	2055	9	7	1924
AC 299,263 + SUN-IT II	0.063	23	6	2071	11	6	2229
PURSUIT + SUN-IT II + 28%N	0.032	13	7	1714	10	5	2247
AC 299,263 + SUN-IT II + 28%N	0.032	25	13	1855	10	7	2200
AC 299,263 + SUN-IT II + 28%N	0.063	50	15	1352	35	13	1803
CHECK, UNTREATED		0	0	1241	0	0	1471
LSD (0.05)		15	7	NS	10	6	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.

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 of Upland navy bean compared to Topaz pinto bean. AC 299,263 when applied with X-77 caused less injury 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 than AC 299,263 applied with Mor-Act or X-77. The addition of 28% urea ammonium nitrate increased crop injury. AC 299,263 at 0.032 lb/A caused more injury than Pursuit at 0.032 lb/A. There was no significant reduction in yield.

Pre-harvest eastern black nightshade control in drybeans. W. H. Ahrens and M. G. Ciernia. The experiment was conducted in an eastern black nightshade-infested pinto bean field located near Erie in Cass Co., ND. Plots typically contained 5 to 10 plants but plants were large (mostly 12 to 18 inches tall, with some 8 to 24 inches) and ranged from as few as two per plot to a fairly dense canopy of nightshade. Treatments were applied Sept. 1 using a 3-nozzle backpack sprayer positioned to treat two crop rows without spray contact with the two outer border rows. Treatments 1 through 7 were applied with 8002 nozzle tips delivering 17 gal/A at 40 psi, while 8, 9, and 10 were applied with 8001 tips delivering 8.5 gal/A and 40 psi. Drybeans were 10 to 12 inches tall with 45% green leaves and 85% ripe pods. Temperature at application was 78 F, wind was 5 to 7 mph, relative humidity was 35%, the sky was sunny, and the soil surface dry. Visual estimates of percentage crop desiccation and nightshade control were made on Sept. 4, 8, and 15. Because the untreated crop rows on the plot borders showed substantial desiccation due to normal crop maturity, the crop desiccation data reflect the percentage control compared with the untreated border rows (i.e. the untreated border rows were assumed to have 0% control). Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

Treatment	Rate (lb/A)	Eval. 9/4 Drbe	Eval. 9/4 EBNS	Eval. 9/8 Drbe	Eval. 9/8 Ebns	Eval. 9/15 Drbe	Eval. 9/15 Ebns
		(%)					
1. Diquat+Activator90	0.25+0.125%	41	78	87	76	64	55
2. Diquat+Activator90	0.375+0.125%	72	83	96	90	95	77
3. Diquat+Activator90	0.5+0.125%	90	84	96	85	94	77
4. Paraquat+Activator90	0.3125+0.125%	10	68	53	72	30	54
5. Paraquat+Activator90	0.469+0.125%	44	72	43	81	27	79
6. Diquat+Paraquat+Act90	0.25+0.25+0.125%	78	79	93	86	88	81
7. Diquat+Paraquat+Act90	0.125+0.125+0.125%	27	27	43	25	36	31
8. Diquat+Activator90	0.25+0.125%	39	66	69	65	61	52
9. Paraquat+Activator90	0.3125+0.125%	33	70	45	64	40	59
10. Paraquat+Activator90	0.3125+0.25%	35	67	43	57	23	58
C.V. %		37	19	27	18	31	22
LSD 5%		25	19	26	19	25	20

Comments: Diquat appeared to provide greater drybean desiccation than did paraquat. Diquat and paraquat provided approximately equivalent control of eastern black nightshade. Spray volume of 8.5 gal/A appeared to be as effective as 17 gal/A with diquat or paraquat.

Weed control in potato, Grand Forks 1995. (Zollinger) An experiment was conducted to evaluate weed control in potato. Potato were seeded in spring of 1995. Treatments were applied on June 30 with 78 F, 45% RH, 10% cloudy sky and 5-7 mph wind to 10-18 inch potato, Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot 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	July 18		
		Potato	Fxtl	Vol Wht
	lb/A	% inj	----- % control -----	
Prism + Mor-Act	0.094 + 1 qt	0	93	89
Prism + Mor-Act	0.125 + 1 qt	2	99	96
Poast + Dash	0.188 + 1 qt	0	99	86
Untreated		0	0	0
LSD (0.05)		1	2	5
C.V. %		14	2	4

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

All herbicide provided 86% or greater foxtail and volunteer wheat control without any injury to potato.

Weed control in sunflower, Fargo, ND and Glyndon, MN 1995. (Zollinger) An experiment was conducted to evaluate weed control in sunflower. Sunflower was seeded in the spring of 1995 in Fargo, ND and Glyndon, MN. Treatments were applied at Fargo on June 16 with 70 F, 50% RH, 10% cloudy sky and 10-15 mph wind to 8-10 leaf, 10-14 inch sunflower, 3-4 leaf fxtl, and 3-5 leaf volunteer wheat. Treatments were applied at Glyndon, MN on June 16 with 70 F, 50% RH, 10% cloudy sky and 10-15 mph wind to 8-10 leaf, 10-14 inch sunflower, 4-5 leaf wioa, 3-4 leaf fxtl, and 3-5 leaf volunteer wheat. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment was a randomized complete block design with four replicates/treatment.

Fargo, ND

Treatment[a]	Rate	July 18		
		Sufl	Fxtl	Vol Wht
	lb/A	% inj	----- % control -----	
Prism + Mor-Act	0.094 + 1%	0	95	93
Prism + Mor-Act	0.125 + 1%	0	99	99
Prism + Assert + Mor-Act	0.094 + 0.25 + 1%	0	99	97
Untreated		0	0	0
LSD (0.05)		NS	NS	4
C.V. %		-	-	3

Glyndon, MN

Treatment[a]	Rate	July 18			
		Sufl	Wioa	Fxtl	Vol Wht
	lb/A	% inj	---------- % control ----------		
Prism + Mor-Act	0.094 + 1%	2	93	92	90
Prism + Mor-Act	0.125 + 1%	3	93	92	96
Prism + Assert + Mor-Act	0.094 + 0.25 + 1%	5	93	91	86
Untreated		0	0	0	0
LSD (0.05)		NS	NS	NS	5
C.V. %		-	-	-	4

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

Light weed pressure and heavy grass existed at Fargo and Glyndon, respectively. Sunflower injury symptoms were essentially nonexistent. Injury symptoms was associated primarely with stunting but stunting may have resulted from study location in the field rather than herbicide exposure. All herbicide provided 86% or greater grass control.

Spring-applied kochia control in fallow, Arthur 1995. W. H. Ahrens and M. G. Ciernia. This experiment was conducted in an untilled corn stubble field with a moderate to dense good stand of 1- to 6-inch kochia. Treatments were applied June 12 with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 40 psi. During application, air temperature was 88 F, wind 0-5 mph, RH 27%, the sky clear, and the soil surface dry. Visual estimates of percentage kochia control were taken June 22 and July 10. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate (lb ae/A)	Kochia control 6/22 (%)	Kochia control 7/10 (%)
Glyphosate	0.28	36	52
Glyphosate	0.375	64	68
Glyphosate	0.469	82	78
Glyphosate	0.5625	93	85
Glyphosate	0.656	96	89
Glyphosate	0.75	97	90
Glyphosate+Activator90+AS	0.28+0.5%+2%	43	64
Glyphosate+2,4-D-dma+Act90	0.28+0.25+0.25%	81	83
Glyphosate+2,4-D-dma	0.375+0.5	91	80
Glyphosate+2,4-D-dma	0.469+0.5	92	70
Glyphosate+2,4-D-dma	0.5625+0.5	94	85
Glyphosate+2,4-D-dma	0.656+0.5	100	96
Glyphosate+2,4-D-dma+Act90+AS	0.375+0.5+0.5%+2%	98	93
Glyphosate+2,4-D-bee	0.28+0.5	69	84
Glyphosate+2,4-D-bee	0.375+0.5	87	90
Glyphosate+2,4-D-bee	0.469+0.5	93	83
Glyphosate+2,4-D-bee	0.5625+0.5	98	95
Glyphosate+2,4-D-bee	0.656+0.5	98	95
Glyphosate+2,4-D-bee+Act90+AS	0.28+0.5+0.5%+2%	90	88
Glyphosate+Dicamba	0.28+0.25	80	99
Glyphosate+Dicamba	0.375+0.25	88	98
Glyphosate+Dicamba	0.469+0.25	88	98
Glyphosate+Dica+Act90+AS	0.28+0.25+0.5%+2%	95	99
Paraquat+Activator90	0.25+0.25%	88	72
Paraquat+Activator90	0.375+0.25%	95	85
Paraquat+Activator90	0.5+0.25%	96	86
Paraquat+2,4-D-bee+Activator90	0.25+0.25+25%	91	78
Paraquat+2,4-D-bee+Activator90	0.375+0.25+0.25%	95	84
C.V.		10	10
LSD 5%		14	15

[a] 2,4-D-dma = dimethylamine salt of 2,4-D; 2,4-D-bee = butoxyethyl ester of 2,4-D; AS = ammonium sulfate.

Commercial adjuvants with Nicosulfuron, Fargo 1995. 'Interstate Payco 4X-85' corn and white proso millet were seeded in adjacent strips as bioassay species on June 9. Treatments were applied across the species to 5- to 6-leaf corn, 6- to 7-leaf proso millet, and 4- to 7-leaf yellow foxtail on June 26 with 75 F, 60% RH, partly sunny sky, and 6-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	7/11			8/3	
		Corn	Prmi	Yeft	Prmi	Yeft
	oz/A			%		
Nicosulfuron+X-77+28N	0.25+0.25%+2%	4	86	86	96	88
Nicosulfuron+Scoil	0.25+1%	1	78	91	76	87
Nicosulfuron+Sun-itII	0.25+1%	4	73	79	71	81
Nicosulfuron+191b	0.25+1%	7	73	84	70	87
Nicosulfuron+MSO	0.25+1%	2	82	92	87	93
Nicosulfuron+DynAmic	0.25+0.5%	1	69	76	34	53
Nicosulfuron+Methoil	0.25+1%	2	73	84	64	82
Nicosulfuron+Hasten	0.25+1%	10	75	84	76	85
Nicosulfuron+ND-4	0.25+1%	7	81	89	88	91
Nicosulfuron+Class Destiny	0.25+1%	3	81	88	90	94
C.V. %		128	4	4	11	5
LSD 5%		NS	5	5	11	6
# OF REPS		4	4	4	4	4

Summary

Condition were very wet at and following treatment with water above the soil surface at times. Injury to corn was not important and not evident at the second evaluation. Differences among adjuvants in enhancement of nicosulfuron phytotoxicity were not great, except DynAmic and Sun-it II were less effective than that of the other adjuvants. Phytotoxicity to both proso millet and yellow foxtail tended to be greatest when nicosulfruon was applied with X-77 + 28%N, MSO, ND-4, or Class Destiny. Results may have been confounded by excessive moisture in certain plots. The yellow foxtail was a natural infestation in the four-row corn strip.

Post weed control in corn, Casselton 1995. 'Interstate Payco 4X-85' corn was seeded June 2. Treatments (1-2") were applied to 2- to 4.5-leaf corn, 2- to 5-leaf foxtail spp., and cotyledon- to 4-leaf wild mustard on June 19 with 88 F, 48% RH, clear sky, and 5- to 15-mph wind. Treatments (3-4") were applied to 6- to 7-leaf corn, 3- to 7-leaf foxtail spp., and 5- to 8-leaf wild mustard on June 28 with 72 F, 84% RH, cloudy sky, and 5- 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 25 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/18 Corn	7/18 Fxtl	7/18 Wimu
	oz/A		%	
Thif&Rims+X-77+28N(1-2" fxtl)	0.25+0.25%+1G	4	70	99
Thif&Rims+Dica+X-77+28N(1-2" fxtl)	0.25+4+0.25%+1G	1	65	99
Thif&Rims+X-77+28N(1-2" fxtl)	0.25+0.5%+1G	9	78	99
Thif&Rims+Dica+X-77+28N(1-2" fxtl)	0.25+4+0.5%+1G	6	78	99
Thif&Rims+PO+28N(1-2" fxtl)	0.25+1%+1G	11	82	99
Thif&Rims+Dica+PO+28N(1-2" fxtl)	0.25+4+1%+1G	10	78	99
Thif&Rims+Scoil+28N(1-2" fxtl)	0.25+1%+1G	11	87	99
Thif&Rims+Dica+Scoil+28N (1-2" fxtl)	0.25+4+1%+1G	8	81	99
Thif&Rims+ND-4(1-2" fxtl)	0.25+1%	11	75	99
Thif&Rims+Dica+ND-4(1-2" fxtl)	0.25+4+1%	5	68	99
Thif&Rims+Atra-DF+Scoil(1-2" fxtl)	0.25+6+1%	15	70	99
Nico+Scoil(3-4" fxtl)	0.25+1%	3	89	99
Nico+ND-4(3-4" fxtl)	0.25+1%	1	88	99
Nico+Atra-DF+Scoil(3-4" fxtl)	0.25+6+1%	0	91	99
Nico+Dica+Scoil(3-4" fxtl)	0.25+2+1%	9	87	99
Nico+Dica+ND-4(3-4" fxtl)	0.25+2+1%	4	90	99
Nico+NAF 73+X-77(3-4" fxtl)	0.25+3+0.25%	4	86	99
Nico+NAF 73+ND-4(3-4" fxtl)	0.25+3+2%	13	82	99
Untreated	0	0	0	0
C.V. %		108	14	0
LSD 5%		NS	15	0
# OF REPS		4	4	4

Summary

Dicamba(dma) in tank mixture with thifensulfruon & rimsulfuron generally tended to reduce foxtail control regardless of adjuvant. However, reduction in foxtail control by dicamba was small. Methylated vegetable oil (Scoil) was the most effective adjuvant with thifensulfuron & rimsulfuron. Nicosulfuron gave similar green and yellow foxtail control regardless of adjuvant or other tank-mixture herbicides. Growing conditions were wet which reduced response to adjuvants and caused post-treatment foxtail emergence.

Nicosulfuron with commercial products on corn, Williston. 'Cenex hybrid 166' corn was seeded May 31. Treatments were applied to 5.5-leaf corn, 1- to 3-inch Russian thistle, 4- to 8-leaf green foxtail, 1- to 3-inch redroot pigweed, 1- to 3-inch kochia, and 1- to 2-inch common lambsquarter on June 21 with 76 F, 60% RH, and 4.5 mph wind. Treatments were applied with a field type plot sprayer mounted on a G-Allis Chalmers tractor delivering 8.5 gpa at 32 psi through 8001 flat fan nozzles. The experiment was a randomized complete block design with four replicates. Weed densities Russian thistle 1- to 2 plants/yd^2; green foxtail 10- to 15-plants/ft^2; redroot pigweed 1 plant/ft^2; kochia 0.5 plant/ft^2; and common lambsquarters 1- to 2-plants/yd^2.

Treatment	Rate	7/29					
		Corn	Grft	Rrpw	Kocz	Ruth	Colq
	oz/a			%			
Nicosulfuron+X-77	0.5+0.25%	13	68	95	66	56	48
Nicosulfuron+X-77	0.25+0.25%	11	59	90	54	29	43
Nicosulfuron+X-77	0.125+0.25%	5	54	93	48	28	39
Nicosulfuron+X-77+28N	0.5+0.25%+2%	5	85	96	65	38	49
Nicosulfuron+X-77+28N	0.25+0.25%+2%	4	71	93	59	38	40
Nicosulfuron+X-77+28N	0.125+0.25%+2%	6	49	85	50	4	23
Nicosulfuron+PO	0.5+1%	8	89	96	93	83	88
Nicosulfuron+PO	0.25+1%	14	70	95	78	43	44
Nicosulfuron+PO	0.125+1%	13	54	93	85	28	45
Nicosulfuron+MS	0.5+1%	4	89	97	95	69	89
Nicosulfuron+MS	0.25+1%	3	71	93	88	19	25
Nicosulfuron+MS	0.125+1%	6	74	95	78	34	35
Nicosulfuron+ND-4	0.5+1%	3	92	98	94	89	89
Nicosulfuron+ND-4	0.25+1%	4	81	98	90	69	64
Nicosulfuron+ND-4	0.125+1%	0	64	96	78	46	20
Untreated	0	0	0	0	0	0	0
C.V. %		104	19	4	23	54	62
LSD 5%		9	18	6	22	32	41
# OF REPS		4	4	3	4	4	4

Summary

The inclusion of 28N in addition to X-77 enhanced nicosulfuron control of green foxtail, but not the other weed species. Mor-act® (PO), Scoil® (MS), and ND-4 were similarly more effective than X-77 as adjuvants for nicosulfuron. However, ND-4 tended to be more effective than PO or MS with nicosulfuron at 0.25 oz/A for green foxtail and common lambsquarters.

Nicosulfuron with adjuvants, Exp 1, Fargo, 1995. 'Interstate Payco 4x-85' corn and white proso millet were seeded in adjacent strips as bioassay species on June 9. Treatments were applied across the species to 5- to 6-leaf corn, 6- to 7-leaf proso millet, 4- to 7-leaf yellow foxtail, 4- to 10-leaf redroot pigweed, and 6- to 12-leaf common lambsquarters on June 26 with 75 F, 60% RH, partly sunny sky, and 6-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.

		7/09					8/03			
Treatment	Rate	Corn	Yeft	Prmi	Rrpw	Colq	Corn	Prmi	Colq	Fxtl
	oz/A					%				
Nicosulfuron+X-77	0.5+0.25%	0	84	87	88	33	1	91	51	79
Nicosulfuron+X-77	0.25+0.25%	1	76	75	85	16	0	69	21	56
Nicosulfuron+X-77	0.125+0.25%	3	70	75	83	25	1	71	15	55
Nico+X-77+28N	0.5+0.25%+2%	3	88	89	94	50	0	92	59	81
Nico+X-77+28N	0.25+0.25%+2%	6	87	88	87	30	0	92	46	75
Nico+X-77+28N	0.125+0.25%+2%	3	80	82	84	5	0	83	26	65
Nicosulfuron+PO	0.5+1%	1	81	84	91	36	0	89	21	73
Nicosulfuron+PO	0.25+1%	3	76	76	89	33	0	66	28	56
Nicosulfuron+PO	0.125+1%	0	63	68	83	11	0	63	25	53
Nicosulfuron+MS	0.5+1%	4	96	94	97	69	1	95	63	84
Nicosulfuron+MS	0.25+1%	3	93	91	97	71	0	90	53	78
Nicosulfuron+MS	0.125+1%	0	76	77	92	38	0	63	23	53
Nicosulfuron+ND-4	0.5+1%	5	98	96	98	71	1	95	58	83
Nicosulfuron+ND-4	0.25+1%	4	89	91	95	63	0	86	50	79
Nicosulfuron+ND-4	0.125+1%	1	82	82	89	43	0	73	29	64
Nicosulfuron+VO	0.5+1%	1	92	91	97	60	0	94	56	81
Nicosulfuron+VO	0.25+1%	3	85	84	94	50	0	88	43	74
Nicosulfuron+VO	0.125+1%	3	63	62	85	16	0	61	28	54
Untreated	0	0	0	0	0	0	0	0	0	0
C.V. %		126	8	9	5	41	440	9	33	9
LSD 5%		NS	9	10	6	22	NS	10	17	9
# OF REPS		4	4	4	4	4	4	4	4	4

Summary

Considering all rates, ND-4 and X-77 plus 28%N were the most effective adjuvants for enhancement of nicosulfuron phytotoxicity to all species. Considering only the 0.5 oz/A recommended nicosulfuron rate, the most effective adjuvant treatments were Scoil® (MS), ND-4, and vegetable oil (VO).

Nicosulfuron with adjuvants, Exp 2, Fargo 1995. 'Interstate Payco 4x-84' corn and white proso millet were seeded in adjacent strips as bioassay species on June 9. Treatments were applied across the species to 5- to 7-leaf corn, 3- to 5-leaf proso millet, 4- to 5-leaf yellow foxtail, and 4- to 8-leaf common lambsquarters on June 20 with 93 F, 40% RH, sunny sky, and 13- to 18-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.

Treatment	Rate	7/12				8/03	
		Corn	Prmi	Yeft	Colq	Prmi	Yeft
	oz/A				%		
Nicosulfuron+X-77	0.5+0.25%	1	95	94	51	96	96
Nicosulfuron+X-77	0.25+0.25%	1	88	86	59	86	83
Nicosulfuron+X-77	0.125+0.25%	0	70	74	42	55	58
Nicosulfuron+X-77+28N	0.5+0.25%+2%	3	97	96	62	96	91
Nicosulfuron+X-77+28N	0.25+0.25%+2%	1	89	88	45	91	88
Nicosulfuron+X-77+28N	0.125+0.25%+2%	1	82	78	32	78	74
Nicosulfuron+PO	0.5+1%	2	95	96	68	93	92
Nicosulfuron+PO	0.25+1%	1	87	88	58	82	81
Nicosulfuron+PO	0.125+1%	1	77	78	46	70	76
Nicosulfuron+MS	0.5+1%	2	98	98	73	97	95
Nicosulfuron+MS	0.25+1%	2	95	94	59	96	94
Nicosulfuron+MS	0.125+1%	1	88	86	48	83	79
Nicosulfuron+ND-4	0.5+1%	5	97	98	73	99	97
Nicosulfuron+ND-4	0.25+1%	2	90	90	58	86	81
Nicosulfuron+ND-4	0.125+1%	3	83	82	35	81	79
Untreated	0	0	0	0	0	0	0
C.V. %		112	5	5	19	9	8
LSD 5%		2	6	6	14	10	9
# OF REPS		4	4	4	4	4	4

Summary

Nicosulfuron at 0.5 oz/A effectively controlled grass weeds regardless of adjuvant. Nicosulfuron at 0.125 oz/A was enhanced the most by MS (Scoil®) and ND-4. The inclusion of 28%N with X-77 greatly enhanced grass weed control with nicosulfuron at 0.12 oz/A.

Nicosulfuron with adjuvants, Exp 3, Casselton 1995. 'Interstate Payco 4x-85' corn was seeded June 2. Treatments were applied to 6- to 7-leaf corn, 3- to 7-leaf foxtail spp., and 4-to 8-leaf common lambsquarters on June 28 with 72 F, 84% RH, cloudy sky, and 5- 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 25 ft plots. The experiment was a randomized complete block design with four replciates.

Treatment	Rate	7/19			
		Corn	Fxtl	Colq	Coco
	oz/A	%			
Nicosulfuron+X-77	0.5+0.25%	5	85	33	43
Nicosulfuron+X-77	0.25+0.25%	0	59	10	31
Nicosulfuron+X-77	0.125+0.25%	0	33	5	0
Nicosulfuron+X-77+28N	0.5+0.25%+2%	8	88	47	48
Nicosulfuron+X-77+28N	0.25+0.25%+2%	1	84	38	38
Nicosulfuron+X-77+28N	0.125+0.25%+2%	0	69	14	19
Nicosulfuron+PO	0.5+1%	0	85	39	40
Nicosulfuron+PO	0.25+1%	0	66	10	34
Nicosulfuron+PO	0.125+1%	0	35	0	6
Nicosulfuron+MS	0.5+1%	0	97	80	73
Nicosulfuron+MS	0.25+1%	0	84	36	39
Nicosulfuron+MS	0.125+1%	0	71	23	15
Nicosulfuron+ND-4	0.5+1%	3	89	60	45
Nicosulfuron+ND-4	0.25+1%	0	88	44	46
Nicosulfuron+ND-4	0.125+1%	0	56	16	21
Untreated	0	0	0	0	0
C.V. %		433	13	49	47
LSD 5%		NS	13	20	21
# OF REPS		4	4	4	4

Summary

Scoil® (MS) was the most effective adjuvant for nicosulfuron at all rates. Petroleum oil (PO) and X-77 were the least effective adjuvants for green and yellow foxtail control with nicosulfuron.

Nicosulfuron with salt water carriers, Fargo 1995. 'Interstate Payco 4X-85' corn and white proso millet were seeded in adjacent strips as bioassay species on June 9. Treatments were applied across the species to 5- to 6-leaf corn, 6- to 7-leaf proso millet, 4- to 7-leaf yellow foxtail, and 6- to 12-leaf common lambsquarters on June 26 with 75 F, 60% RH, partly sunny sky, and 6 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[a]	Rate	7/11				8/3	
		Corn	Prmi	Fxtl	Colq	Prmi	Yeft
	oz/A	%					
Nicosulfuron(Fgo)+X-77+28N	0.25+0.25%+2%	6	85	91	59	97	93
Nico($NaHCO_3$)+X-77+28N	0.25+0.25%+2%	4	86	88	55	95	86
Nico($CaCl_2$)+X-77+28N	0.25+0.25%+2%	2	80	90	46	93	91
Nicosulfuron(Fgo)+Scoil	0.25+1%	3	74	92	53	78	86
Nicosulfuron($NaHCO_3$)+Scoil	0.25+1%	1	71	87	49	63	76
Nicosulfuron($CaCl_2$)+Scoil	0.25+1%	6	75	83	61	76	81
Nicosulfuron(Fgo)+Mor-Act	0.25+1%	4	72	80	33	61	62
Nicosulfuron($NaHCO_3$)+Mor-Act	0.25+1%	6	70	80	24	69	75
Nicosulfuron($CaCl_2$)+Mor-Act	0.25+1%	5	76	79	35	78	78
Nicosulfuron(Fgo)+ND-4	0.25+1%	7	82	88	59	90	89
Nicosulfuron($NaHCO_3$)+ND-4	0.25+1%	3	81	90	59	90	91
Nicosulfuron($CaCl_2$)+ND-4	0.25+1%	1	82	90	61	88	87
C.V.%		113	4	4	20	6	8
LSD 5%		NS	4	5	15	7	9
# OF REPS		4	4	4	4	4	4

[a]() contain type of spray carrier;Fgo-Fargo city water, $NaHCO_3$=Fargo city water+ sodium bicarbonate at 1.8 g/L, and $CaCl_2$=Fargo city water + calcium chloride at 1.5 g/L.

Summary

Conditions were very wet and may have confounded results as some plots had more standing water than others. Sodium bicarbonate or calcium chloride in the spray carrier did not greatly influence nicosulfuron phytotoxicity regardless of adjuvant. The most effective adjuvants were X-77 + 28%N and ND-4 followed by Scoil® and then Mor-Act®. The highly moist condition may have been favorable to the X-77 + 28%N adjuvants as in other years Scoil was more effective than X-77 + 28%N.

Nicosulfuron with 28%N-Fargo water carrier, Fargo 1995. 'Interstate Payco 4X-85' corn and white proso millet were seeded in adjacent strips as bioassay species on June 9. Treatments were applied across the species to 7- to 8-leaf corn, 4- to 6-leaf proso millet, 2- to 5-leaf yellow foxtail, and 4- to 8-leaf common lambsquarters on June 28 with 76 F, 66% RH, cloudy sky, and 16-mph wind. Treatments are 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.

Treatment	Rate	7/13				8/3	
		Corn	Prmi	Yeft	Colq	Prmi	Yeft
	oz/A	%					
Nicosulfuron+X-77	0.25+0.25%	1	66	76	43	81	79
Nicosulfuron+X-77+28N	0.25+0.25%+2%	1	71	79	33	85	83
Nicosulfuron+Preference	0.25+0.25%	1	64	77	34	83	82
Nicosulfuron+Preference+28N	0.25+0.25%+2%	0	75	85	43	92	91
Nicosulfuron+Activator90	0.25+0.25%	1	67	78	38	81	80
Nicosulfuron+Activator 90+28N	0.25+0.25%+2%	2	75	85	25	91	89
Nicosulfuron+Scoil	0.25+1%	1	76	90	44	95	92
Nicosulfuron+Hasten+28N	0.25+0.25G+4%	4	85	97	57	98	98
Nicosulfuron+Dispatch 2N	0.25+.6G	1	78	90	54	95	95
Nicosulfuron+W4951+28N	0.25+0.25G+4%	1	85	93	62	97	96
Nicosulfuron+W4952+28N	0.25+0.25G+4%	2	89	98	61	98	98
Nicosulfuron+W4955	0.25+0.5G	2	88	96	53	97	97
Nicosulfuron+Cayuse Plus	0.25+0.25G	1	77	88	53	91	92
Nicosulfuron+ND-50	0.25+1%	0	71	80	38	84	84
Nicosulfuron+ND-4	0.25+1%	2	74	89	57	90	88
C.V. %		136	6	7	30	4	4
LSD 5%		NS	7	9	19	5	5
# OF REPS		4	4	4	4	4	4

Summary

Positive growing conditions with ample moisture may have reduced differences in enhancement of nicosulfuron by adjuvants. 28% liquid nitrogen fertilizer generally enhanced the effectiveness of all surfactants with nicosulfuron. Volume of adjuvants probably accounted for differences in enhancement among some adjuvants. Previous research had indicated that increases in methylated vegetable oil from 0.25 to 0.5 G/A (1 to 2 qt/A) enhanced nicosulfuron phytotoxicity. The 1% adjuvants used with ND-4 is equal only at 0.4 qt/A compared to Hasten, W4951, and W4952 at 1 qt/A, probably accounting for Hasten's (ethylated vegetable oil) greater effectiveness compared to Scoil (methylated vegetabe oil). Hasten was also applied with 28%N, but 28%N has not always enhanced esterified oils in other experiments.

Nicosulfuron with 28%N-$NaHCO_3$ water carrier, Fargo 1995. 'Interstate Payco 4X-85' corn and white proso millet were seeded in adjacent strips as bioassay species on June 9. Treatments were applied across the species to 7- to 8-leaf corn, 2- to 5-leaf yellow foxtail, 4- to 6-leaf proso millet, and 4- to 8-leaf redroot pigweed and common lambsquarters on June 28 with 76 F, 66% RH, cloudy sky, and 16-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.

		6/9					8/3			
Treatment	Rate	Corn	Yeft	Prmi	Rrpw	Colq	Corn	Prmi	Colq	Yeft
	oz/A					%				
Nico+X-77	0.25+0.25%	3	68	64	78	3	0	83	15	65
Nico+X-77+28N	0.25+0.25%+2%	4	79	74	89	10	0	90	24	76
Nico+Preference	0.25+0.25%	0	68	62	82	7	0	80	14	70
Nico+Preference+28N	0.25+0.25%+2%	1	68	71	81	0	0	89	28	75
Nico+Activator90	0.25+0.25%	4	69	71	86	0	0	82	23	71
Nico+Activator 90+28N	0.25+0.25%+2%	3	70	64	81	13	0	86	26	71
Nico+Scoil	0.25+1%	5	86	85	86	30	0	92	35	80
Nico+Hasten+28N	0.25+0.25G+4%	6	87	81	88	47	0	98	45	87
Nico+Dispatch 2N	0.25+.6G	9	80	81	83	8	0	94	29	81
Nico+W4951+28N	0.25+0.25G+4%	3	82	66	90	28	0	98	46	85
Nico+W4952+28N	0.25+0.25G+4%	7	87	83	89	32	0	98	44	81
Nico+W4955	0.25+0.5G	9	84	77	80	23	0	97	39	83
Nico+Cayuse Plus	0.25+0.25G	1	71	68	83	20	0	90	33	78
Nico+ND-50	0.25+1%	4	64	59	83	3	0	83	27	72
Nico+ND-4	0.25+1%	2	80	80	90	13	0	91	30	81
C.V. %		102	9	11	7	107	0	6	24	7
LSD 5%		NS	9	11	8	NS	NS	7	10	8
# OF REPS		4	4	4	4	3	4	4	4	4

Summary

Nicosulfruon phytotoxicity was enhanced more by 28% liquid nitrogen fertilizer when with X-77 than Preference and 28%N did not enhance Activator 90. These results differ from similar experiments using Fargo water. ND-50 and Cayuse Plus were the least effective of the non-surfactant type adjuvants. Scoil and Hasten were similarly effective in this experiment with sodium bicarbonate eventhough Scoil was at 0.5 qt/A (1%) and hasten at 1 qt/A (0.25 G/A).

Weed control in corn from PPI herbicides, Fargo 1995. (Zollinger) An experiment was conducted to evaluate weed control from herbicides used in corn. 'Interstate Payco 4X-85' corn was seeded May 31. Treatments were applied on May 30 with 75 F, 40% RH, 5% cloudy sky 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. All plots were roto-tilled immediately after herbicide application with a small tractor mounted roto-tiller set at 1 to 1.5 inches. The experiment was a randomized complete block design with four replicates/treatment.

Treatment[a]	Rate	July 13					
		Fxtl	Rrpw	Colq	Wimu	KOCZ	Cocb
	lb/A	% control					
Eradicane	5.33	97	82	84	44	63	0
Eradicane + Bladex	5.33+1.5	98	92	97	76	93	30
DoublePlay	4	94	83	94	48	92	16
DoublePlay + Bladex	4+1.5	95	96	98	92	97	39
Surpass	2	82	86	90	41	87	23
Surpass + Bladex	2+1.5	84	99	99	89	99	51
Dual II	2.5	43	66	71	45	46	0
Dual II + Bladex	2.5+1.5	60	56	67	65	66	21
Surpass + Broadstrike Plus	1.8+0.26	80	99	99	99	99	93
Untreated		0	0	0	0	0	0
LSD (0.05)		13	11	12	13	20	6
C.V. %		9	9	9	10	17	5

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

Cool, wet conditions occured until May 15 then hot temperatures followed. Eradicane + Bladex or DoublePlay + Bladex controlled most weeds except common cocklebur. Surpass + Broadstrike controlled all broadleaf weeds in the study.

Weed control in corn from PRE herbicides, Fargo 1995. (Zollinger) An experiment was conducted to evaluate weed control from herbicides used or soon to be registered in corn. 'Interstate Payco 4X-85' corn was seeded May 31. Treatments were applied on June 1 with 72 F, 65% RH, 15% cloudy sky 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 was a randomized complete block design with four replicates/treatment.

Treatment[a]	Rate	July 13					
		Fxtl	Rrpw	Colq	Wimu	KOCZ	Cocb
	lb/A	% control					
Dual II	2.4	25	5	5	8	5	0
Lasso MT	3	18	28	29	23	29	0
Frontier	1.5	26	20	23	30	25	0
Harness	2	40	40	35	31	40	25
Surpass	2	28	40	44	39	41	26
Surpass + Bladex	2+1.5	63	54	54	44	34	35
Surpass 100	3.25	69	54	63	80	74	40
Harness + Battalion	2+0.094	40	38	70	86	72	70
Axiom	0.72	28	38	36	34	0	0
Axiom	0.81	45	50	51	35	0	0
Axiom	0.89	59	50	44	35	0	0
Axiom + Bladex	0.81+1.5	76	55	64	59	78	30
Broadstrike + Dual	2.4	29	74	69	93	91	66
Surpass + Broadstrike Plus	1.8+0.26	44	86	95	95	95	89
Untreated		0	0	0	0	0	0
LSD (0.05)		25	15	17	17	19	6
C.V. %		22	11	12	11	11	6

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

Cool, wet weather existed until May 15 and was followed by hot tempertures. Poor weed control is attributed to almost no precipitation following application and rapid germination due to high temperatures. The label rate of Harness and Surpass based on soil type and organic matter is 2.2 to 3 lb/A rather than 2 lb/A. Bladex usually enhanced weed control of the companion herbicide. Broadstrike Plus gave the greatest broadleaf weed control.

Weed control in corn from PRE/POST applied herbicides, Fargo 1995. (Zollinger) An experiment was conducted to evaluate weed control from herbicides used or soon to be labeled in corn. 'Interstate Payco 4X-85' corn was seeded May 31. Preemergence treatments were applied on June 1 with 75 F, 45% RH, 35% cloudy sky and 3 to 5 mph wind. Postemergence treatments were applied to V4 corn, 1-4 inch foxtail, 3-6 inch redroot pigweed, 3-6 inch common lambsquarters, 2-12 inch rosette wild mustard, 2-5 inch kochia, 2-6 inch common cocklebur, and 4-10 inch Canada thistle on June 23 with 75 F, 45% RH, 35% cloudy sky and 3 to 5 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 for preemergence treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for postemergence treatments. The experiment was a randomized complete block design with four replicates/treatment.

Treatment[a]	Rate	July 13						
		Fxtl	Rrpw	Colq	Wimu	KOCZ	Cocb	Cath
	lb/A	% control						
Frontier/Banvel	0.25	79	73	70	82	81	79	46
Frontier/Tough + PO	0.47 + 1%	74	70	68	70	95	0	18
Frontier/Banvel + Tough	0.125 + 0.47	68	88	81	70	95	78	44
Frontier/Atrazine + Tough + PO	0.38 + 0.47 + 1%	79	74	66	67	95	13	30
Frontier/Marksman	1.2	59	78	79	95	93	74	84
Harness/Atrazine + Resource + Scoil	0.38 + 0.43oz + 1%	80	79	68	99	95	28	39
Harness/Buctril Gel	0.25	76	65	85	94	95	76	25
Harness/Permit + X-77	0.5oz + 0.25%	35	79	48	97	99	88	15
Harness/BuctilGel + Permit + X-77	0.188 + 0.125oz + 0.25%	65	80	80	99	95	95	46
Harness/BuctrilGel + Permit + X-77	0.188 + 0.25oz + 0.25%	59	76	66	99	96	99	28
Harness/Permit + Resource + Scoil	0.5oz + 0.43oz + 1%	81	94	74	99	95	91	19
Harness/Permit + Atrazine + Scoil	0.5oz + 0.38 + 1%	79	74	40	99	71	81	26
Frontier/Sencor + Buctril Gel	1.5oz + 0.25	90	78	93	99	95	94	53
Frontier/Sencor + Buctril Gel	1.2oz + 0.25	81	75	93	99	94	79	63
Frontier/PCC 136 + X-77	0.39 + 0.25%	53	89	96	99	99	51	65
Frontier/PCC 136 + X-77	0.59 + 0.25%	65	85	96	99	96	63	67
Frontier/Shotgun	0.82	85	88	93	99	99	89	59
Frontier/Shotgun	1.22	82	85	95	99	98	91	68
Surpss/Scorpion III + X-77 + 28%N	0.21 + 0.25% + 1%	84	93	93	99	96	86	63
Surpass/Scorpion III + Scoil	0.21 + 1%	82	95	93	99	96	92	51
Untreated		0	0	0	0	0	0	0
LSD (0.05)		11	12	15	10	17	10	14
C.V. %		9	10	13	5	13	9	15

[a]Frontier was applied at 1.2 lb/A and Harness was applied at 1.8 lb/A to control grass weeds so accurate evaluation of broadleaf weeds could be made. Refer to 'List of Herbicides Tested' for active ingredients of herbicides tested.

Cool, wet weather existed until May 15 then followed by hot temperatures. Poor grass control is attributed to no precipitation folllowing PRE application. This demonstrates the need to incorporation soil applied herbicides for adaquate weed control (compare data with corn PPI study). Permit did not adaquately control common lambsquarters. Resource only control common lambsquarters less than 1.5 to 2 inches tall. Low atrazine rates were used to reduce potential of carryover. Treatments containing Permit, Shotgun or Scorpion III gave greatest common cocklebur control. Cost for Sencor + Buctril = $9 to $10/A, Shotgun = 6.50 to $10.00/A, and Scorpion III = $7 to $8/A.

Weed control in corn from POST herbicides, Casselton 1995. (Zollinger) An experiment was conducted to evaluate weed control from herbicides used in corn and from adjuvants and various tankmixes. 'Interstate 353A' corn was seeded June 2. Spike treatments were applied on June 13 to V1 to V2 corn, 0.5-1 inch foxtail, 2 leaf wild mustard, 2-4 leaf redroot pigweed, 2-4 leaf common lambsquarters, kochia and common cocklebur had not emerged with 82 F, 40% RH, 30% cloudy sky and 2 to 4 mph wind. Postemergence treatments were applied on June 19 to V3 corn, 4 leaf foxtail, 4 leaf mustard, 4-6 leaf redroot pigweed, 4-6 leaf common lambsquarters, 2-4 leaf kochia, and cotyledon to 2 leaf common cocklebur with 83 F, 63% RH, 5% cloudy sky, and 5-7 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 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	July 13						
		Fxtl	Wimu	Rrpw	Colq	Kocz	Cocb	New Flush
	oz/A	% control						
Prowl + Bladex (Spike)	1.5lb + 2lb	49	99	99	97	99	40	99
Prowl + Accnt + Bnvl + X-77 + 28%N	1.5lb + 0.25lb + 0.25	97	99	99	99	99	98	90
Basis + X-77 + 28%N	0.188	86	99	99	91	83	74	40
Basis + X-77 + 28%N	0.25	55	99	99	67	73	28	30
Basis + Dispatch 2N	0.25 + 2.5%	76	99	99	91	84	56	30
Basis + Impressive	0.25 + 25lb/100gal water	33	99	99	39	70	26	30
Basis + Scoil	0.25 + 1%	78	99	99	98	89	61	20
Basis + ND-4	0.25 + 1%	75	99	99	97	85	56	50
Accent + Preference + 28%N	0.25 + 0.25%	84	99	99	20	75	18	10
Accent + CL9506 + 28%N	0.25 + 0.25%	92	99	99	70	75	28	30
Accent + 17%COC + 28%N	0.25 + 1%	57	99	99	15	73	23	10
Accent + Scoil + 28%N	0.25 + 1%	91	99	99	47	83	37	20
Accent + Destiny + 28%N	0.25 + 1%	90	99	99	69	85	56	30
Accent + CL9502	0.25 + 2.5%	91	99	99	45	81	38	30
Accent + Buctril Gel + X-77 + 28%N	0.25 + 0.25lb	85	99	99	86	99	98	10
Acnt + BctlG + Permit + X-77 + 28N	0.25 + 0.188lb + 0.125	78	99	99	86	99	93	10
Accent + Frontier + X-77 + 28%N	0.25 + 0.7lb	97	99	99	64	75	33	90
Accent + Banvel + X-77	0.25 + 0.25lb	85	99	99	99	99	97	70
Accent + Frontier + Banvel + X-77	0.25 + 0.7lb + 0.25lb	60	99	99	97	99	95	70
Accent + Resource + Scoil	0.25 + 0.43	84	99	99	55	78	28	20
Accent + Permit + Resource + Scoil	0.25 + 0.5 + 0.43	96	99	99	74	73	94	70
Accent + Atrazine + Scoil	0.25 + 0.38lb	83	99	99	65	92	29	40
Accent + ScorpionIII + X-77 + 28%N	0.25 + 0.21lb	86	99	99	38	99	38	20
Accent + ScorpionIII + Scoil	0.25 + 0.21lb	93	99	99	85	99	75	30
Untreated		0	0	0	0	0	0	0
LSD (0.05)		11	NS	NS	13	5	16	12
C.V. %		9	-	-	10	4	15	8

[a]X-77, was applied at 0.25% v/v, Scoil, was applied at 1.5 pt/A, and 28% UAN was applied at 2% v/v. Refer to 'Table of Herbicides Tested' for active ingedients of herbicides tested and type of adjuvant used.

Temperatures turned from cool to hot near May 15. No crop injury was observed with any treatment. All treatments controlled wild mustard and redroot pigweed. Control from Basis + Impressive was reduced compared to other Basis/adjuvant treatments. Accent at 0.25 oz/A is half the labeled rate. Accent with methylated seed oil additives generally provided greater weed control than with surfactants. Accent + Destiny generally gave greater weed control than other Accent/adjuvant combinations. Accent + Atrazine gave poor common cocklebur control. Accent tankmixed with Buctril, Banvel, or Scorpion III controlled most broadleaf weeds. No antagonism was observed with Accent + Scorpion III tankmixes. Scoil enhanced Accent + Scorpion III greater than X-77 + 28%N. New weed flushes were evident after herbicides controlled existing weeds at application. A rating was made as to the effectiveness of herbicides preventing other other flushes from germination.

Weed control in corn from POST directed herbicides, Casselton 1995. (Zollinger) An experiment was conducted to evaluate weed control from post-directed herbicides. 'Interstate Payco 4X-85' corn was seeded June 2. Treatments were applied on July 6 to 26 inch corn, 4-6 inch foxtail, rosette to bolt mustard, 4-6 inch redroot pigweed, 4-6 inch common lambsquarters, 2-4 inch kochia, and 2-8 inch common cocklebur with 84 F, 55% RH, 45% cloudy sky, and 4-7 mph wind. Treatments were applied to the between row area of the middle two rows of four row plots measuring 10 ft wide by 30 ft long with a dual nozzle mounted on a back-pack sprayer delivering 17 gpa at 40 psi through 8002E flat fan nozzles. The experiment was a randomized complete block design with four replicates/treatment.

Treatment[a]	Rate	July 13					
		Fxtl	Wimu	Rrpw	Colq	Kocz	Cocb
	oz/A	% control					
Accent + Preference	0.5	77	99	99	61	73	0
Accent + Buctril + X-77	0.5 + 0.25lb	84	99	99	81	76	50
Accent + Sencor + X-77	0.5 + 1.2	86	99	99	83	78	55
Accent + Sencor + X-77	0.5 + 1.5	90	99	99	82	81	58
Sencor + Buctril	1.5 + 0.25lb	0	99	99	99	99	89
Sencor + Banvel	1.5 + 0.25lb	0	99	99	99	99	93
Untreated		0	0	0	0	0	0
LSD (0.05)		7	NS	NS	10	4	6
C.V. %		7	-	-	19	4	9

[a]X-77, was applied at 0.25% v/v. Refer to 'Table of Herbicides Tested' for active ingredients of herbicides tested.

Slight leaf burn was noted in the Sencor + Buctril treatment. Reduced weed control from Accent + Buctril may be a result of application method and size of weeds. Sencor + Banvel gave greatest broadleaf weed control.

Weed control in corn, Carrington 1995. (Zollinger, Schatz, and Zwinger) An experiment was conducted to evaluate weed control from established, recently registered, and herbicides in development for use in corn. 'Keltgen 2292' corn was seeded, and PPI and PRE treatments were applied on June 1. PRE treatments were applied with 73 F. POST treatments were applied to V2-V3 corn, 3-4" foxtail, 4-8 inch redroot pigweed, 1-3 inch prostrate pigweed, 1-5 inch wild buckwheat, 1-4 inch common lambsquarters, 1-3 inch kochia, 1-3 inch Russian thistle, and 1-3 inch annual smartweed on June 27 with 70 F, 60% RH, 90% clouds and 0-3 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 for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment was a randomized complete block design with four reps/treatment.

		July 18							
Treatment[a]	Rate	Fxtl	Rrpw	Prpw	Wibw	Colq	Kocz	Ruth	Pesw
	lb/A	% control							
PPI									
Eradicane + Bladex	5.33+1.5	99	93	64	90	99	99	99	99
DoublePlay + Bladex	4+1.5	99	91	90	88	99	99	99	99
Surpass + Broadstrike Plus	1.8+0.26	80	99	98	97	99	99	99	99
PRE									
Axiom	0.81	50	16	40	10	49	20	45	41
Axiom + Bladex	0.81+1.5	77	43	40	45	50	66	72	99
Surpass + Bladex	2+1.5	85	87	87	28	99	99	99	99
Surpass + Broadstrike Plus	1.8+0.26	91	99	99	88	99	99	99	99
PRE/POST									
Surpass/Sencor+Buctril Gel	1.8/1.5oz+0.25	84	88	80	51	99	99	99	99
Surpass/PCC 136 + X-77	1.8/0.59	98	95	87	43	99	99	99	99
Harness/Permit+Resource+PO	2/0.5oz+0.43oz	97	77	84	73	60	99	99	99
Frontier/Banvel	1.2/0.5	83	73	63	45	99	99	99	99
Srps/ScorpionIII+X-77+28%N	1.8/0.21	97	89	90	99	99	99	99	99
Surpass/Shotgun	2/0.81	88	88	78	60	99	99	99	99
POST									
Basis + Dispatch 2N	0.25oz+2.5%	98	99	99	91	99	99	99	89
Basis + ND-4	0.25oz+1%	97	99	99	90	99	99	99	99
Accent + Preference + 28%N	0.25oz	99	97	98	58	55	90	79	78
Accent + CL9506 + 28%N	0.25oz+0.25%	92	99	99	35	60	80	69	76
Accent + CL9502	0.25oz+2.5%	91	99	99	38	39	99	91	81
Accent + 17%COC + 28%N	0.25oz+1%	90	99	99	70	71	93	70	76
Accent + Destiny + 28%N	0.25oz+1%	97	99	99	64	53	98	69	84
Accent + Scoil	0.25oz	99	99	99	53	44	99	91	86
Accent+Frontier+X-77+28%N	0.25oz+0.7	99	99	99	63	87	99	91	90
Accent + Banvel	0.25oz+0.25	97	99	99	99	99	99	99	99
Accent + Atrazine + Scoil	0.25oz+0.38	95	99	98	94	92	99	79	99
Accent+Permit+Atrazine+Scoil	0.25oz+.5oz+.38	88	99	99	81	58	99	99	99
Accnt+ScorpionIII+X-77+28%N	0.25oz+0.21	99	98	98	93	99	99	97	99
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		15	12	19	24	24	7	20	10
C.V. %		12	9	15	26	21	5	16	8

[a]X-77, CL9506, and Preference was applied at 0.25% v/v, Scoil, ND-4, 17% COC, and Destiny was applied at 1% v/v, and 28% UAN was applied at 2% v/v. Refer to 'List of Herbicides Tested' for active ingredients of herbicides used in testing.

Broadstrike gave excellent broadleaf weed control applied PPI or PRE. Axiom appear to require greater moisture for activation than Surpass. Scorpion III gave excellent broadleaf weed control. Accent regardless of adjuvant gave greater than 90% foxtail control. Basis with adjuvants gave greater grass and broadleaf weed control than Accent with adjuvants.

Soil-applied treatments in no-till corn, Fargo 1995. W. H. Ahrens and M. Ciernia. The experiment was established in untilled wheat stubble in a silty clay soil with pH 7.8, 4.5% OM, and 90% residue cover. Early preplant (EPP) treatments not involving RPEXP3113 were applied April 28 using a 4-nozzle bicycle wheel sprayer with 8002 tips and delivering 17 gal/A at 40 psi, when air temp was 53 F, wind was 10-15 mph (spray shield used), RH was 40%, skies were partly cloudy, and soil surface damp. RPEXP3113 EPP treatments were applied May 1 with the same sprayer and when air temp was 57 F, wind was 5 mph, RH was 33%, skies were mostly cloudy, and soil surface damp. The entire experiment was treated May 31 with 1 qt/A Roundup plus 1 pt/A 2,4-D amine to control emerged weeds. Interstate 4X-85 corn was seeded June 1 at 22,200 seeds/A and 1.5 inches deep with a Hiniker no-till planter on 30-inch rows. Preemergence (PRE) treatments were applied later that day with the sprayer as above and while the air temp was 70 F, wind was 5 mph, RH was 40%, skies were sunny, and soil surface dry. Visual estimates of weed control were taken May 31, June 19 (KOCZ 5-15/m^2, Yeft 20-30/m^2), and Aug. 2. Crop injury was estimated June 19 and 27 for RPEX3113 treatments. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

		Weed control							Crop injury[b]				
		May 31			June 19		Aug. 2		June 19		June 27		
Treatment[a]	Rate	Vowh	KOCZ	Dand	KOCZ	Yeft	KOCZ	Yeft	Inc	Sev	Inc	Sev	Stunt
	(lb ai/A)	(%)											
Topnotch+Cyan(EPP)	2.4+1.5	99	100	95	12	15	15	0	-	-	-	-	-
Surpass+Cyan(EPP)	2.4+1.5	99	99	79	11	0	16	0	-	-	-	-	-
Topnotch+GX412(EPP)	2.4+1.5	98	99	97	13	5	12	0	-	-	-	-	-
Topnotch+GX411(EPP)	2.4+1.5	97	99	97	40	48	0	0	-	-	-	-	-
Topnotch+Extra(EPP)	2.4+1.5	99	100	89	-	8	70	0	-	-	-	-	-
Topnotch+GX414(EPP)	2.4+1.5	99	100	68	97	0	69	0	-	-	-	-	-
Topnotch+GX413(EPP)	2.4+1.5	98	100	75	94	38	83	0	-	-	-	-	-
Frontier+Cyan(EPP)	1.5+1.5	98	99	97	0	0	6	0	-	-	-	-	-
DualII+Cyan(EPP)	3+1.5	99	100	72	-	16	-	3	-	-	-	-	-
BroadstrikeDual(EPP)	2.4	75	71	23	59	54	-	0	-	-	-	-	-
RPEXP3113(EPP)	0.05	26	72	69	99	81	-	6	3	1	3	1	3
RPEXP3113(EPP)	0.07	3	97	93	90	68	59	8	3	2	1	0	0
RPEXP3113(EPP)	0.1	21	98	88	100	68	87	14	11	3	3	2	3
RPEXP3113(EPP)	0.12	20	99	93	95	78	69	17	6	3	3	1	3
RPEXP3113(EPP)	0.14	40	99	96	100	75	92	39	12	2	4	1	4
RP3113+Harness(EPP)	0.1+1	22	93	98	89	69	16	17	3	1	0	0	0
RP3113+Harness(EPP)	0.14+1	68	99	96	96	89	88	31	10	2	5	2	3
RP3113+DualII(EPP)	0.1+1	39	99	92	98	81	79	17	5	2	0	0	0
RP3113+DualII(EPP)	0.14+1	92	99	97	-	90	-	28	13	3	2	1	0
RP3113+Micro(EPP)	0.1+1.25	15	97	90	96	74	84	24	4	2	0	0	0
RP3113+SAN582(EPP)	0.1+0.6	67	99	87	99	84	91	16	0	0	0	0	0
Topnotch+Cyan(PRE)	2+1.5	-	-	-	-	14	-	0	-	-	-	-	-
Topnotch+Cyan(PRE)	2.4+1.5	-	-	-	97	78	56	0	-	-	-	-	-
Topnotch+Extra(PRE)	2+1.5	-	-	-	99	78	98	21	-	-	-	-	-
C.V. %		20	9	14	20	46	42	132	114	137	183	209	299
LSD 5%		19	12	17	21	32	33	18	NS	NS	NS	NS	NS

[a]Cyan = cyanazine-DF; GX 411 = cyanazine 4L by Griffin; GX 412 = cyanazine 90DF by Griffin; GX413 = cyanazine&atrazine (32 + 10.4%) by Griffin; GX 414 = cyanazine&atrazine (67.5 + 21.4%) by Griffin; Extra = Extrazine-DF; BroadstrikeDual = Broadstrike +Dual by DowElanco; Micro = MICROTECH alachlor by Monsanto; Topnotch is encapsulated acetochlor by Zeneca; Harness is acetochlor by Monsanto.

[b]Inc = "incidence", the percentage of plants in the plot showing any injury (determined by actual counts; Sev = "severity", the overall percentage injury in the plot; Stunt = % height reduction.

Soil-applied treatments in conventional till corn, Fargo 1995. W. H. Ahrens and M. Ciernia. The experiment was conducted on a conventionally tilled silty clay with 4.5% organic matter, pH 7.8, and 12% residue cover. F1 sunflower seed was broadcast May 26 and incorporated with a field cultivator to establish a volunteer sunflower infestation. Interstate 4X-85 corn was seeded 1.5 inch deep on June 1 at 22,200 seeds/A using a Hiniker no-till planter on 30-inch rows. Preemergence (PRE) treatments were applied later that day using a 4-nozzle bicycle wheel sprayer with 8002 tips and delivering 17 gal/A at 40 psi. Conditions at application were: air temperature 70 F; wind 3 to 5 mph; RH 40%; sky sunny; soil surface dry. The entire experiment was treated June 19 with 0.03 lb/A Asana XL for sunflower beetle control. Corn injury was determined June 20 (4.5 to 5 leaf) and June 26. Weed control was determined June 26 (vol. sunflowers 2-8/m^2, kochia 2-10/m^2, foxtail (75% yellow and 25% green) 30-60/m^2, and lambsquarters 5-10/m^2). Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate	June 20 Corn inj[b]		Evaluated June 26						
				Corn injury			Weed control			
		Sev	Inc	Sev	Stunt	Inc	Fxtl	Vosu	Colq	Rrpw
	(lb ai/A)	(%)								
RPEXP3113(PRE)	0.05	1	3	0	0	0	10	0	72	53
RPEXP3113(PRE)	0.07	0	0	0	0	0	20	0	90	86
RPEXP3113(PRE)	0.1	0	0	0	0	0	14	0	93	85
RPEXP3113(PRE)	0.12	1	2	0	0	0	44	0	94	88
RPEXP3113(PRE)	0.14	1	1	0	0	0	45	0	97	92
RPEXP3113+Acetochlor(PRE)	0.1+1	0	1	0	0	0	63	12	92	92
RPEXP3113+Metolachlor(PRE)	0.1+1	0	0	0	0	0	33	4	86	90
RPEXP3113+Alachlor(PRE)	0.1+1.25	1	3	0	0	0	15	1	92	93
RPEXP3113+SAN582(PRE)	0.1+0.6	1	4	0	0	0	23	0	90	85
Acet+Atra-DF+Cyan-DF(PRE)	2.4+0.4+1.1	-	-	-	-	-	67	0	76	89
Flms&Meto(PRE)	0.06&2.3	-	-	-	-	-	15	0	62	82
Flms&Meto+Acet(PRE)	0.04&1.6+0.8	-	-	-	-	-	42	0	75	92
C.V.%		149	170	0	0	0	43	514	23	14
LSD 5%		NS	NS	NS	NS	NS	19	NS	26	16

[a] Flms&Meto = Broadstrike +Dual by DowElanco.

[b] Sev = "severity", the overall percentage injury in the plot (estimated); Inc = "incidence", the percentage of plants in the plot showing any injury (determined by actual counts); Stunt = % height reduction.

Comments. Weed growth in virtually all plots became excessive by mid July, probably due to heavy mid-summer rains. Thus, weed control evaluations in late July and beyond could not be taken. The heavy weed growth also caused nitrogen deficiency in the crop and slowed its growth, making crop injury difficult to evaluate after June 26. No injury was detected after June 26, however.

Weed control in IMI-tolerant and -resistant corn, Fargo 1995. W. H. Ahrens and M. Ciernia. The experiment was established on a silty clay with 4.5% organic matter and pH 7.8. Volunteer sunflower seed was spread over the entire area on May 26 and incorporated with a field cultivator. Pioneer 3751 IR corn and ICI IT corn was seeded May 29 at 22,000 seeds per acre.

Early post (PO1) treatments were applied June 19 with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 40 psi when air temperature was 77 F (90 F later that day), RH 51%, dry soil, wind 5-10 mph (shield used); corn was 4 to 5-leaf and 4 to 6 inches tall (moisture stressed, beginning to roll), wild mustard (Wimu) was 7-leaf and 2.5 to 2 inches tall, redroot pigweed (Rrpw) was 2.5 to 3 inches tall, common lambsquarters (Colq) was 2 to 2.5 inches tall, volunteer sunflowers (Vosu) were 6 to 7-leaf and 3 to 3.5 inches tall, yellow foxtail was 5 to 6 inches tall, and kochia (KOCZ) was 2 to 3 inches tall.

Late post (PO2) treatments were applied June 26 with spray procedures as above and air temperature of 75 F, RH 60%, soil somewhat dry; corn 7-leaf and 10 inches tall, wild mustard 5 to 9 inches tall and flowering, redroot pigweed 6 to 8 inches tall, common lambsquarters 3 to 6 inches tall, volunteer sunflowers 6 to 8 inches tall, yellow foxtail 5 to 8 inches tall, kochia 4 to 7 inches tall.

Visual estimates of percentage control were taken 14 to 18 days after application (DAA) and 28 to 29 DAA. All plots were evaluated again August 14. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with three replications.

Table 1. PO1 treatments evaluated July 7 (18 DAA).

Treatment[a]	Rate[b] (oz ai/A)	Corn injury	Corn stunt[c]	Weed control Wimu (%)	Yeft	Vosu	Rrpw	Colq	KOCZ
Resolve+Act90+28%UAN	4+0.25%+1Q	0	3	98	78	84	92	90	94
Resolve+SunitII+28%UAN	4+1.5pt+1Q	0	0	98	80	90	93	91	95
AC513997+Act90+28%UAN	3.25+0.25%+1Q	0	0	99	82	90	93	88	95
AC513997+SunitII+28%UAN	3.25+1.5pt+1Q	2	3	99	86	88	94	90	99
AC513995+Act90+28%UAN	3.9+0.25%+1Q	0	0	98	82	85	92	89	94
AC513995+SunitII+28%UAN	3.9+1.5pt+1Q	0	0	99	87	88	93	91	97
Permit+Nico+POC+28%UAN	1+0.5+1%+4%	0	0	98	86	65	93	28	92
Nico+Dicamba+Act90+28%	0.5+5+0.25%+4%	0	0	99	84	81	93	90	97
Untreated	0	0	0	0	0	0	0	0	
C.V. %		490	323	1	4	25	1	3	3
LSD 5%		NS	NS	NS	6	NS	NS	4	NS

[a]28% or 28%UAN = 28% urea ammonium nitrate fertilizer solution; Act90 = Activator 90 nonionic surfactant; Permit = MON 12000 (halosulfuron proposed); POC = petroleum oil adjuvant containing 17% emulsifier.

[b]Q = quarts per acre; pt = pints per acre.

[c]Corn injury refers to chlorosis, and stunting to height effects. Evaluation was difficult due to variable stands and drought. It is doubtful there were any phytotoxic effects at all, despite the numbers shown above.

*** Continued on next page ***

*** See previous page for experiment description ***

Table 2. PO1 treatments evaluated July 18 (29 DAA).

Treatment[a]	Rate[b] (oz ai/A)	Corn injury	Weed control Wimu	Yeft	Vosu	Rrpw
			(%)			
Resolve+Act90+28%UAN	4+0.25%+1Q	0	100	62	99	99
Resolve+SunitII+28%UAN	4+1.5pt+1Q	0	100	79	99	99
AC513997+Act90+28%UAN	3.25+0.25%+1Q	0	100	89	99	99
AC513997+SunitII+28%UAN	3.25+1.5pt+1Q	0	100	96	99	100
AC513995+Act90+28%UAN	3.9+0.25%+1Q	0	100	87	97	99
AC513995+SunitII+28%UAN	3.9+1.5pt+1Q	0	100	96	94	100
Permit+Nico+POC+28%UAN	1+0.5+1%+4%	0	100	91	100	100
Nico+Dicamba+Act90+28%	0.5+5+0.25%+4%	0	99	61	97	100
Untreated	0	0	0	0	0	0
C.V. %		0	0	25	3	1
LSD 5%		NS	1	31	5	1

[a]28% or 28%UAN = 28% urea ammonium nitrate fertilizer solution; Act90 = Activator 90 nonionic surfactant; Permit = MON 12000 (halosulfuron proposed); POC = petroleum oil adjuvant containing 17% emulsifier.
[b]Q = quarts per acre; pt = pints per acre.

Table 3. PO2 treatments evaluated July 10 (14 DAA).

Treatment[a]	Rate[b] (oz ai/A)	Corn injury	Weed control Wimu	Yeft	Vosu	Rrpw	Colq	KOCZ
			(%)					
AC513997+Act90+28%UAN	3.25+0.25%+1Q	0	94	91	83	90	85	78
AC513997+SunitII+28%UAN	3.25+1.5pt+1Q	0	94	87	87	91	86	100
AC513995+Act90+28%UAN	3.9+0.25%+1Q	0	94	89	87	91	87	83
AC513995+SunitII+28%UAN	3.9+1.5pt+1Q	0	94	88	84	91	87	100
Permit+Nico+POC+28%UAN	1+0.5+1%+4%	0	95	81	89	88	28	72
Nico+Dicamba+Act90+28%	0.5+5+0.25%+4%	0	94	88	82	91	88	85
Untreated	0		0	0	0	0	0	0
C.V. %		0	2	7	6	2	3	6
LSD 5%		NS	3	9	8	2	4	8

[a]28% or 28%UAN = 28% urea ammonium nitrate fertilizer solution; Act90 = Activator 90 nonionic surfactant; Permit = MON 12000 (halosulfuron proposed); POC = petroleum oil adjuvant containing 17% emulsifier.
[b]Q = quarts per acre; pt = pints per acre.

*** See previous pages for experiment description ***

Table 4. PO2 treatments evaluated July 24 (28 DAA).

Treatment[a]	Rate[b] (oz ai/A)	Corn injury	Weed control Wimu	Yeft	Vosu	Rrpw
			(%)			
AC513997+Act90+28%UAN	3.25+0.25%+1Q	0	99	81	95	98
AC513997+SunitII+28%UAN	3.25+1.5pt+1Q	0	99	77	96	97
AC513995+Act90+28%UAN	3.9+0.25%+1Q	0	99	82	98	97
AC513995+SunitII+28%UAN	3.9+1.5pt+1Q	0	99	79	96	98
Permit+Nico+POC+28%UAN	1+0.5+1%+4%	0	100	73	100	96
Nico+Dicamba+Act90+28%	0.5+5+0.25%+4%	0	99	58	97	94
Untreated	0		0	0	0	0
C.V. %		0	1	23	2	3
LSD 5%		NS	1	26	3	4

[a]28% or 28%UAN = 28% urea ammonium nitrate fertilizer solution; Act90 = Activator 90 nonionic surfactant; Permit = MON 12000 (halosulfuron proposed); POC = petroleum oil adjuvant containing 17% emulsifier.
[b]Q = quarts per acre; pt = pints per acre.

Table 5. PO1 and PO2 treatments evaluated July 14.

Treatment[a]	Rate[b] (oz ai/A)	Weed control Yeft	Vosu	Rrpw	KOCZ	Colq
		(%)				
Resolve+Act90+28%UAN(PO1)	4+0.25%+1Q	57	89	95	100	100
Resolve+SunitII+28%UAN(PO1)	4+1.5pt+1Q	63	93	60	100	100
AC513997+Act90+28%UAN(PO1)	3.25+0.25%+1Q	72	92	95	100	100
AC513997+Act90+28%UAN(PO2)	3.25+0.25%+1Q	57	78	93	97	96
AC513997+SunitII+28%UAN(PO1)	3.25+1.5pt+1Q	82	86	96	100	95
AC513997+SunitII+28%UAN(PO2)	3.25+1.5pt+1Q	43	89	78	100	92
AC513995+Act90+28%UAN(PO1)	3.9+0.25%+1Q	68	90	91	91	99
AC513995+Act90+28%UAN(PO2)	3.9+0.25%+1Q	57	87	83	92	95
AC513995+SunitII+28%UAN(PO1)	3.9+1.5pt+1Q	72	81	98	100	92
AC513995+SunitII+28%UAN(PO2)	3.9+1.5pt+1Q	57	86	96	100	94
Permit+Nico+POC+28%(PO1)	1+0.5+1%+4%	81	100	100	90	37
Permit+Nico+POC+28%(PO2)	1+0.5+1%+4%	41	100	85	84	12
Nico+Dicamba+Act90+28%(PO1)	0.5+5+0.25%+4%	37	98	90	97	100
Nico+Dicamba+Act90+28%(PO2)	0.5+5+0.25%+4%	23	91	75	84	97
Untreated	0	0	0	0	0	0
C.V. %		33	12	19	7	16
LSD 5%		30	17	26	11	22

[a]28% or 28%UAN = 28% urea ammonium nitrate fertilizer solution; Act90 = Activator 90 nonionic surfactant; Permit = MON 12000 (halosulfuron proposed); POC = petroleum oil adjuvant containing 17% emulsifier.
[b]Q = quarts per acre; pt = pints per acre.

POST herbicides in conventional till corn, Fargo 1995. W. H. Ahrens and M. G. Ciernia. This experiment was conducted on a conventionally tilled silty clay with 4.5% organic matter and pH 7.8. The entire experiment was sprayed May 24 with 1.3 lb/A Frontier herbicide incorporated twice with a field cultivator for grass control. Interstate Payco 4X-85 hybrid seed corn was planted May 29 using a Hiniker no-till planter set on a 30-inch row spacing and 1.5-inch seeding depth. All treatments were applied June 19 with a 4-nozzle bicycle wheel sprayer equipped with 8001 tips and delivering 8.5 gal/A at 40 psi. At application, air temperature was 86 F, wind was 5 to 10 mph (spray shield used), RH was 51%, corn was 4- to 5-leaf and 4 to 6 inches tall, wild mustard was 7-leaf and 1.5 to 2 inches tall, redroot pigweed was 2.5 to 3 inches tall, common lambsquarters was 2 to 2.5 inches tall, yellow foxtail was 5 to 6 inches tall, and green foxtail was 3 to 4 inches tall. Visual estimates of percentage corn injury were made June 26 and July 6 and weed control was determined July 7 and 24. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate	Corn injury		Weed control						
				Evaluated July 6				Eval. July 24		
		6/26	7/6	Fxtl	Wimu	Rrpw	Colq	Fxtl	Wimu	Rrpw
	(lb ai/A)	(%)								
Flumiclorac+NIS	0.027+0.25%	4	0	0	13	21	9	-	-	35
CGA-248757+NIS	0.004+0.25%	2	0	0	28	18	8	1	-	9
CGA-248757+NIS	0.005+0.25%	2	0	0	23	18	9	-	-	10
CGA-248757+Atra+NIS	0.004+0.5+0.25%	2	0	0	98	63	62	-	98	32
CGA-248757+Atra+Scoil	0.004+0.5+1.5pt	3	0	3	93	68	-	5	84	54
CGA-248757+Dicamba+NIS	0.004+0.13+0.25%	3	0	2	96	85	-	-	95	95
Flumiclorac+Atra+NIS	0.03+0.5+0.25%	4	0	0	98	82	-	5	99	68
Dicamba+NIS	0.25+0.25%	4	1	0	95	92	92	4	97	99
Dicamba+Atra+Scoil	0.13+0.38+1.5pt	2	0	0	98	87	91	5	98	95
Dicamba+Cyan+Scoil	0.13+0.38+1.5pt	3	0	10	100	87	96	33	99	92
Bromoxynil+NIS	0.25+0.25%	9	0	0	98	20	51	-	99	5
Flms&Clpy&24D+NIS	0.023&0.063&0.13+0.25%	1	0	13	100	88	75	6	100	90
Nico+Atra+Scoil	0.016+0.38+1.5pt	3	0	95	100	99	80	97	99	100
Nico+Cyan+Scoil	0.016+0.38+1.5pt	6	0	66	100	98	39	55	97	100
Nico+Dicamba+Scoil	0.016+0.13+1.5pt	2	0	98	100	98	95	99	99	99
Pyridate	0.35	1	0	0	37	31	-	-	-	5
Pyridate+Scoil	0.35+1.5pt	2	0	0	63	6	4	-	-	3
Pyridate	0.47	2	0	0	74	33	14	-	-	0
Pyridate	0.7	4	0	0	87	49	35	-	-	22
Pyridate	0.94	6	0	0	86	74	41	-	-	-
Pydt+Atra+POC	0.47+0.38+0.25G	4	1	0	90	38	84	-	81	7
Pydt+Atra+POC	0.35+0.38+0.25G	3	0	0	93	42	89	-	94	10
Pydt+Atra&Dica+NIS	0.47+0.6+0.25%	2	0	3	100	89	95	-	100	97
Pydt+Atra&Dica+NIS	0.35+0.6+0.25%	1	0	3	100	84	100	-	99	98
Pydt+Metr+POC	0.47+0.063+0.25G	8	0	0	86	25	70	-	-	3
Pydt+Metr+POC	0.47+0.094+0.25G	9	0	0	88	42	89	40	79	29
Pyridate+Dica	0.47+0.5	3	0	0	99	93	-	19	99	100
Pydt+Dica+Metr+NIS	0.47+0.25+0.06+0.25%	5	0	0	99	93	-	-	99	99
Dica+Metr+NIS	0.25+0.06+0.25%	2	0	0	98	94	102	-	96	99
C.V.%		57	753	62	13	23	26	41	11	25
LSD 5%		3	NS	9	15	20	26	18	NS	19

[a]NIS = Activator90 surfactant; Flms&Clpy&24D = BroadstrikePlus; Atra = atrazine-DF; Cyan = cyanazine-DF; Nico = nicosulfuron; Atra&Dica = Marksman herbicide; Metr = metribuzin; Dica = dicamba-SGF; POC = petroleum oil adjuvant.

Broadleaf tank mixes with POAST in POAST-resistant corn, Fargo 1995. W. H. Ahrens and M. G. Ciernia. This experiment was established on a conventionally tilled silty clay with pH 7.8 and 4.5% organic matter. POAST-resistant DeKalb seed corn was planted June 1 at 22,200 seeds/A and 1.5 inches deep using a Hiniker 4-row no-till row crop planter set on 30-inch rows. All treatments were sprayed June 20 using a 4-nozzle bicycle wheel sprayer equipped with 8001 tips and delivering 8.5 gal/A at 40 psi. At application, air temperature was 86 F, wind was 5 to 10 mph (shield used), RH was 44%, skies were sunny, soil surface was dry, growing conditions were very dry, corn was 4- to 5-leaf and 4 to 6 inches tall, redroot pigweed was 2.5 to 3 inches tall, common lambsquarters was 2 to 2.5 inches tall, foxtail (70% yellow and 30% green foxtail) was 5 to 6 inches tall, and wild mustard was 7-leaf and 1.5 to 2 inches tall. Visual estimates of percentage corn injury were made June 28 and July 18 and weed control was determined June 28, July 18, and Aug. 1. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

		Evaluated June 28					Eval. July 18			Eval. 8/1	
		Corn	Weed control								
Treatment[a]	Rate[b] (lb/A)	inj	Rrpw	Colq	Fxtl	Wimu	Rrpw	Fxtl	Wimu	Rrpw	Fxtl
		(%)									
Sethoxydim	0.19	1	0	0	76	3	0	99	0	0	97
Seth+Bent+28%	0.19+0.75+1G	10	39	20	77	100	4	89	99	28	52
Seth+Bent&Atra	0.19+0.52&0.52	0	96	97	71	100	98	47	100	87	29
Seth+Bent&Atra+28%	0.19+0.52&0.52+1G	11	90	93	80	100	95	97	99	79	70
Seth+Dicamba	0.19+0.5	1	68	73	76	67	100	96	98	91	21
Seth+Brox+Atra	0.19+0.25+0.5	13	97	100	81	100	99	95	99	93	48
Seth+Atra&Dica	0.19+0.92&0.48	2	92	100	70	100	100	78	100	100	59
Seth+Bent+2,4-D	0.19+0.75+0.05	3	69	68	71	100	48	96	100	41	51
Seth+MON12000+28%	0.19+0.031+1G	3	76	0	77	86	95	99	100	86	83
Nico+Brox+28%+NIS	0.031+0.25+1G+0.25%	11	88	71	70	100	100	97	99	99	40
C.V.%		43	15	20	10	18	20	17	1	18	40
LSD 5%		3	14	16	9	21	19	20	1	17	29

[a]All sethoxydim treatments contained petroleum oil adjuvant at 1 quart/A; NIS = Activator90 nonionic surfactant; Bent = bentazon; 28% = urea ammonium nitrate solution; Bent&Atra is Laddok herbicide by BASF; Brox = bromoxynil; Atra = Atrazine-DF; Atra&Dica is Marksman herbicide by Sandoz; 2,4-D = dimethylamine salt of 2,4-D; Nico = nicosulfuron.

[b]G = gal/A.

Comments. No crop injury was observed July 18. Sethoxydim efficacy was antagonized by Bent&Atra (Laddok) but the addition of 28% UAN restored efficacy. Sethoxydim efficacy also was reduced by Atra&Dica (Marksman).

Fall applied acetanilides in corn, Colfax 1995. W. H. Ahrens and M. G. Ciernia. This experiment was conducted in a farmer's field 4 miles south of Colfax, ND on a loamy sand with untilled soybean residue from 1994. Fall treatments (F) were applied Oct. 31, 1994 while air temp was 60 F, wind 0-4 mph, and the sky sunny. All herbicide granules (G) were applied using a 10-ft-wide Gandy airflow applicator. Liquid treatments were applied using a 6-nozzle bicycle-wheel sprayer with 8003 tips, and delivering 12.5 gal/A at 30 psi. Early preplant (EPP) treatments were applied Apr. 26, 1995 with the equipment described above except that the sprayer used 8002 tips and delivered 17 gal/A at 40 psi. At application, air temp was 45 F, wind 0-5 mph, RH 60%, the sky cloudy, and soil surface wet. On Apr. 26, 85 lb/A N as ammonium nitrate was broadcast over the entire experiment. On May 1, Pioneer 3723 corn was seeded 1.25 inches deep at 29,300 seeds/A using a MaxEmerge 2 planter with 30-inch row spacings. Preemergence (PRE) treatments were applied May 2 using the equipment described above and when air temp was 65 F, wind was 2-6 mph, RH was 37%, sky was partly sunny, and the soil surface mostly dry. Visual estimates of weed control were made June 15 and Sept. 14. The entire area was sprayed June 16 with 1 pt/A Buctril + 0.25 pt/A Banvel to control broadleaf weeds. Plot size was 15 by 30 ft and the experiment was a randomized complete block with four replications.

Treatment[a]	Rate	Evaluated 6/15			9/14[b]
		Colq	Fxtl	Rrpw	Fxtl
	(lb/A)	(%)			
Metolachlor&Safener(F)	2	37	82	-	69
Metolachlor&Safener(F)	2.5	64	96	65	94
Metolachlor&Safener-G(F)	2	51	100	-	98
Metolachlor&Safener-G(F)	2.5	63	100	-	95
Alachlor(F)	2	30	-	3	33
Alachlor(F)	2.5	10	-	4	51
Alachlor-G(F)	2	42	50	-	6
Alachlor-G(F)	2.5	57	-	-	58
Acetochlor&Safener(F)	1.5	38	-	-	34
Acetochlor&Safener(F)	2	70	69	66	43
SAN582(F)	1.1	42	92	7	37
SAN582(F)	1.3	54	-	11	95
Metolachlor&Safener(EPP)	2	51	-	-	97
Metolachlor&Safener(EPP)	2.5	48	-	-	95
Metolachlor&Safener-G(EPP)	2	84	-	-	100
Metolachlor&Safener-G(EPP)	2.5	94	99	95	98
Alachlor(EPP)	2	87	100	-	93
Alachlor-G(EPP)	2	93	-	-	94
Acetochlor&Safener(EPP)	1.5	98	97	-	38
SAN582(EPP)	1.1	87	97	-	85
Metolachlor&Safener(PRE)	2	72	-	91	74
Metolachlor&Safener(PRE)	2.5	88	100	93	99
Metolachlor&Safener-G(PRE)	2	95	100	-	98
Metolachlor&Safener-G(PRE)	2.5	95	-	-	100
Alachlor(PRE)	2	80	76	94	65
Alachlor-G(PRE)	2	68	97	-	90
Acetochlor&Safener(PRE)	1.5	91	99	92	87
SAN582(PRE)	1.1	51	-	-	73
CV, %		47	18	35	37
LSD 5%		43	24	28	39

[a]SAN582 = Frontier herbicide by Sandoz; Metolachlor&Safener = Dual II by Ciba; Acetochlor&Safener = Harness Plus by Monsanto.

[b]Fxtl = 50/50 mixture of green and yellow foxtail.

PPI SAN 582 and Eradicane for wild oat control in corn, Fargo 1995. W. H. Ahrens and M. G. Ciernia. This experiment was established on a conventionally tilled silty clay with 4.5% organic matter and pH 7.8. The entire area was tilled May 22 with a field cultivator. Treatments were applied May 23 with a 4-nozzle bicycle wheel sprayer using 8002 tips and delivering 17 gal/A at 40 psi. All treatments were then double-pass incorporated with a 10-ft field cultivator at 6 mph and 2 inches deep. Interstate Payco 4X-85 corn was seeded May 29 at 1.5 inch deep and 22,200 seeds/A with a 4-row Hiniker no-till planter set on 30-inch rows. On May 30 the whole experiment was sprayed with 1 qt/A Roundup to control wild oats that escaped preplant tillage. The entire area was sprayed June 23 with 2 pt/A Curtail plus 1 quart/A Basagran to control Canada thistle and wild mustard. Visual estimates of wild oat control and corn injury were taken June 22. Wild oat and foxtail control were determined July 11. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate	Eval. June 22		Eval. July 11	
		Corn injury	Wioa	Wioa	Fxtl
	(lb/A)	(%)			
SAN582	1.4	0	63	63	99
EPTC&R29148	5	0	93	97	91
SAN582+EPTC&R29148	0.59+3.35	0	93	96	90
SAN582+EPTC&R29148	0.94+2.52	0	95	98	99
Acetochlor+EPTC&R29148	0.8+3.35	0	96	98	97
C.V. %		0	8	15	7
LSD 5%		NS	11	25	NS

[a]SAN 582 is Frontier by Sandoz; EPTC&R29148 is Eradicane by Zeneca; Acetochlor is Surpass by Zeneca.

Commercial adjuvants with Roundup, Fargo 1995. 'Valley' oat, '2371' hard red spring wheat, and white proso millet were seeded in adjacent strips as bioassay species on May 30. Treatments were applied across the species to 4-leaf oat and proso millet, 4- to 5-leaf wheat and 4- to 8-leaf redroot pigweed on June 21 with 90 F, 52% RH, cloudy sky, and 5-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	6/28				7/24			
		Oat	Fxtl	Rrpw	KOCZ	Oat	Wht	Prmi	Gen
	oz/A	%							
Roundup	1	85	74	63	60	70	70	78	66
Roundup+X-77	1+0.5%	96	79	81	75	86	88	88	83
Roundup+R-11	1+0.5%	95	82	77	80	89	90	88	84
Roundup+Preference	1+0.5%	97	74	72	50	84	85	83	80
Roundup+Li-700	1+0.5%	85	70	77	75	73	69	75	70
Roundup+Activator 90	1+0.5%	90	71	78	66	77	77	79	75
Roundup+Silwet L-77	1+0.25%	55	66	83	77	46	54	68	58
Roundup+Amway 80	1+0.5%	98	90	85	77	88	89	88	85
Roundup+Spray booster S	1+0.5%	90	76	88	70	76	78	79	76
Roundup+Activator plus	1+0.5%	89	69	84	65	78	79	79	73
Roundup+Sensation	1+3%	99	89	93	95	90	91	88	86
Roundup+Dispatch AMS	1+2%	99	91	93	95	94	95	91	91
Roundup+Class ACT	1+2%	98	91	93	90	93	94	90	90
Roundup+Choice+Act-90	1+0.75%+0.5%	98	83	87	80	87	88	86	84
Roundup+Cayuse+R-11	1+0.5%+0.5%	98	86	90	85	91	93	93	88
Roundup+Surfate II	1+1.5%	98	89	93	90	94	96	97	93
C.V. %		7	6	7		7	5	5	6
LSD 5%		9	6	9		8	6	6	7
# OF REPS		4	4	3	1	4	4	4	4

Summary

Considering all species and evaluation dates, Roundup enhancement by adjuvants was most by compounds known to contain mainly ammonium sulfate (AMS), Sensation, Dispatch AMS, Sensation, Class Act, and Surfate. The least effective adjuvants with Roundup were: Silwet L-77, Li-700, Activator 90, Spray Booster S, and Activator Plus. Silwet L-77 adjuvant was effective in enhanceing redroot pigweed control, but was antagonistic to grass control with Roundup.

Commercial adjuvants with Roundup, Carrington 1995. 'Valley' oat and 'Sunup' proso millet were seeded in adjacent strips as bioassay species on June 2. Treatments were applied across the species to 4- to 5-leaf oat, 4-leaf proso millet, 3- to 6-inch yellow foxtail, and 4- to 6-inch redroot pigweed on June 27 with 74 F, cloudy 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.

Treatment	Rate	7/15				
		Oat	prmi	Yeft	Byqr	Rrpw
	oz/A			%		
Roundup	1	64	53	42	50	0
Roundup+X-77	1+0.5%	95	71	67	60	0
Roundup+R-11	1+0.5%	97	82	73	80	0
Roundup+Preference	1+0.5%	99	91	89	50	0
Roundup+Li-700	1+0.5%	96	82	67	65	0
Roundup+Activator 90	1+0.5%	97	75	74	30	0
Roundup+Silwet L-77	1+0.25%	96	77	60	90	0
Roundup+Amway 80	1+0.5%	96	80	63	75	0
Roundup+Spray booster S	1+0.5%	97	90	86	0	0
Roundup+Activator plus	1+0.5%	96	81	68	30	0
Roundup+Sensation	1+3%	99	97	97	90	0
Roundup+Dispatch AMS	1+2%	99	93	94	80	0
Roundup+Class ACT	1+2%	99	96	94	97	0
Roundup+Choice+Act-90	1+0.75%+0.5%	97	92	83	50	0
Roundup+Cayuse+R-11	1+0.5%+0.5%	98	83	78	88	0
Roundup+Surfate II	1+1.5%	99	90	96	95	0
C.V. %		12	12	18		0
LSD 5%		16	15	23		NS
# OF REPS		4	4	3	1	4

Summary

Plants were in water at evaluation and the wet conditions may have increased response to Roundup and minimized differences among adjuvants. Oats were controlled by Roundup treatments containing adjuvants. Barnyard grass only occurred in one replicate and density was variable so data will not be discussed. The results are similar to other experiments in that adjuvants with known ammonium sulfate were the most effective in enhancement of Roundup phytotoxicity (Sensation, Dispatch AMS, Class Act, and Surfate).

Commercial adjuvants with Roundup, Hettinger 1995. 'Grandin' hard red spring wheat was seeded May 29. Treatments were applied to 8-inch jointing wheat and 12-inch jointing wild oat on June 14 with 79 F, 75% RH, clear sky, and 5- to 10-mph wind. Treatments were applied with a tractor-mounted CO_2 plot sprayer delivering 17 gpa at 40 psi through 8001 flat fan nozzles to a 5 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/27	7/11	7/15
		Wioa	Wht/Wioa	Wioa
	oz/A		%	
Roundup	1	66	67	58
Roundup + X-77	1 + 0.5%	66	82	66
Roundup + R-11	1 + 0.5%	62	77	59
Roundup + Preference	1 + 0.5%	65	76	62
Roundup + Li-700	1 + 0.5%	52	55	39
Roundup + Activator 90	1 + 0.5%	68	71	58
Roundup + Silwet L-77	1 + 0.125%	52	58	40
Roundup + Amway 80	1 + 0.5%	71	84	74
Roundup + Spray Booster S	1 + 0.5%	58	67	58
Roundup + Activator Plus	1 + 0.5%	62	62	51
Roundup + Sensation	1 + 1.5%	79	90	82
Roundup + Dispatch AMS	1 + 1%	72	83	74
Roundup + Class Act	1 + 2%	88	96	87
Roundup + Choice + Act. 90	1 + 0.75% + 0.5%	81	93	82
Roundup + Cayuse + R-11	1 + 0.5% + 0.5%	81	89	84
Roundup + Surfate II	1 + 1.5%	82	91	80
Roundup + Ammonium Sulf.	1 + 2%	69	86	65
Roundup + 17% Concentrate	1 + 0.5%	60	59	50
Roundup + Scoil	1 + 0.5%	55	56	48
Roundup + Destiny	1 + 0.5%	44	40	39
Roundup + Class APM 28	1 + 0.75%	72	84	70
Roundup + Kenetic	1 + 0.1%	59	50	54
Roundup + Optima	1 + 0.75%	70	89	85
Roundup + EV Concentrate	1 + 0.5%	75	84	76
Roundup + TF8035	1 + 0.5%	29	65	0
Roundup + (pH-5.0)	1	50	58	48
Roundup + AmmSul + (pH=5)	1 + 1%	69	78	65
C.V. %		22	17	55
LSD 5%		20	17	22
# OF REPS		4	4	4

oz/A=formulated Roundup

Summary

Adjuvants differed greatly in efficacy with Roundup. Adjuvants containing ammonium sulfate (AMS) were most effective in enhancement of wheat and wild oats control by Roundup. Adjuvants containing oils were antagonistic, in agreement with other research. Among the surfactants some tended to reduce Roundup phytotoxicity.

Commercial adjuvants with Roundup, Minot 1995. 'Amidon' hard red spring wheat was seeded June 5. Treatments were applied to 4- to 5-leaf wheat on July 14 with 70 F and 5- to 8-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	8/15 Wht
	oz/A	-%-
Roundup	1	90
Roundup+X-77	1+0.5%	96
Roundup+R-11	1+0.5%	96
Roundup+Preference	1+0.5%	97
Roundup+Li-700	1+0.5%	92
Roundup+Activator 90	1+0.5%	93
Roundup+Silwet L-77	1+0.25%	82
Roundup+Amway 80	1+0.5%	98
Roundup+Spray booster S	1+0.5%	96
Roundup+Activator plus	1+0.5%	89
Roundup+Sensation	1+3%	99
Roundup+Dispatch AMS	1+2%	99
Roundup+Class ACT	1+2%	99
Roundup+Choice+Act-90	1+0.75%+0.5%	97
Roundup+Cayuse+R-11	1+0.5%+0.5%	99
Roundup+Surfate II	1+1.5%	99
C.V. %		2
LSD 5%		3
# OF REPS		4

Summary

Roundup alone was highly phytotoxic to wheat in this experiment so enhancement by adjuvants was not always discernable. However, Silwet L-77 was antagonistic to Roundup phytotoxicity and Li-700, Activator 90, and Spray booster S did not enhance phytotoxicity.

Commercial adjuvants with roundup, Williston 1995. 'Otana' oat, 'Dawn' proso millet, and 'Brewer' lentils were seeded in adjacent strips as bioassay species on June 6. Treatments were applied to 1.5- to 2-leaf oat, 4-leaf proso millet, 2-inch lentil, tillering to jointing green foxtail, 2- to 6-inch redroot pigweed, and 3- to 4-inch Russian thistle on June 20 with 81 F, 33% RH, partly cloudy sky, and 3-mph wind. Treatments were applied with a shielded bicycle wheel type plot sprayer mounted on a G-Allis Chalmers tractor delivering 8.5 gpa at 32 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 7 by 24 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/13				
		Grft	Oats	Prmi	Rrpw	Ruth
	oz/A	%				
Roundup	1	65	11	55	11	8
Roundup+X-77	1+0.5%	88	50	79	43	0
Roundup+R-11	1+0.5%	94	66	89	51	9
Roundup+Preference	1+0.5%	93	60	82	61	0
Roundup+Li-700	1+0.5%	79	31	64	29	2
Roundup+Activator 90	1+0.5%	88	25	73	41	0
Roundup+Silwet L-77	1+0.25%	79	16	23	56	0
Roundup+Amway 80	1+0.5%	94	75	88	60	11
Roundup+Spray booster S	1+0.5%	92	42	84	48	5
Roundup+Activator plus	1+0.5%	84	38	67	48	0
Roundup+Sensation	1+3%	98	87	93	92	77
Roundup+Dispatch AMS	1+2%	96	91	94	95	69
Roundup+Class ACT	1+2%	98	93	93	96	75
Roundup+Choice+Act-90	1+0.75%+0.5%	96	60	88	71	29
Roundup+Cayuse+R-11	1+0.5%+0.5%	96	75	91	75	48
Roundup+Surfate II	1+1.5%	97	93	94	94	77
C.V. %		7	20	8	26	31
LSD 5%		9	17	9	23	11
# OF REPS		4	4	4	4	4

Summary

Large differences occurred among adjuvants in enhancement of Roundup phytotoxicity to various species. The most effective adjuvants were those known to contain ammonium sulfate; Sensation, Dispatch AMS, Class Act, and Surfate. The least effective adjuvants were: Li-700, Silwet L-77, Activator plus, Activator 90, and Spray booster S.

Roundup-Riverside-Wilfarm-, Fargo 1995. '2371' hard red spring wheat, 'Valley' oat, and white proso millet were seeded in adjacent strips as bioassay species on May 30. Treatments were applied across the species to 4- to 5-leaf wheat, and 4-leaf oat and proso millet with 90 F, 52% RH, cloudy sky, and 5 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	6/28			7/24	
		Oat	Wht	Prmi	Oat	Broadleaf[a] general
	oz/A			%		
Roundup+AD-100	1+.18G	92	93	92	96	76
Roundup+Activate Plus+AMS	1+0.25%+40	83	86	84	95	60
Roundup+Activate Plus+AD-100	1+.25%+.18G	84	86	88	95	77
Roundup+Activate Plus+Nisal	1+.25%+.25G	87	87	85	92	62
Roundup+Activate Plus + AMS Plus	1+.25%+.25G	95	95	95	99	87
Roundup+Activate Plus	1+.25%	64	63	71	82	31
Roundup+Cayuse Plus	1+.37%	88	89	88	99	83
Roundup+W3953	1+.5%	88	90	89	99	78
Roundup+R11+AMS	1+.5%+2%	98	98	97	97	93
Roundup+Surface II	1+1%	98	99	97	96	86
Roundup	1+1%	61	55	73	70	49
Roundup+CZ	1+1%	96	97	95	99	83
Roundup+Li-201 802	1+0.25%	76	75	83	92	60
Roundup+Li-201 767Q	1+0.5%	94	94	92	99	86
Roundup+Kalo+AMS	1+0.25%+2%	90	96	93	97	83
C.V. %		6	6	4	7	12
LSD 5%		8	7	6	9	13
# OF REPS		4	4	4	4	4

[a]Broadleaf general is an evaluation of barnyard grass and other broadleaf weeds.

Summary

Roundup phytotoxicity was high because of the excellent moist conditions. The spray carrier was Fargo water which only has 25 ppm each calcium and sodium. However all adjuvants enhanced Roundup phytotoxicity except Activate Plus. The late evaluation indicated that control of the natural weed infestation of barnyard grass, yellow foxtail and redroot pigweed varied with the adjuvant more than the bioassay species. The barnyard grass occurred because of excessive moisture and was not uniform in the experiment. All treatments with ammonium suflate (AMS) gave 90% or more control of all species at the early evaluation except when with Activate Plus.

Roundup Plus oils and surfactants with Valley City water, Fargo 1995. 'Pioneer 2371' hard red spring wheat, 'Valley' oat, and white proso millet were seeded in adjacent strips as bioassay species on May 30. Treatments were applied across the species to 4- to 5-leaf wheat, and 4-leaf oat and proso millet on June 21 with 90 F, 52% RH, cloudy sky and 5-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	6/28				7/24		
		Oat	Wht	Prmi	General	Oat	Bygr	Fxtl
	oz/A	%						
Roundup	1	51	50	61	28	83	41	48
Roundup+Scoil	1+1%	76	74	79	55	99	34	58
Roundup+Scoil+AMS	1+1%+2%	88	94	93	75	99	82	83
Roundup+Scoil+28N	1+1%+2%	82	87	86	63	99	56	67
Roundup+Scoil+AMS	1+1%+1%	92	93	95	84	98	71	77
Roundup+Surfate II	1+1.5%	95	95	93	81	99	71	75
Roundup+Scoil+AMS	1+0.5%+2%	85	88	88	81	99	76	78
Roundup+MON 818	1+.5%	82	82	83	54	98	55	60
Roundup+X-77+AMS	1+.5%+2%	93	95	95	84	99	78	81
Roundup+Cayuse+R-11	1+.5%+.5%	88	89	88	71	99	64	69
Roundup+CZ	1+1%	94	95	93	84	99	64	79
C.V. %		4	5	5	16	3	23	12
LSD 5%		5	6	7	16	4	21	12
# OF REPS		4	4	4	4	4	4	4

Summary

Oil adjuvants normally do not enhance glyphosate, but reports from South Africa indicated that Scoil+ammonium sulfate (AMS) enhanced glyphosate more than other AMS + surfactants. Treatments were applied in a water from Valley City with about 250 ppm calcium plus other cations. The inclusion of AMS with Scoil increased Roundup phytotoxicity, but not beyond that when Roundup was with Surfate II, X-77 + AMS, or CZ. AMS at 1 or 2% were equally effective but Scoil tended to be more effective at 1 than 0.5%. Ammonium nitrate (AMN) was less effective than AMS in combination with Scoil adjuvant.

Surfactants with Roundup, Fargo 1995. 'Pioneer 2371' hard red spring wheat, 'Valley' oat, and white proso millet were seeded in adjacent strips as bioassay species on May 30. Treatments were applied across the species to 4- to 5-leaf wheat, 4-leaf oat and proso millet, and 4- to 8-leaf redroot pigweed on June 21 with 90 F, 52% RH, cloudy sky, and 5-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 radnomized complete block design with four replicates.

		6/28				7/24			
Treatment	Rate	Oat	Wht	Prmi	General	Oat	Fxtl	Rrpw	KOCZ
	oz/A	%							
Roundup	1	74	71	83	58	92	63	58	39
Roundup+AMS	1+1%	86	89	89	80	98	78	86	54
Roundup+INDUCE	1+.5%	88	89	87	71	99	70	66	45
Roundup+INDUCE+AMS	1+0.5%+1%	91	95	94	84	99	80	90	63
Roundup+Optima	1+0.5%	91	93	94	83	99	79	78	77
Roundup+Optima+AMS	1+.5%+1%	94	94	96	84	99	80	91	85
Roundup+HM 9327	1+.15%	86	87	87	59	98	83	65	62
Roundup+HM 9327+AMS	1+.15%+1%	92	93	92	82	99	79	94	61
Roundup+Class ACT	1+2%	95	95	95	87	99	81	90	80
Roundup+Surfate II	1+1.5%	94	97	94	87	99	86	93	83
C.V. %		4	4	4	9	17	10	11	17
LSD 5%		5	5	6	10	NS	11	12	16
# OF REPS		4	4	4	4	4	4	4	4

Summary

All adjuvants enhanced Roundup phytotoxicity at the first evalution. Differences among adjuvants were not large because environmental conditions were positive to glyphosate phytotoxicity. Roundup applied in Fargo water with about 25 ppm each calcium and sodium.

Precision products with Roundup in Valley City Water, Fargo 1995. 'Pioneer 2371' hard red spring wheat, 'Valley' oat, and white proso millet were seeded in adjacent strips as bioassay species on May 31. Treatments were applied across the species to 3- to 4.5-leaf wheat, 4- to 5.5-leaf oat, 5.5- to 6.5-leaf proso millet 3-to 6-leaf foxtail spp. and 1- to 15-inch redroot pigweed on June 29 with 65 F, 78% RH, cloudy 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.

Treatment	Rate	7/10			7/24		
		Oat	Wht	Prmi	Oat	Fxtl	Rrpw
	oz/A	%			%		
Roundup+Deliver	1+2.5%	94	94	94	99	85	94
Roundup+Deliver XTRA	1+5%	95	92	90	99	85	91
Roundup+PENATRATE II+AMS	1+.5%+2%	95	93	92	99	85	92
Roundup+PXDTS	1+2%	96	93	91	99	81	86
Roundup+NEW BALANCE+AMS	1+.25%+.6%	95	94	93	99	87	86
Roundup+NEW BALANCE	1+.25%	78	77	71	95	59	63
Roundup+CAYUSE PLUS	1+.25G	97	97	94	99	86	89
Roundup+NEW BALANCE+PENATRATE II+AMS	1+.25%+0.25%+.6%	96	92	90	99	84	92
Roundup+Induce+AMS	1+.5%+2%	97	96	95	99	88	90
Roundup+Cayuse+R-11	1+.5%+.37%	89	84	84	99	71	71
Roundup+PXT100	1+1%	92	89	88	99	83	86
Roundup+PXT100PP	1+1%	74	70	71	89	54	54
Roundup+Surfate	1+1.5%	96	96	93	99	87	89
C.V. %		4	5	5	2	9	11
LSD 5%		6	6	7	2	10	13
# OF REPS		4	4	4	4	4	4

Summary

Roundup phytotoxicity was high because conditions were moist and plants growing vigoriously at treatment. Roundup gave 90% or more control of all species at the first evaluation, except when applied with New Balance, Cayuse+R-11, PXT100, or PXT100PP. Roundup was not applied alone in this experiment, but probably would have been between 50 and 75% at the 1 oz/A rate in water with moderate calcium. Conditons were positive to glyphosate phytotoxicity reducing differences among treatments.

Nozzle size and volume with sethoxydim, Fargo 1995. Wheat, oats, and proso millet (Prmi) were seeded July 25 in adjacent strips with a 10-ft drill. Treatments were applied perpendicular to the drill strips so that each plot contained all three species. Treatments were applied August 31 using an all-terrain vehicle equipped with a 4-nozzle boom (20-inch nozzle spacing). The boom was mounted off to one side to eliminate wheel traffic in the treated area. Different carrier volumes of 5, 10, 20, or 30 gal/A were achieved by changing nozzle tip size or travel speed. At time of treatment, air temperature was 79 F, wind 10 mph, RH 35%, the sky sunny, and the soil surface dry. Wheat was 7 inches tall while oats and proso millet averaged 8 inches tall, producing a fairly open canopy. Visual estimates of percentage control were taken September 12. Plot size was 11.5 by 30 ft and the experiment was a randomized complete block with four replications.

Nozzle tip	Volume (gpa)	Velocity (mph)	Passes (no.)	Pressure (psi)	Herbicide[a]	Rate (lb/A)	Wheat (% control)	Oats (% control)	Prmi (% control)
8001	5	5	1	28	Sethoxydim+POC	0.0625+0.25G	61	72	72
8001	5	6	1	40	Sethoxydim+POC	0.0625+0.25G	66	74	75
8001	20	5	4	28	Sethoxydim+POC	0.0156+0.25G	76	81	82
8001	20	5	4	28	Sethoxydim+POC	0.0156+0.0625G	65	71	70
8002	5	10	1	28	Sethoxydim+POC	0.0625+0.25G	69	77	75
8002	10	5	1	28	Sethoxydim+POC	0.0625+0.25G	65	65	70
8004	10	10	1	28	Sethoxydim+POC	0.0625+0.25G	63	66	69
8004	20	5	1	28	Sethoxydim+POC	0.0625+0.25G	55	58	65
8006	30	5	1	28	Sethoxydim+POC	0.0625+0.25G	54	53	66
C.V. %							10	9	11
LSD 5%							9	9	NS

[a]POC = petroleum oil adjuvant containing 17% emulsifier.

Effect of application time of day on sethoxydim efficacy, Expt 1, Fargo 1995. Z. Peng and W. H. Ahrens. Wheat, oats, and proso millet (Prmi) were seeded May 30 in adjacent strips using a 10-ft-wide drill. Treatments were applied perpendicular to these strips so that each plot contained all three species. Treatments were applied June 22 with a 4-nozzle bicycle wheel sprayer equipped with 8001 tips and delivering 8.5 gal/A at 40 psi, when oats were 4.5-leaf and 4 to 5 inches tall with one tiller, wheat was 5.5-leaf and 4 to 5 inches tall with two tillers, and proso millet was 5-leaf and 4 to 5 inches tall. On June 26, the entire experiment was sprayed with 0.75 pint/A Bronate + 1 pint/A MCPA ester for broadleaf weed control. Visual estimates of percentage control were made July 6. Plot size was 11 by 30 ft and the experiment was a randomized complete block design with four replications.

Table 1. Environmental conditions at time of application.

Application time	Air temp. (F)	Dew	RH (%)	Wind speed (mph)	Sky	Growing condtion	Soil surface
9 a.m.	82	no	45	7[a]	hazy	dry	dry
3 p.m.	88	no	47	12	sunny	dry	dry
9 p.m.	78	no	66	0	partly cloudy	dry	dry
3 a.m.	69	no	90	5	cloudy	dry	dry[b]

[a]Spray shield was used.
[b]0.09 inches of rain fell approximately one half hour after application.

Table 2. Oat, wheat, and proso millet control.

Treatment[c]	Rate (lb/A)	Evaluated 7/6 Oats	Wheat	Prmi
		(%)		
Sethoxydim+POC(9am)	0.0625+0.25	85	83	94
Sethoxydim+POC(3pm)	0.0625+0.25	82	74	87
Sethoxydim+POC(9pm)	0.0625+0.25	83	80	89
Sethoxydim+POC(3am)	0.0625+0.25	15	18	74
Sethoxydim+POC+SC(9am)	0.0625+0.25+1000ppm	8	30	61
Sethoxydim+POC+SC(3pm)	0.0625+0.25+1000ppm	8	25	66
Sethoxydim+POC+SC(9pm)	0.0625+0.25+1000ppm	38	53	80
Sethoxydim+POC+SC(3am)	0.0625+0.25+1000ppm	7	8	44
Sethoxydim+Scoil(9am)	0.0625+0.188	91	84	95
Sethoxydim+Scoil(3pm)	0.0625+0.188	89	80	91
Sethoxydim+Scoil(9pm)	0.0625+0.188	85	82	94
Sethoxydim+Scoil(3am)	0.0625+0.188	35	43	77
Sethoxydim+Scoil+SC(9am)	0.0625+0.188+1000ppm	24	56	80
Sethoxydim+Scoil+SC(3pm)	0.0625+0.188+1000ppm	74	70	87
Sethoxydim+Scoil+SC(9pm)	0.0625+0.188+1000ppm	64	70	84
Sethoxydim+Scoil+SC(3am)	0.0625+0.188+1000ppm	10	12	53
C.V. %		15	17	9
LSD (5%)		10	13	10

[c]All treatments were mixed in deionized water; POC = petroleum oil adjuvant; SC = sodium bicarbonate.

Effect of application time of day on sethoxydim efficacy, Expt 2, Fargo 1995. Z. Peng and W. H. Ahrens. Wheat, oats, and proso millet (Prmi) were seeded July 25 in adjacent strips using a 10-ft-wide drill. Treatments were applied perpendicular to these strips so that each plot contained all three species. Treatments were applied August 21 with a 4-nozzle bicycle wheel sprayer equipped with 8001 tips and delivering 8.5 gal/A at 40 psi, when oats were 3 to 4-leaf and 7 to 8 inches tall with one tiller, wheat was 4-leaf and 6 to 6.5 inches tall with one tiller, and proso millet was 4.5 to 5-leaf and 5 to 6 inches tall. Visual estimates of percentage control were made August 30. Plot size was 11 by 30 ft and the experiment was a randomized complete block design with four replications.

Table 1. Environmental conditions at time of application.

Application time	Air temp. (F)	Dew	RH (%)	Wind speed (mph)	Sky	Growing condtion	Soil surface
9 a.m.	69	no	50	10	sunny	dry	dry
3 p.m.	86	no	29	5	sunny	dry	dry
9 p.m.	72	no	61	9	cloudy	dry	dry
3 a.m.	69	no	81	4	cloudy	dry	dry

Table 2. Oats, wheat, and proso millet control.

Treatment[a]	Rate (lb/A)	Evaluated 8/30 Oats	Wheat	Prmi
		(%)		
Sethoxydim+POC(9am)	0.0625+0.25	50	57	84
Sethoxydim+POC(3pm)	0.0625+0.25	60	59	96
Sethoxydim+POC(9pm)	0.0625+0.25	76	74	97
Sethoxydim+POC(3am)	0.0625+0.25	72	65	96
Sethoxydim+POC+SC(9am)	0.0625+0.25+1000ppm	10	21	56
Sethoxydim+POC+SC(3pm)	0.0625+0.25+1000ppm	16	27	71
Sethoxydim+POC+SC(9pm)	0.0625+0.25+1000ppm	30	47	83
Sethoxydim+POC+SC(3am)	0.0625+0.25+1000ppm	20	35	61
Sethoxydim+Scoil(9am)	0.0625+0.188	74	70	95
Sethoxydim+Scoil(3pm)	0.0625+0.188	79	75	98
Sethoxydim+Scoil(9pm)	0.0625+0.188	87	77	99
Sethoxydim+Scoil(3am)	0.0625+0.188	77	70	97
Sethoxydim+Scoil+SC(9am)	0.0625+0.188+1000ppm	36	46	89
Sethoxydim+Scoil+SC(3pm)	0.0625+0.188+1000ppm	46	49	96
Sethoxydim+Scoil+SC(9pm)	0.0625+0.188+1000ppm	50	53	96
Sethoxydim+Scoil+SC(3am)	0.0625+0.188+1000ppm	56	60	96
CV %		16	19	11
LSD (5%)		12	15	13

[a]All treatments were mixed with deionized water; POC = petroleum oil adjuvant; SC = sodium bicarbonate; Scoil = methylated vegetable oil containing emulsifier.

Nozzle size and spray volume with imazethapyr, Expt 1, Fargo 1995. W. H. Ahrens, J. D. Nalewaja, and M. G. Ciernia. Oats, foxtail millet (Ftmi), and proso millet (Prmi) were seeded May 30 in adjacent strips with a 10-ft drill. Plots were treated per-pendicular to the drill strips so that each plot contained all three species. Treatments were applied June 24 using an all-terrain vehicle equipped with a 4-nozzle boom (20-inch spacing). The boom was mounted off to one side to eliminate wheel traffic in the treated area. Different carrier volumes of 5, 10, 20, or 30 gal/A were achieved by changing nozzle tip size or travel speed. At time of treatment, air temperature was 67 F, wind 0-3 mph, RH 78%, and the sky partly cloudy. Oats were 5-7 inches tall and tillered, foxtail millet was 5-8 inches tall and tillered, and proso millet was 4 to 5-leaf to tillered and 5-8 inches tall. Vegetative canopy for all three species was judged to be "moderately dense". Visual estimates of percentage control were taken July 7. Plot size was 11.5 by 30 ft and the experiment was a randomized complete block with four replications.

Nozzle tip	Volume (gpa)	Velocity (mph)	Passes (no.)	Pressure (psi)	Herbicide[a]	Rate[b] (lb/A)	Oats	Ftmi	Prmi
							—(% control)—		
8001	5	5	1	28	Imazethapyr+Act90	0.03125+0.25%	31	82	69
8001	5	5	1	28	Imazethapyr+Act90	0.03125+1%	63	86	78
8001	5	5	1	28	Imazethapyr+SunitII	0.03125+0.2G	81	92	86
8001	20	5	4	28	Imazethapyr+Act90	0.00781+0.063%	44	85	71
8001	20	5	4	28	Imazethapyr+SunitII	0.00781+0.05G	50	90	82
8002	5	10	1	28	Imazethapyr+Act90	0.03125+0.25%	27	85	68
8002	5	10	1	28	Imazethapyr+SunitII	0.03125+0.2G	75	92	86
8002	10	5	1	28	Imazethapyr+Act90	0.03125+0.25%	29	88	73
8002	10	5	1	28	Imazethapyr+SunitII	0.03125+0.2G	51	89	84
8004	10	10	1	28	Imazethapyr+Act90	0.03125+0.25%	22	86	71
8004	10	10	1	28	Imazethapyr+SunitII	0.03125+0.2G	45	88	82
8004	20	5	1	28	Imazethapyr+Act90	0.03125+0.25%	25	83	67
8004	20	5	1	28	Imazethapyr+Act90	0.03125+0.063%	16	84	64
8004	20	5	1	28	Imazethapyr+SunitII	0.03125+0.2G	45	89	83
8006	30	5	1	28	Imazethapyr+Act90	0.03125+0.25%	24	86	71
8006	30	5	1	28	Imazethapyr+SunitII	0.03125+0.2G	23	86	78
C.V. %							20	4	7
LSD 5%							12	5	7

[a]Imep = imazethapyr; Act90 = Activator 90 nonionic surfactant; SunitII = methylated vegetable oil adjuvant containing emulsifier.
[b]G = gallons per acre.

Nozzle size and spray volume with imazethapyr, Expt 2, Fargo 1995. W. H. Ahrens, J. D. Nalewaja, and M. G. Ciernia. Wheat, oats, and proso millet (Prmi) were seeded July 25 in adjacent strips with a 10-ft drill. Plots were treated perpendicular to the drill strips so that each plot contained all three species. Treatments were applied August 31 using an all-terrain vehicle equipped with a 4-nozzle boom (20-inch spacing). The boom was mounted off to one side to eliminate wheel traffic in the treated area. Different carrier volumes of 5, 10, 20, or 30 gal/A were achieved by changing nozzle tip size or travel speed. At time of treatment, air temperature was 88 F, wind 1-4 mph,RH 30%, the sky sunny, and the soil surface dry. Wheat was 6 inches tall and 5 to 6-leaf, oats were 6 inches tall and 4 to 5-leaf, and proso mil-let was 3-6 inches tall with 4 to 6-leaves and 0 to 2 tillers. The vegetative cano-py for all three species was judged to be "open". Visual estimates of percentage control were taken September 8. Plot size was 11.5 by 30 ft and the experiment was a randomized complete block with four replications.

Nozzle tip	Volume (gpa)	Velocity (mph)	Passes (no.)	Pressure (psi)	Herbicide[a]	Rate[b] (lb/A)	Wheat	Oats	Prmi
							---(% control)---		
8001	5	5	1	28	Imazethapyr+Act90	0.0313+0.25%	42	30	43
8001	5	6	1	40	Imazethapyr+Act90	0.0313+0.25%	36	31	54
8001	5	5	1	28	Imazethapyr+Act90	0.0313+1%	71	52	70
8001	5	5	1	28	Imazethapyr+SunitII	0.0313+0.2G	81	65	85
8001	20	5	4	28	Imazethapyr+Act90	0.00781+0.25%	30	25	38
8001	20	5	4	28	Imazethapyr+SunitII	0.00781+0.05G	71	61	81
8002	5	10	1	28	Imazethapyr+Act90	0.0313+0.25%	27	19	40
8002	5	10	1	28	Imazethapyr+SunitII	0.0313+0.2G	75	53	80
8002	10	5	1	28	Imazethapyr+Act90	0.0313+0.25%	22	13	19
8002	10	5	1	28	Imazethapyr+SunitII	0.0313+0.2G	55	43	65
8004	10	10	1	28	Imazethapyr+Act90	0.0313+0.25%	13	11	16
8004	10	10	1	28	Imazethapyr+SunitII	0.0313+0.2G	38	31	66
8004	20	5	1	28	Imazethapyr+Act90	0.0313+0.25%	17	22	29
8004	20	5	1	28	Imazethapyr+Act90	0.0313+0.063%	9	11	48
8004	20	5	1	28	Imazethapyr+SunitII	0.0313+0.2G	16	15	38
8006	30	5	1	28	Imazethapyr+Act90	0.0313+0.25%	6	7	7
8006	30	5	1	28	Imazethapyr+SunitII	0.0313+0.2G	21	20	33
C.V. %							32	38	41
LSD 5%							17	16	27

[a]Act90 = Activator 90 nonionic surfactant; SunitII = methylated vegetable oil containing emulsifier.
[b]G = gallons per acre.

Nozzle size and spray volume with paraquat, Expt 1, Fargo 1995. W. H. Ahrens, J. D. Nalewaja, and M. G. Ciernia. Wheat, oats, and proso millet (Prmi) were seeded May 30 in adjacent strips with a 10-ft drill. Plots were treated perpendicular to the drill strips so that each plot contained all three species. Treatments were applied June 26 using an all-terrain vehicle equipped with a 4-nozzle boom (20-inch spacing). The boom was mounted off to one side to eliminate wheel traffic in the treated area. Different carrier volumes of 5, 10, 20, or 30 gal/A were achieved by changing nozzle tip size or travel speed. At time of treatment, air temperature was 74 F, wind 0-1 mph, RH 68%, and the sky sunny. Wheat was 6-8 inches tall and tillered, oats were 6-9 inches tall and tillered, and proso millet was 7-10 inches tall. Vegetative canopy for all three species was judged to be "moderately dense". Visual estimates of percentage control were taken June 29. Plot size was 11.5 by 30 ft and the experiment was a randomized complete block with four replications.

Nozzle tip	Spray volume (gal/A)	Travel speed (mph)	Passes (no.)	Spray pressure (psi)	Herbicide[a]	Rate (lb/A)	Oats	Wheat	Prmi
							—(% control)—		
8001	5	5	1	28	Paraquat+NIS	0.19+0.25%	91	85	91
8001	5	5	1	28	Paraquat+NIS	0.19+1%	93	87	92
8001	20	5	4	28	Paraquat+NIS	0.0469+0.063%	85	83	91
8002	5	10	1	28	Paraquat+NIS	0.19+0.25%	91	85	92
8002	10	5	1	28	Paraquat+NIS	0.19+0.25%	89	88	93
8004	10	10	1	28	Paraquat+NIS	0.19+0.25%	89	87	93
8004	20	5	1	28	Paraquat+NIS	0.19+0.25%	90	88	93
8004	20	5	1	28	Paraquat+NIS	0.19+0.063%	80	82	94
8006	30	5	1	28	Paraquat+NIS	0.19+0.25%	89	89	94
C.V. %							3	3	2
LSD 5%							4	3	NS

[a]NIS = Activator 90 nonionic surfactant.

Nozzle size and spray volume with paraquat, Expt 2, Fargo 1995. W. H. Ahrens, J. D. Nalewaja, and M. G. Ciernia. Wheat, oats, and proso millet (Prmi) were seeded July 25 in adjacent strips with a 10-ft drill. Plots were treated perpendicular to the drill strips so that each plot contained all three species. Treatments were applied August 23 using an all-terrain vehicle equipped with a 4-nozzle boom (20-inch spacing). The boom was mounted off to one side to eliminate wheel traffic in the treated area. Different carrier volumes of 5, 10, 20, or 30 gal/A were achieved by changing nozzle tip size or travel speed. At time of treatment, air temperature was 81 F, wind 10 mph, RH 40%, the sky sunny, and the soil surface very dry. Wheat was 7 inches tall while oats and proso millet averaged 8 inches tall. Vegetative canopy for all three species was judged to be light or "open". Visual estimates of percentage control were taken September 30. Plot size was 11.5 by 30 ft and the experiment was a randomized complete block with four replications.

Nozzle tip	Spray volume	Travel speed	Passes	Spray pressure	Herbicide[a]	Rate	Wheat	Oats	Prmi
	(gal/A)	(mph)	(no.)	(psi)		(lb/A)	—(% control)—		
8001	5	5	1	28	Paraquat+R11	0.125+0.25%	81	81	99
8001	5	6	1	40	Paraquat+R11	0.125+0.25%	83	83	99
8001	5	5	1	28	Paraquat+R11	0.125+1%	82	67	97
8001	20	5	4	28	Paraquat+R11	0.0313+0.25%	63	50	98
8002	5	10	1	28	Paraquat+R11	0.125+0.25%	79	79	99
8002	10	5	1	28	Paraquat+R11	0.125+0.25%	61	62	97
8004	10	10	1	28	Paraquat+R11	0.125+0.25%	65	66	99
8004	20	5	1	28	Paraquat+R11	0.125+0.25%	56	58	99
8004	20	5	1	28	Paraquat+R11	0.125+0.063%	45	54	99
8006	30	5	1	28	Paraquat+R11	0.125+0.25%	36	30	96
C.V. %							20	19	2
LSD 5%							19	17	NS

[a]R11 = nonionic surfactant.

Rotational crop response to sulfentrazone, Fargo 1995. (Zollinger and Dexter) An experiment was conducted to evaluate response of rotational crops planted one year following sulfentrazone application. Treatments were applied May 25, 1994 with 68 F, 50% RH, 75% cloudy sky, and 3-9 mph wind. PPI treatments were incorporated immediately after application with a small tractor mounted roto-tiller set at 1 to 1.5 inches. 'P3751' corn, 'Interstate 7000' sunflower, 'Ach196' sugarbeet was seeded May 26, 1995 and '2371' hard red spring wheat, 'Foster' barley, 'Topaz' rape, and 'Meyer' crambe was seeded May 29, 1995. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment was a randomized complete block design with four replicates/treatment.

		July 10, 1995						
Treatment[a]	Rate	Snfl	Corn	Sgbt	Wht	Brly	Rape	Crambe
	lb/A	% injury						
PPI								
Sulfentrazone	0.38	0	0	10	0	0	5	60
Sulfentrazone	0.76	0	0	75	0	0	11	70
PRE								
Sulfentrazone	0.38	0	0	10	0	0	5	53
Sulfentrazone	0.76	0	0	73	0	0	46	61
Untreated		0	0	0	0	0	0	0
LSD (0.05)		NS	NS	24	NS	NS	14	3
C.V. %		0	0	26	0	0	26	3

[a]Sulfentrazone (trade name is Authority) is a product under development from FMC.

No sunflower, corn, hard red spring wheat, or barley injury was observed two years after Authority application and up to 75% sugarbeet, 46% rape, and 70% crambe injury was observed two years after Authority application. Authority at 0.38 lb/A is the projected labeled rate and 0.76 lb/A is twice the labeled projected rate.

Crop Management Systems at Dickinson, North Dakota in 1995. Cathy A. Morton, John D. Nalewaja, Calvin G. Messersmith, and Patrick M. Carr. A long-term cropping systems experiment was established in the fall of 1992 to determine the effect of conventional, no-till, and sustainable systems on weed development and crop production at Dickinson, North Dakota. There are three crop production systems, and these are the results for the second year after establishment. All three crop production systems use wheat-silage corn-fallow rotation; the silage corn in the sustainable system is seeded with sweetclover in the rows for green manure in the fallow season. Each crop is included every year for each system for a total of nine treatments, i.e. three cropping systems and three crops each year. Indianhead black lentils were planted in the fallow sustainable plots in the spring 1995 after disking down the sunflower stalks, because the sweetclover did not overwinter.

Weed control in the conventional system is tillage before seeding, postemergence herbicides in crops, and field cultivations in fallow. No-till system relies upon postemergence herbicides for weed control in all phases of the rotation. Weed control for the sustainable system was limited use of postemergence herbicides in wheat and was row cultivation in silage corn interseeded with sweetclover. A 75 lb N/A credit was given in the spring of 1995 for the green manured sweetclover.

Soil core samples were taken in the fall of 1995 for moisture and fertility (N, P, and K) analysis. Soil moisture (4-foot depth), soil nitrogen (4-foot depth), soil phosphorus (6-inch depth), and soil potassium (6-inch depth) were similar for the three management systems in silage corn; however, there were a few differences among the three management systems in wheat and fallow (data not shown). Soil moisture and soil nitrogen was greater in conventional fallow than the no-till and sustainable fallow plots. Soil potassium was less in the sustainable wheat than the conventional and no-till wheat.

Surface residue was determined using the Soil Conservation Service string-bead method. Tillage was not done postharvest in wheat in 1994, so fall residue values are similar for management system (Table 1). The no-till silage corn plots postharvest and in the early spring had more surface residue than the conventional and sustainable systems due to the high wheat residue remaining from the wheat grown in 1993. Wheat stubble from 1994 was about 80% at early 1995 spring preplant for management systems. Wheat, silage corn and fallow residue was similar between fall and early spring preplant evaluations.

Seedbeds in the conventional and sustainable systems were prepared for wheat with one pass of a field cultivator at the 4-inch depth and silage corn with one pass of a tandem disk at the 4-inch depth. The tillage operations for wheat and silage corn reduced surface residue measured after planting (postplant) compared to the no-till system (Table 1). The planting operation for the no-till treatment only caused a small reduction of cover. The no-till silage corn grown on 1994 wheat had 68% cover postplant in 1995. The no-till fallow plots had 50% ground cover in 1995 due to the high wheat residue from 1993 plus silage corn residue from 1994. Tillage was not done postharvest in wheat and silage corn in 1995, so fall residue values are similar for those crops regardless of management system.

Crop yield, weed species, and weed density were determined before planting, before postemergence herbicide application, and preharvest (Table 2). Weed density varied with crop and crop management practice. The predominant weeds at planting were fairy candelabra, Russian thistle, flixweed, wild buckwheat, and greenflower pepperweed at 10 to 97 plants per square yard. The most abundant weed species at preharvest were

barnyardgrass, redroot pigweed, green foxtail, prostrate pigweed, and Russian thistle.

Weed populations were three and a half times higher in 1995 than in 1994 before seedbed preparation (data not shown). Thus preplant tillage or herbicide burndown treatment was a required component of weed control in 1995. However, the herbicide burndown treatment for the no-till system that was planned between planting and wheat emergence could not be applied, so weeds were more abundant after crop emergence than in the other systems which caused early season competition (Table 2). Unfortunately, preplant weed density in no-till wheat was almost double that of the conventional or sustainable system. However, at time of postemergence herbicide application the conventional and sustainable cultivated wheat with cultivated seedbed had over 900 weeds per square yard compared to the 226 weeds per square yard in the no-till wheat.

Weed density was less before herbicide treatment and before harvest in no-till wheat and silage corn compared to conventional or sustainable management systems (Table 2). Weed density did not correlate with wheat or silage corn yields. Wheat and silage corn yields were similar regardless of management system. However, wheat kernel moisture was higher for the no-till system compared to the conventional and sustainable system which tends to indicate delayed crop maturity (data not shown). Delayed maturity of wheat may have been from early season weed competition.

No-till wheat had a wider range of weed species and a more uniform population distribution than the conventional and sustainable systems (data not shown). Twenty-one weed species were present in the no-till wheat at preharvest, whereas conventional wheat had 7 weed species and sustainable wheat had 13 weed species. Russian thistle in wheat was more abundant in no-till ($21/yd^2$) than conventional ($0/yd^2$) or sustainable ($2/yd^2$) systems at preharvest. Barnyardgrass and green foxtail made up half of weeds present in the conventional and sustainable systems for wheat at preharvest.

Weeds in the sustainable fallow were disked under before drilling in Indianhead black lentils. However, high densities ($1258/yd^2$) of many weed species grew in the lentil crop, and lentils were green manured earlier than desired due to the high weed population. More Russian thistle, fairy candelabra, kochia, and common lambsquarters plants were present before herbicide treatment in no-till fallow than conventional or sustainable fallow before tillage, but barnyardgrass densities were the least in no-till fallow. No redroot pigweed or prostrate pigweed developed in no-till fallow. Weed density before final herbicide treatment in no-till fallow was less than before the final tillage in conventional or sustainable fallow, and all management systems effectively reduced weed density in fallow by the end of season.

The unpredictability of sweetclover establishment may limit it as a major component of the sustainable system. Sweetclover established well in 1993 row crops and overwintered well for good growth in 1994. However, the sweetclover did not establish in the row crop in 1994 or in 1995, probably because of inadequate rainfall after planting. Indianhead black lentil, an annual legume with large seeds, was selected as the green manure crop to replace the sweetclover in the sustainable fallow plots in 1995. The lentils established early, were green manured earlier than desired due to the high weed population. Consideration is being given to not interseed the sweetclover within the silage corn rows so that 2,4-D amine can be used to assist row cultivation to control the high weed populations that develop in the crop and continue using the Indianhead black lentils in the fallow season.

Table 1. Effects of crop management practices on surface residue for three crops in Dickinson, ND in 1994 and 1995.

Time of residue sample 1994 crop	1995 crop	Conventional	No-till	Sustainable[a]	LSD 5%
		% cover			
Postharvest 1994:					
Fallow		6	17	6	NS
Wheat		71	82	77	NS
Silage corn		56	97	49	24
Overwinter - Preplant 1995:					
Fallow -	Wheat	1	10	6	9
Wheat stubble -	Silage corn	82	80	80	NS
Silage corn -	Fallow	43	90	36	19
Postplant 1995:	Wheat	0	6	2	4.2
	Silage corn	19	68	18	12
	Fallow	11	79	8	7
Postharvest 1995:	Wheat	99	99	99	NS
	Silage corn	47	62	53	NS
	Fallow	30	50	17	8

[a]Indianhead black lentils were planted in the fallow sustainable plots in the spring 1995 for green manure in the fallow season, because the sweetclover did not overwinter.

Table 2. Effects of crop management practices on weed density and crop dry yield for three crops in Dickinson, ND in 1995.

Crop	Time	Conventional	No-till	Sustainable[a]	LSD 5%
Weed density (no./yd^2):					
Wheat	Preplant -	68	115	50	NS
	Pretreatment -	915	226	971	636
	Preharvest -	115	87	139	NS
Silage corn	Preplant -	277	278	384	NS
	Pretreatment -	172	79	198	70
	Preharvest -	2	1	4	NS
Fallow	Preplant -	-	-	144	-
	Pretreatment -	270	601	1258	551
	Second treatment -	44	46	-	NS
	Preharvest -	131	32	254	88
Dry yield:					
Wheat (bu/A)		30.3	31.5	35.3	NS
Silage corn (ton/A)		1.4	1.0	1.4	NS

[a]Indianhead black lentils were planted in the fallow sustainable plots in the spring 1995 for green manure in the fallow season, because the sweetclover did not overwinter.

Crop Management Systems at Fargo, North Dakota in 1995. Cathy A. Morton, John D. Nalewaja, Calvin G. Messersmith, and Erick O. Grafstrom. A long-term cropping systems experiment was established in the fall of 1992 to determine the effect of conventional, no-till, and sustainable systems on weed development and crop production at Fargo, North Dakota. There are three crop production systems, and these are the results for the second year after establishment. Conventional and no-till crop production systems use wheat-soybean rotation and each crop is included every year for each system for a total of four treatments. Weed control in the conventional system is tillage before planting with pre- and/or postemergence herbicides for weed control. No-till system relies upon postemergence herbicides for weed control in all phases of the rotation.

The sustainable cropping systems is a wheat-sweetclover-rye-soybean rotation for four more treatments. The sweetclover in the sustainable system is drilled after wheat harvest and allowed to grow into the early part of the following year before undercutting and disking under, then winter rye is seeded that fall and harvested the following year. Weed control for the sustainable system was limited use of postemergence herbicides in wheat, rye, and soybean. Soybean was planted in 30-inch rows in the sustainable system to utilize row cultivation whereas the other two management systems had drilled soybean. A 75 lb N/A credit was given in the spring of 1995 for the green manured sweetclover.

Soil core samples were taken in the spring of 1995 for moisture and fertility (N, P, and K) analysis. Soil moisture (4-foot depth), soil nitrogen (4-foot depth), soil phosphorus (6-inch depth), and soil potassium (6-inch depth) were similar for the three management systems in wheat; however, there were a few differences among the three management systems in soybean (data not shown). Soil nitrogen was twice as great in no-till soybean than the conventional and sustainable soybean. Soil potassium was less in the conventional soybean than the sustainable soybean and no-till soybean was similar to both systems.

Surface residue was determined using the Soil Conservation Service string-bead method. Postharvest residue results in 1994 were similar for the three management systems in wheat and soybean (Table 1). Surface residue measured preplant and postplant for wheat in 1994 are similar regardless of management system because there was no fall tillage after soybean harvest. Planting operations and herbicide applications to the no-till treatment reduced cover 40% for wheat and more than 25% for soybean. No-till had more wheat stubble than conventional and sustainable systems after planting soybeans. The soybean seedbed for the conventional and sustainable systems were field cultivated 2 to 3 inches deep and harrowed, both of those soybean systems had less surface residue than the no-till system. Sweetclover and rye were already established in the sustainable system at time of midspring surface residue determination, thus not measured.

In 1995, postharvest wheat stubble in the no-till system and rye stubble after the 30-inch V-blade undercutting operation in the sustainable system retained more surface residue than undercutting and disking wheat stubble in the sustainable system. All of which retained more surface residue than conventional wheat. Sweetclover was green manured with an undercutter and a disk, which retained more surface residue than the previous year's kill of sweetclover and weeds with four diskings. Postharvest soybean residue was greater in the no-till and sustainable systems than the conventional system.

Crop yield for all management systems may have been reduced by the late planting because of wet conditions, extremely wet field conditions throughout the season, and presence of

many weeds especially in the sustainable system. Wheat yield was low because of head blight, vomitoxin averaged 2.5 ppm and was similar for the three systems. Wheat and soybean yields were greater in the conventional and no-till systems than the sustainable system (Table 2). Similarly, wheat kernel moisture was and soybean moisture tended to be greater for the sustainable system compared to the conventional and no-till systems which indicated delay in crop maturity or moisture from green weeds present at harvest.

Reduced yields and increased crop moisture of wheat in the sustainable system corresponded to weed density, especially the high density of green and yellow foxtail, redroot pigweed, common lambsquarters, kochia, and Canada thistle pretreatment (Table 2). Foxtail species and Canada thistle remained high in the sustainable wheat plots at harvest. Sustainable plot crops treatments were limited to postemergence nonresidual herbicides and cultivation. Sustainable wheat was treated twice with phenoxys, while conventional and no-till wheat received clopyralid and 2,4-D amine for Canada thistle control. Due to the dense kochia population in the no-till wheat, tribenuron was added to the tankmix of clopyralid and 2,4-D amine.

After wheat harvest in the sustainable system in 1994, the ground was disked and sweetclover was drilled; however, only fifty percent of the ground had crop cover. Sweetclover seed was drilled into standing crop in early spring, and undercut and disked twice to green manure in mid summer. The sweetclover, drilled in fall of 1995 after disking wheat stubble, established well.

Trends for reduced yields and increased crop moisture of soybean in the sustainable management system corresponded to weed density, especially the high density of Canada thistle that competed season-long and the early season competition from green and yellow foxtail which was later controlled with imazethapyr. This was the second year of the rotation and weeds were beginning to differentiate treatments. The most difficult decision was the amount and type of herbicides to be included in the sustainable system to help differentiate it from the conventional.

Table 1. Effects of crop management practices on surface residue for four crops in Fargo, ND in 1994 and 1995.

Time of residue sample					
1994 crop	1995 crop	Conventional	No-till	Sustainable[a]	LSD 5%
		% cover			
Postharvest 1994:					
Soybean		77	88	84	NS
Rye		-	-	25	-
Clover		-	-	4	-
Wheat		48	73	42	NS
Overwinter - Preplant 1995:					
Soybean -	Wheat	70	70	64	NS
Wheat or rye -	Soybean	61	86	27	11
Clover -	Rye	-	-	6	-
Wheat -	Clover	-	-	72	-
Postplant 1995:	Wheat	11	30	17	3
	Soybean	24	59	30	7
	Rye	-	-	-	-
	Clover	-	-	-	-
Postharvest 1995:	Wheat	47	99	63	10
	Soybean	67	82	60	19
	Rye	-	-	93	-
	Clover	-	-	53	-

[a]The sustainable management system has drilled sweetclover and rye crops. Both crops overwinter, sweetclover is undercut and disked under as green manure in the clover year and rye is taken to yield.

Table 2. Effects of crop management practices on weed density and crop dry yield for four crops in Fargo, ND in 1995.

Crop	Time	Conventional	No-till	Sustainable[a]	LSD 5%
Weed density (no./yd^2):					
Wheat	Preplant -	56	163	327	NS
	Pretreatment -	59	99	734	452
	Preharvest -	61	49	90	14
Clover	Pretreatment -	-	-	37	-
	Preharvest -	-	-	110	-
Rye	Pretreatment -	-	-	57	-
	Preharvest -	-	-	565	-
Soybean	Preplant -	158	45	279	167
	Pretreatment -	68	85	297	62
	Preharvest -	36	32	44	NS
Preharvest foxtail species density (no./yd^2):					
Wheat		29	23	49	16
Clover		-	-	81	-
Rye		-	-	537	-
Soybean		1	1	1	NS
Dry yield:					
Wheat (bu/A)		22.1	20.2	3.7	3.2
Clover (ton/A)		-	-	1.8	-
Rye (bu/A)		-	-	36.0	-
Soybean (bu/A)		21.5	19.2	12.5	5.4
Crop moisture (%):					
Wheat		16.7	16.7	35.5	4.7
Clover		-	-	66.3	-
Rye		-	-	11.6	-
Soybean		10.0	10.6	11.3	1.9

[a]The sustainable management system has drilled sweetclover and rye crops. Both crops overwinter, sweetclover is undercut and disked under as green manure in the clover year and rye is taken to yield.

Crop Management Systems at Minot, North Dakota in 1995. Cathy A. Morton, John D. Nalewaja, Calvin G. Messersmith, and Mark Zarnstorff. A long-term cropping systems experiment was established in the fall of 1992 to determine the effect of conventional, no-till, and sustainable systems on weed development and crop production at Minot, North Dakota. There are three crop production systems, and these are the results for the second year after establishment.

All three crop production systems use a wheat-sunflower-fallow rotation; the sunflower in the sustainable system is seeded with sweetclover in the rows for green manure in the fallow season. Indianhead black lentils were planted in the fallow sustainable plots in the spring 1995 after disking down the sunflower stalks, because the sweetclover did not overwinter. Each crop is included every year for each system for a total of nine treatments, i.e. three cropping systems and three crops each year. Weed control in the conventional system is tillage before seeding, postemergence herbicides in crops, and field cultivations in fallow. No-till system relies upon postemergence herbicides for weed control in all phases of the rotation. Weed control for the sustainable system was limited use of postemergence herbicides in wheat and was row cultivation in sunflower with sweetclover. A 75 lb N/A credit was given in the spring of 1995 for the green manured sweetclover.

Soil core samples were taken in the fall of 1995 for moisture and fertility (N, P, and K) analysis. Soil moisture (4-foot depth), soil nitrogen (4-foot depth), soil phosphorus (6-inch depth), and soil potassium (6-inch depth) were similar for the three management systems in wheat, sunflower, or fallow (data not shown).

Surface residue was determined using the Soil Conservation Service string-bead method. The no-till system had more surface residue than sustainable systems, and both systems had more surface residue than the conventional system at postharvest 1994 (Table 1).

Seedbed for wheat in the conventional and sustainable systems were field cultivated at the 2 to 3 inch depth followed by a drag harrow, which reduced surface residue measured after planting (Table 1). Seedbed preparation for wheat and sunflower reduced surface residue more in the conventional and sustainable systems than the no-till system. The wheat and sunflower planting operations and herbicide applications to the no-till system only caused a small reduction of cover. Seedbed for sunflower in the conventional system was treated with Sonalan 10G granules (ethalfluralin at 1 lb ai/A) and incorporated twice at the 2 to 3 inch depth. Seedbed for sunflower in the no-till and sustainable systems was treated with Prowl at 3.6 pt/A (pendimethalin at 1.5 lb ai/A) two weeks prior to planting. Due to the high weed pressure at planting, weeds were controlled with Roundup RT Shuttle 100 at 1.25 qt/A (0.94 glyphosate lb ae/A) plus AMS at 1% v/v before crop emergence in the no-till system and weeds were disked with one pass at the 2 to 3 inch depth in the sustainable system.

Postharvest residue in 1995 was more than 90% for the no-till system, which was greater than for conventional and the sustainable systems. The conventional and sustainable wheat plots had similar residue. The sunflower and fallow plots for the conventional system had less surface residue than the sustainable plots.

In addition to surface residue, data collected were crop yield, weed species, and weed density before planting, before postemergence herbicide application, and preharvest (Table 2). Weed density varied with crop and crop management practice. The most abundant weed species at time of planting were common lambsquarters, field pennycress, shepherdspurse, common dandelion, and fairy candelabra; at time of postemergence treatment counts were prostrate pigweed, shepherdspurse, Russian thistle, common lambsquarters, and western ragweed; at time of preharvest counts were common dandelion, Canada thistle, kochia, volunteer wheat, and perennial sowthistle. The preharvest weeds were greatest in the sustainable system for wheat, but least in the sustainable system for sunflower.

Wheat yields were greater in the conventional and sustainable systems than the no-till system (Table 2). The reduced yield for the no-till wheat may be due to the combination of surface residue and weed species/density. The high surface residue probably gave poor wheat seed-to-soil contact and reduced soil temperature in spring. Western ragweed, Canada thistle and common dandelion densities were greatest in the no-till wheat system than the conventional and sustainable wheat systems, although total weed density was the least in the no-till wheat system than the conventional and sustainable wheat systems (data not shown). Postemergence weed control for wheat in the conventional system was Harmony Extra at 0.33 oz/A (thifensulfuron + tribenuron at 0.15 + 0.075 oz ai/A) plus Weedone 638 at 0.53 pt/A (2,4-D ester at 0.38 lb ae/A); in the no-till system Curtail at 2 pt/A (clopyralid at 0.09 lb ai/A + 2,4-D amine at 0.5 lb ae/A) for Canada thistle control; and in the sustainable system 2,4-D amine at 1.05 pt/A (0.5 lb ae/A). Postemergence herbicide controlled the weeds, so that at harvest weed densities were quite low and similar for the three systems.

Sunflower yield was equal for sustainable and conventional systems, but 50% lower in no-till. The low sunflower yield in no-till related to the delayed crop emergence and development. Greater than 30% surface residue remained after the no-till sunflower planting operation compared to less than 5% in the conventional and sustainable systems. The high wheat residue in the no-till system probably gave poor sunflower seed-to-soil contact and/or cooler soil temperatures early season compared to the conventional and sustainable systems.

The unpredictability of sweetclover establishment may limit it as a major component of the sustainable system. Sweetclover established well in 1993 row crops and overwintered well for good growth in 1994. However, the sweetclover did not establish in the row crop in 1994 or in 1995, probably because of inadequate rainfall after planting. We will need to replant a spring legume cover crop in 1996. Indianhead black lentil, an annual legume with large seeds, was selected as the green manure crop to replace the sweetclover in the sustainable fallow plots in 1995. The lentils established early, were green manured earlier than desired due to the high weed population.

Table 1. Effects of crop management practices on surface residue for three crops in Minot, ND in 1994 and 1995.

Time of residue sample 1994 crop	1995 crop	Conventional	No-till	Sustainable[a]	LSD 5%
		% cover			
Postharvest 1994:					
Fallow		18	43	37	16
Wheat		52	78	63	9
Sunflower		38	93	57	10
Overwinter - Preplant 1995:					
Fallow -	Wheat	7	50	21	38
Wheat stubble -	Sunflower	48	93	77	29
Sunflower -	Fallow	21	93	38	20
Postplant 1995:	Wheat	2	34	4	8
	Sunflower	15	53	22	23
	Fallow	3	75	5	9
Postharvest 1995:	Wheat	78	96	80	10
	Sunflower	33	96	48	8
	Fallow	10	91	20	9

[a]Indianhead black lentils were planted in the fallow sustainable plots in the spring 1995 for green manure in the fallow season, because the sweetclover did not overwinter.

Table 2. Effects of crop management practices on weed density and crop dry yield for three crops in Minot, ND in 1995.

Crop	Time	Conventional	No-till	Sustainable[a]	LSD 5%
Weed density (no./yd^2):					
Wheat	Preplant -	100	94	221	NS
	Pretreatment -	813	78	498	341
	Preharvest -	47	42	62	NS
Sunflower	Preplant -	45	73	61	NS
	Replant -	-	115	157	NS
	Pretreatment -	48	-	38	NS
	Preharvest -	47	55	35	15
Fallow	Preplant -	-	-	135	-
	Pretreatment -	335	347	120	NS
	Second treatment -	44	105	58	NS
	Preharvest -	63	61	63	NS
Dry yield:					
Wheat (bu/A)		33.2	22.9	37.7	8.0
Sunflower (ton/A)		0.34	0.18	0.34	NS

[a]Indianhead black lentils were planted in the fallow sustainable plots in the spring 1995 for green manure in the fallow season, because the sweetclover did not overwinter.

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 applied with 2,4-D at 0.4 + 0.6 lb/A 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 brome with occasional wheatgrass. Visual evaluations were based on percent stand reduction as compared to the control.

Glyphosate plus 2,4-D generally provided better long-term leafy spurge control then picloram plus 2,4-D after a single application. Glyphosate plus 2,4-D at 0.4 + 0.6 lb/A averaged 90% leafy spurge control 3 months after treatment (MAT) when applied alone or with the adjuvant X-77 (Table 1). Control with picloram or picloram plus 2,4-D averaged over application rate was 78% at Valley City. Grass injury only averaged 12% with glyphosate plus 2,4-D and was similar whether applied alone or with X-77. Leafy spurge control was similar when picloram was applied with glyphosate plus 2,4-D compared to glyphosate plus 2,4-D applied alone. In general, glyphosate alone provided less leafy spurge control then glyphosate plus 2,4-D.

Leafy spurge control with glyphosate plus 2,4-D still averaged 71% 12 MAT at Valley City and was much better then either picloram plus 2,4-D treatment that only averaged 31% (Table 1). Control was similar with glyphosate whether applied alone or with 2,4-D or picloram but grass injury tended to be higher with glyphosate plus X-77 compared to glyphosate plus 2,4-D. Control gradually declined by 24 MAT. However, treatments that included glyphosate or glyphosate plus 2,4-D averaged 58% control compared to only 6% with picloram or picloram plus 2,4-D.

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, but better long-term control 12 MAT in the first year of a rotational program (Table 2). Grass injury averaged 15% with glyphosate plus 2,4-D at 0.4 + 0.6 lb/A 3 MAT, 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. Control was similar regardless of treatment 15 months after the first treatment (MAFT) (data not shown).

Control was better at Valley City than Jamestown 24 MAFT and averaged 76% and 47%, respectively, over all treatments (Table 2). 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 97% or higher with all treatments at Valley City 27 MAFT but varied at Jamestown. The best treatments at Jamestown were picloram plus 2,4-D or dicamba applied 3 yr in a row or following glyphosate plus 2,4-D plus picloram. Grass injury increased when glyphosate was applied alone or with 2,4-D for the second or third time and averaged 6% and 17% at Jamestown and Valley City, respectively.

A second series of experiments was established to further evaluate glyphosate plus 2,4-D alone at reduced application 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 treatment.

In general, control was less in 1995 than in previous years regardless of treatment (Tables 1,2, and 3). For instance, control with glyphosate plus 2,4-D was 93% 3 MAT in 1993 averaged over all locations (Tables 1 and 2), but only 63% in 1995 (Table 3). Control also was lower for the picloram plus 2,4-D and dicamba treatments which averaged 78% in 1993, but only 49% in 1995. The reason for the reduced control may be due to air temperature at application. The air temperature ranged from 72 to 83 during application in 1995 and quickly warmed to the upper 80s to 90s 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 leav es and stems in the upper portions, but had green stems nearer the surface. New growth emerged from the greem stems approximately 6 weeks after treatment. In the previous experiments the stem tissue had been killed to the soil surface.

Glyphosate plus 2,4-D averaged 77% 3 MAT at Ekre and Fort Ransom which was better than the picloram plus 2,4-D or dicamba treatments which only averaged 56%. However, glyphosate plus 2,4-D averaged only 48% at Jamestown and was similar to picloram plus 2,4-D and dicamba. Glyphosate alone did not control leafy spurge. 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 the grass species most frequently injured and bluegrass was not injured from these treatments at any location.

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 then 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. Glyphosate plus auxin herbicide combinations for leafy spurge control applied in late June 1993 at Valley City, North Dakota.

Treatment	Rate	3 MAT		12 MAT		15MAT	24 MAT
		Control	Grass injury	Control	Grass injury	Control	Control
	lb/A	%					
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	94	17	73	0	65	52
Glyphosate+2,4-D[b]+picloram+X-77	0.3+0.45+0.19+0.5%	89	7	71	0	79	50
Glyphosate+2,4-D[b]+picloram+X-77	0.4+0.6+0.25+0.5%	92	7	70	0	59	51
Glyphosate+picloram+X-77	0.4+0.25+0.5%	79	9	77	0	63	56
Glyphosate+2,4-D[b]	0.4+0.6	88	10	74	0	75	60
Glyphosate+2,4-D[b]	0.3+0.45	89	10	66	0	69	52
Glyphosate+X-77	0.4+0.5%	70	20	83	15	73	67
Glyphosate	0.4	63	11	86	6	77	54
Glyphosate+X-77	0.3+0.5%	64	14	86	8	75	66
Picloram	0.25	63	4	20	0	13	3
Picloram+2,4-D	0.25+1	83	0	33	0	26	11
Picloram+2,4-D	0.5+1	87	3	41	0	31	5
LSD (0.05)		12	6	22	10	27	22

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

Table 2. Glyphosate plus 2,4-D treatments alternated with auxin herbicides over 3 years applied in late June at two locations in North Dakota.

1993 and 1995		1994		3 MAT[a]		12 MAT[a]		24MAT[a]	27 MAT[a]	
Treatment	Rate	Treatment	Rate	Control	Grass injury	Control	Grass injury	Control	Control	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%	88	18	47	0	48	57	13
Gly+2,4-D[b]+X-77	0.4+0.6+0.5%	Picloram+2,4-D	0.25+1	90	12	59	0	54	58	3
Gly+2,4-D[b]+X-77	0.4+0.6+0.5%	Dicamba+X-77	2+0.5%	94	11	68	0	53	55	1
Picloram+2,4-D	0.25+1	Picloram+2,4-D	0.25+1	60	0	23	0	27	73	0
Dicamba+X-77	2+0.5%	Dicamba+X-77	2+0.5%	76	0	22	0	32	79	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%	97	8	65	0	61	86	0
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Picloram+2,4-D	0.25+1	97	15	69	0	44	92	11
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Dicamba+X-77	2+0.5%	98	11	65	0	53	93	8
LSD (0.05)				13	7	18		NS	21	10
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%	94	16	88	0	67	98	16
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Picloram+2,4-D	0.25+1	97	16	94	5	81	97	16
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Dicamba+X-77	2+0.5%	97	16	93	0	89	98	18
Picloram+2,4-D	0.25+1	Picloram+2,4-D	0.25+1	89	1	43	0	70	99	0
Dicamba+X-77	2+0.5%	Dicamba+X-77	2+0.5%	80	3	30	0	71	97	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%	98	11	91	0	81	99	19
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Picloram+2,4-D	0.25+1	96	9	80	0	68	99	14
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Dicamba+X-77	2+0.5%	93	12	86	0	84	99	17
LSD (0.05)				8	9	17	3	NS	NS	9

[a]MAT = months after treatment (only received the first treatment by this date); MAFT = months after first treatment (one and two annual retreatments had been applied by 24 and 27 MAFT, respectively.

[b]Glyphosate + 2,4-D was a commercial formulation - Landmaster BW.

[c]Picloram.

Table 3. Leafy spurge control 3 months after treatment with herbicide treatments applied in just three locations in North Dakota.

Treatment	Rate	Ekre and Ft. Ransom		Jamestown	
		Control	Grass injury[a]	Control	Grass injury
	— lb/A —		%		
Glyphosate + 2,4-D[b]	0.4 + 0.6	73	28	50	23
Glyphosate + 2,4-D[b]	0.4 + 0.6	80	26	43	6
Glyphosate + 2,4-D[b]	0.4 + 0.6	77	31	52	11
Picloram + 2,4-D	0.25 + 1	55	0	40	0
Dicamba	2	57	3	42	0
Picloram + 2,4-D	0.5 + 1	52	0	50	0
Glyphosate	0.4	9	11	0	7
Glyphosate	0.4	8	8	5	1
Glyphosate + 2,4-D[b]	0.3 + 0.46	70	19	45	8
Glyphosate + 2,4-D[b]	0.2 + 0.3	66	10	19	4
LSD (0.05)		13	12	27	15[c]

[a]Grass injury from the Ekre location only, no grass injury was observed at Ft. Ransom.
[b]Commercial formulation - Campaign.
[c]LSD is at (0.10).

Leafy spurge control with quinclorac applied with various adjuvants for 3 years. Rodney G. Lym. Quinclorac is an auxin-type herbicide with moderate soil residual. Previous greenhouse research at North Dakota State University has shown that quinclorac will injure leafy spurge and may be more effective when applied with a seed-oil adjuvant rather than alone. The purpose of this research was to evaluate quinclorac applied alone and in combination with picloram or various spray adjuvants as an annual retreatment.

The experiment was established near West Fargo on September 14, 1990, when leafy spurge was in the fall regrowth stage, and 20 to 30 inches tall with 2 to 3 inch long new fall growth on stems. Retreatments were applied on approximately the same date in 1991 and 1992. Herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The plots were 10 by 30 ft 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 and continued for 36 months after the third annual application. Previous research has shown that quinclorac provided the best leafy spurge control when fall-applied.

Treatment[a]	Rate	Evaluation date						
		June 1991	June 1992	June 1993	Sept 1993	Sept 1994	June 1995	Sept 1995
	— lb/A —	% control						
Quinclorac+BAS-090	1+1 qt	90	93	99	92	90	82	66
Quinclorac+Scoil	1+1 qt	74	95	99	94	81	79	71
Quinclorac	1	49	82	89	59	31	14	3
Quinclorac+picloram	1+0.5	85	97	97	94	93	94	82
Quinclorac+picloram+BAS-090	1+0.5+1 qt	91	99	99	97	97	92	83
Picloram+2,4-D	0.5+1	81	92	94	90	84	86	76
Picloram+2,4-D+Scoil	0.5+1+1 qt	43	69	92	61	63	60	50
Picloram+2,4-D+BAS-090	0.5+1+1 qt	57	83	94	73	68	79	58
Picloram+Scoil	0.5+1 qt	71	82	95	60	63	71	45
Picloram	0.5	60	84	96	81	79	82	62
LSD (0.05)		28	14	6	28	22	20	21

[a]Treatments applied annually in September of 1990, 1991, and 1992.

Quinclorac either alone or with Scoil provided better leafy spurge control in June 1992 following a second application compared to June 1991 (Table). Leafy spurge control in June 1993 following a third application averaged 92% or better with all treatments except when quinclorac was applied alone. Quinclorac at 1 lb/A plus BAS-090 or the methylated-seed-oil adjuvant Scoil provided better long-term leafy spurge control than quinclorac applied alone. Control in September 1994, which was 24 months after the third annual treatment averaged 90% with quinclorac plus an adjuvant and/or picloram but only 31% when quinclorac was applied alone.

Control from all treatments gradually declined in June and September 1995. However, even 36 months after the last treatment, quinclorac applied with Scoil or picloram still provided an average of 78% control (Table). Long-term control with quinclorac plus BAS-090 or Scoil was similar to picloram plus 2,4-D at 0.5 plus 1 lb/A, the most commonly used fall-applied treatment. Scoil applied with picloram did not improve leafy spurge control compared to picloram alone, and both Scoil and BAS-090 tended to reduce control when applied with picloram plus 2,4-D.

A seed-oil adjuvant was required to provide acceptable leafy spurge control with quinclorac. Quinclorac plus BAS-090 or Scoil fall-applied provided over 90% leafy spurge control up to 24 months after a 3 year annual application. Quinclorac could be an alternative to picloram plus 2,4-D. There was no grass injury with any treatment.

Comparison of various liquid and powder 2,4-D formulations for leafy spurge control. Rodney G. Lym and Calvin G. Messersmith. The most cost-effective treatment for leafy spurge control is picloram plus 2,4-D. Previous research at North Dakota State University has shown that leafy spurge control is increased 15 to 25% when 2,4-D at 1 lb/A is applied with picloram at 0.5 lb/A or less compared to picloram alone. Control has been similar regardless of the 2,4-D formulation applied with picloram. Several formulations of 2,4-D are no longer available because they were not reregistered with the EPA. Also, several powder formulations of 2,4-D have been formulated to decrease the cost of container shipment and disposal. The purpose of this research was to evaluate several formulations of 2,4-D for leafy spurge control.

The experiment was established June 8, 1992 near Valley City, ND, when leafy spurge was in the yellow bract to flowering growth stage with lush growth and 18 to 24 inches tall. Herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. All plots were 10 by 30 ft in a randomized complete block design with four replicates. The 2,4-D formulations were added to water immediately prior to application and no surfactants were used. All treatments were reapplied to the same plots in June 1993 and 1994, 12 and 24 months after the first treatment (MAFT), respectively.

Treatment	Rate	Months after first treatment						
		1	3	12	15	24	27	36
	lb/A	% control						
2,4-D dimethylamine (Weedar 64)	2	98	20	19	46	21	25	45
2,4-D dimethylamine+diethanolamine (Hi-Dep)	2	98	13	11	56	43	65	73
2,4-D butoxyethyl ester (Weedone LV4)	2	100	18	22	57	30	45	55
2,4-D acid+butoxyethyl ester (Weedone 638)	2	99	18	13	75	38	45	65
2,4-D isooctyl(2-ethylhexyl)ester (Esteron 99)	2	99	18	10	47	30	28	65
2,4-D triisopropanolamine+diethylamine (Formula 40)	2	97	17	6	43	18	40	57
2,4-D dimethylamine 80% WSP (CL-782)	2	68	28	13	53	40	37	55
2,4-D dimethylamine 85% WSP (Savage)	2	99	26	11	47	23	39	55
Picloram	0.5	99	89	65	94	93	97	94
LSD (0.05)		11	27	17	25	22	17	11

The water soluble powder CL-782 provided only 68% topgrowth control 1 MAFT compared to 97% or better for all other 2,4-D formulations (Table 1). Control was similar for all 2,4-D formulations 3 and 12 MAFT, including CL-782, and averaged 20 and 13%, respectively. 2,4-D butoxyethyl ester following a second treatment in June 1993 tended to provide better leafy spurge control 15 MAFT than the other 2,4-D formulations. 2,4-D dimethylamine plus diethanolamine provided 73% control 36 MAFT, or 1 yr after the last application which was better than any other 2,4-D formulation evaluated. The 2,4-D dimethylamine formulation tended to be the least effective formulation evaluated. Picloram applied at 0.5 lb/A for 3 consecutive years provided 97% leafy spurge control and remained at 94% 1 yr after the last application.

In general, leafy spurge control was similar with most 2,4-D formulations. 2,4-D mixed amine tended to provide better control than other formulations evaluated, but only after three annual applications. Previous research at North Dakota State University has shown that leafy spurge control was enhanced when 2,4-D was applied with picloram, regardless of picloram formulation.

Evaluation of various grass species to control leafy spurge at Fargo and Jamestown. Rodney G. Lym and Dwight Tober. Traditionally, herbicides have been used to control leafy spurge. Control has been relatively successful following a long-term program. However, herbicides may not be acceptable due to their high cost, potential for groundwater contamination, and prohibition in environmentally sensitive areas. Consequently, non-chemical methods for control must be established. Recent research at the University of Wyoming has shown that several grass species are competitive with leafy spurge and have reduced the infestation density. The purpose of this research was to evaluate several grass species that may be competitive with leafy spurge at two locations in North Dakota.

The first experiment was established in a dense stand of leafy spurge (160 stems/m^2) on the NDSU experiment station at Fargo. The soil was a Fargo silty clay (fine, montmorillonitic, frigid, Vertic Haplaquolls; 3.5% organic matter and pH 8.0). Plots were 12 by 45 feet, and treatments were replicated four times in a completely random design. Initial leafy spurge stand counts were recorded on May 23, 1990, immediately before the first herbicide treatment. Glyphosate plus 2,4-D at 0.4 plus 0.6 lb/A was applied to all plots when leafy spurge was in the flowering growth stage and again on July 27, 1990, to regrowth that was flowering. The glyphosate plus 2,4-D alone treatment was applied in September 1990 through 1993.

The soilbed was prepared for seeding on August 6 and 28, 1990, and the grass was planted on August 29. The experimental site was irrigated with 1 inch of water on September 13 and 25, 1990, and 1.25 inches of rain fell on October 7. Initial grass stand establishment was estimated by counting seedlings in three 20-cm by 1-m quadrats placed over the rows on October 30, 1990.

Leafy spurge and grass species density were recounted in May 1991 through 1993. Bromoxynil plus 2,4-D at 0.25 plus 0.75 lb/A were applied in May 1991 and 1992, to control annual broadleaf weeds. The plots were harvested in mid-July 1991 through 1993 by clipping four 0.25-m^2 quadrats per plot. Herbage was separated into seeded grass species, weedy grass species, leafy spurge, and forbs; then oven-dried at 140 F. Herbage data are reported on a dry weight basis.

'Arthur' Dahurian wildrye, 'Bozoisky' Russian wildrye, 'Hycrest' crested wheatgrass and 'Reliant' intermediate wheatgrass established rapidly despite the dry conditions in Fall 1990 (data not shown). 'Killdeer' sideoats grama was the only species that failed to have at least a 10% stand prior to winter.

'Hycrest' crested wheatgrass had the highest stand density counts in May 1991 (data not shown) and reduced the leafy spurge stand equal to the herbicide treatment 1 yr after planting (Table 1). 'Killdeer' sideoats grama failed to establish. All established grass species tended to reduce leafy spurge production compared to the control 1 yr after planting (Table 2). 'Reliant' intermediate wheatgrass had the highest grass production at 2290 lb/A.

All established grass species reduced leafy spurge production compared to the control 2 yr after planting (Table 2). The reduction was similar to the herbicide treatment with all species except 'Rodan' western wheatgrass and T-17596 mountain rye. 'Arthur' Dahurian wildrye, 'Rebound' smooth brome and 'Reliant' intermediate wheatgrass produced the most herbage and averaged 2830 lb/A. 'Rebound' smooth brome, 'Bozoisky' Russian wildrye, 'Arthur' Dahurian wildrye, and 'Hycrest' crested wheatgrass increased in production from 1991 to 1992.

'Rebound' smooth brome, 'Rodan' western wheatgrass, and 'Arthur' Dahurian wildrye provided the highest leafy spurge control in 1994 and averaged 80, 70, and 60%, respectively (Table 1). These grass species also had the highest total forage production during the study. Grasses were not harvested in 1994 because the plots were flooded in 1993 and a majority of the stands were lost.

A second experiment was established near the Pipestem dam north of Jamestown to evaluate competitive grass species in a soil type more typical of North Dakota than Fargo clay. The soil at Jamestown was a loamy sand with 6.8% organic matter and 6.8 pH. The experimental design and plot size were the same as at Fargo. The initial leafy spurge stand counts were recorded on May 26, 1993 and averaged 83 stems/m^2. Glyphosate plus 2,4-D at 0.4 + 0.6 lb/A was applied to all plots, except the control, in June and again in July. The soilbed was then prepared for seeding and the grass was planted on August 24. No irrigation was necessary as the soil moisture was high at seeding and 0.5 inches of rain was received weekly for the next 3 weeks. The grass species planted were similar to the first study except 'Killdeer' sideoats grama and T-17596 mountain rye were not reevaluated (Table 3). 'Pryor' slender wheatgrass, 'Lodorm' green needlegrass and 'Mankota' Russian wildrye were added to the evaluation.

Initial leafy spurge control from the various grass species at Jamestown was much higher than at Fargo. This is likely due to the ideal soil moisture and timely rains before and after planting which led to rapid establishment of the grasses. Leafy spurge control averaged over all grasses was 44% at Jamestown, compared to only 12% at Fargo the season after planting (Tables 1 and 3). The highest leafy spurge control was from 'Manska' pubescent wheatgrass and 'Arthur' Dahurian wildrye which averaged 70 and 60%, respectively (Table 3). 'Arthur' Dahurian wildrye had the highest forage yield at 2415 lb/A. As in the Fargo study, 'Reliant' intermediate wheatgrass, 'Hycrest' crested wheatgrass along with 'Pryor' slender wheatgrass and 'Manska' pubescent wheatgrass provided good initial leafy spurge control and forage yield (Table 4).

Leafy spurge control 2 years after planting, averaged over all grasses was 71% at Jamestown (Table 4). 'Rebound' smooth brome, 'Arthur' dahurian wildrye, and 'Reliant' intermediate wheatgrass provided the best control and averaged 84%. These grasses were also among the highest in production. Both grass and leafy spurge production was higher in 1995 compared to 1994. This was likely due to increase in stand density of the grass species and recovery of the leafy spurge from the cultivation conducted for seeding in 1993. All grass species except 'Bozoisky' Russian wildrye reduced the proportion of leafy spurge in the total biomass similar to the glyphosate plus 2,4-D treatment.

All grass species evaluated at Fargo could be considered to be competitive with leafy spurge except 'Killdeer' sideoats grama. However, based on both herbage yield and leafy spurge reduction, 'Rebound' smooth brome, 'Arthur' Dahurian wildrye and 'Reliant' intermediate wheatgrass would be the best species to plant into a leafy spurge infestation in a clay soil. Initial evaluations at Jamestown indicated these same grasses along with 'Pryor' slender wheatgrass and 'Manska' pubescent wheatgrass will be very competitive in the sandy loam soil at Jamestown.

Table 1. Evaluation of various grass species competitive with leafy spurge at Fargo (Lym and Tober).

Grass species/or herbicide treatment[a]	Leafy spurge[b]					Total leafy spurge reduction[c]
	1990	1991	1992	1993	1994	
	no. 0.25/m^2					%
'Rebound' smooth brome	45	55	25	15	8	80
'Rodan' western wheatgrass	40	70	30	15	12	70
'Bozoisky' Russian wildrye	40	60	25	15	23	40
'Arthur' Dahurian wildrye	45	70	30	20	17	60
'Reliant' intermediate wheatgrass	40	50	35	30	27	30
T-17596 mountain rye	40	50	35	30	26	35
'Hycrest' crested wheatgrass	45	45	35	25	24	40
'Killdeer' sideoats grama	40	70	..	..	..	0
Glyphosate + 2,4-D	40	45	1	1	<1	99
Control	40	100	65	40	35	--
LSD (0.05)	NS	24	12	12	16	26

[a]Bromoxynil + 2,4-D at 0.25 + 0.75 lb/A applied to all plots except the control 24 May 91 and 26 May 92.
[b]Four 0.25-m^2 quadrats counted per plot in May of each year.
[c]Change in leafy spurge stand count from May 1990 until June 1994.

Table 2. Competitive grass species and leafy spurge production at Fargo (Lym and Tober).

Grass species/or herbicide treatment[a]	Yield[b]									Proportion[d] leafy spurge		
	Grass			Leafy spurge			Total[c]					
	1991	1992	1993	1991	1992	1993	1991	1992	1993	1991	1992	1993
	lb/A									%		
'Rebound' smooth brome	510	3070	2120	290	45	190	2035	3170	2420	14	2	8
'Rodan' western wheatgrass	945	3260	2560	270	140	600	1990	3440	3280	14	4	18
'Bozoisky' Russian wildrye	540	1260	1170	230	95	440	1915	1630	1770	12	8	25
'Arthur' Dahurian wildrye	1180	3240	1400	220	65	580	2045	3350	2460	11	2	24
'Reliant' intermediate wheatgrass	2290	2180	1560	215	40	210	2700	2225	1950	8	2	11
T-17596 mountain rye	355	250	410	145	130	570	1810	830	1490	8	16	38
'Hycrest' crested wheatgrass	1100	1740	1060	210	95	390	2075	1935	1810	10	5	22
'Killdeer' sideoats grama[e]	1	...	...	320	...	...	2005	...	...	16	...	...
Glyphosate + 2,4-D	0	0	0	505	10	10	2380	1100	1020	21	1	1
Control	0	0	0	505	235	630	1330	965	1480	38	24	43
LSD (0.05)	770	1415	1015	NS	85	330	NS	1420	1110	17	8	15

[a]Bromoxynil + 2,4-D at 0.25 + 0.75 lb/A applied to all plots except the control 24 May 91 and 26 May 92.
[b]Four 0.25-m^2 quadrats harvested per plot 23-24 July 91 and July 92.
[c]Total yield includes weedy grasses and forbs.
[d]Percent of component in total yield.
[e]'Killdeer' sideoats grama did not establish and was not harvested in 1992.

Table 3. Evaluation of various grass species competitive with leafy spurge near Jamestown (Lym and Tober).

Grass species/cultivar	Plants seeded	Leafy spurge				
		Stand count[a]			Control[b]	
		1993	1994	1995	1994	1995
	– lb/A –	—— no./0.25 m^2 ——			—— % ——	
'Rebound' smooth brome	10.5	15	14	3	40	91
'Rodan' western wheatgrass	18	33	16	11	25	63
'Bozoisky' Russian wildrye	11.3	20	13	10	40	67
'Arthur' Dahurian wildrye	15	16	9	5	60	83
'Mankota' Russian wildrye	11.3	17	12	11	45	65
'Reliant' intermediate wheatgrass	15	20	9	7	55	77
'Hycrest' crested wheatgrass	10.5	21	12	12	45	63
'Pryor' slender wheatgrass	9.8	24	11	9	50	72
'Lodorm' green needlegrass	10.7	28	20	13	10	57
'Manska' pubescent wheatgrass	15	18	6	9	70	70
Glyphosate + 2,4-D	..	16	20	2	10	93
Control	..	23	22	31	0	0
LSD (0.05)		8	5	5	22	17

[a]Four 0.25-m^2 quadrats counted per plot in May 1994 and 1995.
[b]Control based on stem density change compared to the untreated control each year.

Table 4. Competitive grass species and leafy spurge production at Jamestown (Lym and Tober).

Grass species/[a] herbicide	Yield[b]						Proportion[d] leafy spurge	
	Grass		Leafy spurge		Total[c]			
	1994	1995	1994	1995	1994	1995	1994	1995
	—— lb/A ——						—— % ——	
'Rebound' smooth brome	870	2565	5	130	1070	3090	1	4.5
'Rodan' western wheatgrass	720	1600	20	210	905	2875	3	7.2
'Bozoisky' Russian wildrye	390	800	25	250	605	2090	4	11.4
'Arthur' Dahurian wildrye	2415	2890	5	105	2560	4055	0.1	2.9
'Mankota' Russian wildrye	430	760	15	170	615	1950	3	8.4
'Reliant' intermediate wheatgrass	1585	2445	10	105	1715	3185	0.5	3.2
'Hycrest' crested wheatgrass	1365	2425	15	270	1440	3150	1	8.6
'Pryor' slender wheatgrass	1285	1170	20	295	1405	2695	1	10.3
'Lodorm' green needlegrass	440	990	40	275	760	2875	5	9.4
'Manska' pubescent wheatgrass	1515	2830	10	135	1660	3530	0.5	4.1
Glyphosate + 2,4-D	0	0	25	380	650	2330	4	4.1
Control	0	0	205	75	795	2660	26	16.9
LSD (0.05)	299	751	49	174	351	994	6	6

[a]Bromoxynil + 2,4-D at 0.25 + 0.75 lb/A applied to all plots but the control 24 May 94.
[b]Four 0.25-m^2 quadrats harvested per plot 14 July 94.
[c]Total yield includes weedy grasses and forbs.
[d]Percent of component in total yield.

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. 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.

The *A. nigriscutis* population gradually increased over time and generally reached peak numbers in the first week of July each year (Table 3). For example, the number of flea beetles averaged over all treatments was 21/m^2 on July 7, 1992, which increased to 132 beetles/m^2 on the same date in 1994. Despite the increased leafy spurge control when fall-applied herbicides were combined with the flea beetles, there were less than half as many adults found on those 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 may need to be discontinued to prevent the flea beetles from completely abandoning those plots.

Root nutrient reserves as measured by sucrose, glucose, and protein content declined from 1993 to 1994 (Table 4). However, the decline was similar regardless of treatment. 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.

Treatment[a]	Rate	Date of evaluation					
		June 92	May 93	May 94	Sept 94	May 95	Sept 95
	lb/A	no./0.25 m^2					
Picloram+2,4-D (Spring)	0.25+1	55	52	34	19	4	9
Picloram+2,4-D (Fall)	0.5+1	41	3	3	23	0.1	13
Insect only	. .	47	38	25	30	1.5	17
LSD (0.05)		7	7	5	5	2	3

[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
	lb/A	%				
Picloram+2,4-D (Spring)	0.25+1	6	35	91	60	73
Picloram+2,4-D (Fall)	0.5+1	93	94	81	84	60
Insect only	. .	19	45	73	47	31
LSD (0.05)		11	10	NS	35	23

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

Table 3. *Apthona nigriscutis* density following herbicide application, which began 3 yr after *Aphthona nigriscutis* introduction for leafy spurge control near Cuba, ND.

Treatment and application date	Rate	*A. nigriscutis* 1992 counts						
		10 June	23 June	7 July	22 July	8 Aug	21 Aug	Mean
	lb/A	no./m^2						
1992								
Picloram+2,4-D[a] Spring	0.25+1	8	5	1	1	0.5	0	2
Picloram+2,4-D[a] Fall	0.5+1	7	11	21	6	3	0.2	8
Untreated	0	5	11	12	7	1	0.2	7
LSD (0.05)		NS	5	10	3	NS	NS	2

		A. nigriscutis 1993 counts							
		4 June	18 June	30 June	10 July	9 Aug	23 Aug	14 Sept	Mean
		no./m^2							
1993									
Picloram+2,4-D[a] Spring	0.25+1	0.3	0.6	0	1	0.8	0.3	0	0.5
Picloram+2,4-D[a] Fall	0.5+1	13	34	52	41	8	5	0.8	22
Untreated	0	7	23	28	29	9	4	0.8	14
LSD (0.05)		6	13	16	17	5	3	0.5	7

		A. nigriscutis 1994 counts								1995	
		25 May	1 June	17 June	7 July	22 July	4 Aug	16 Aug	29 Aug	Mean	24 May	17 July
		no./m^2									
1994											
Picloram+2,4-D[a] Spring	0.25+1	8	16	24	19	6	1	1	1	8	76	16
Picloram+2,4-D[a] Fall	0.5+1	12	42	69	40	33	32	23	1	28	30	25
Insect only		18	65	125	132	99	36	31	1	57	70	57
LSD (0.05)		NS	27	63	63	44	22	25	NS	10	26	22

[a]Herbicides applied June or Sept annually from 1992 through 1995.

Table 4. Sucrose, glucose and protein content of leafy spurge roots after introduction of *Aphthona nicriscutis* and either with or without herbicide treatment near Cuba, ND[a].

Treatment and application date	Rate	Sucrose[a]		Glucose		Protein	
		1993	1994	1993	1994	1993	1994
	lb/A	mg/g					
Picloram + 2,4-D[a] Spring	0.25 + 1	151	116	137	143	27	17
Picloram + 2,4-D[a] Fall	0.5 + 1	153	103	147	128	27	21
Insect only	. . .	180	126	158	156	28	25
Untreated[b]	. . .	171	. . .	123	. . .	39	
LSD (0.05)		19	NS	NS	NS	NS	NS

[a]*Apthona nigriscutis* were introduced in 1989, and herbicides were applied in June or Sept. from 1992 to 1994 for spring or fall application, respectively.
[b]Samples collected in insect free area near experiment.

Leafy spurge control with *Aphthona nigriscutis* alone or combined with herbicides in a sandy soil. 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 population is 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 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, one year 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 remained at only 1 beetle/m^2 in the herbicide treated plots.

The initial fall-applied herbicide treatment with insects reduced leafy spurge stem density from an average of 33 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. After two annual fall-applied treatments, stem density still averaged 15 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 same density as when the experiment was established.

The spring-applied treatment of picloram plus 2,4-D reduced the sucrose and glucose content of leafy spurge roots in the first year of the experiment (Table 2). 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. nigri.* count[b]	
		1993	1994		1995			
Treatment[a]	Rate	July	May	Aug	May	Aug	94	95
	– lb/A –	———	No./0.25 m^2		———		-No./m^2 -	
Picloram+2,4-D (spring)	0.25+1	35	26	11	17	0.5	0.7	1
Picloram+2,4-D (fall)	0.5+1	34	4	20	1	15	0.7	1
Insects only	0	30	28	15	28	21	1.6	5
LSD (0.05)		NS	5	4	4	4	NS	3.5

[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 root carbohydrate and protein content at the Ekre research station.

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

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

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. In a field situation the remaining areas of infestation could be treated with high rates of picloram to prevent reinfestation. Probably some type of chemical treatment will be needed to maintain control, but perhaps more economical treatments such as 2,4-D alone rotated with picloram plus 2,4-D every other year will sustain the target control level.

Table. Leafy spurge control from ten annual picloram or picloram plus 2,4-D treatments and biannual 2,4-D treatments in North Dakota (Lym and Messersmith).

Herbicide	Rate	1994 Valley City June	Months after first treatment									
			12[a]	24	36	48	60	72	84	96	108	120
	lb/A	% control										
Picloram	0.25	77	39	48	48	58	49	38	64	56	68	96
Picloram	0.38	91	65	62	52	77	69	67	96	72	91	99
Picloram	0.5	99	65	71	81	86	77	71	92	81	91	99
2,4-D bian	1	55	22	30	38	50	39	55	70	69	74	82
2,4-D bian	1.5	55	22	24	26	45	49	49	62	57	66	74
2,4-D bian	2	74	19	30	26	54	54	62	75	67	78	83
Picloram+2,4-D	0.25+1	97	52	66	63	85	73	76	92	80	85	95
Picloram+2,4-D	0.25+1.5	96	58	66	70	85	77	62	88	73	82	99
Picloram+2,4-D	0.25+2	95	57	62	66	83	76	77	91	88	88	99
Picloram+2,4-D	0.38+1	98	69	72	70	90	84	76	96	82	89	97
Picloram+2,4-D	0.38+1.5	97	68	74	76	93	84	79	88	83	92	99
Picloram+2,4-D	0.38+2	99	68	59	76	91	86	82	96	86	95	99
Picloram+2,4-D	0.5+1	99	71	75	84	94	87	82	96	84	97	99
Picloram+2,4-D	0.5+1.5	99	64	73	80	97	91	88	99	95	98	99
Picloram+2,4-D	0.5+2	99	76	75	81	95	91	88	99	90	96	99
LSD (0.05)		14	18	14	19	14	14	15	19	17	14	10
Mean of treatments		83	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.

Plumeless thistle (*Carduus acanthoides*) and Canada thistle control in pasture and rangeland. Rodney G. Lym. Plumeless thistle is seldom found in cultivated fields even when there are infestations in nearby roadsides or pastures. Plumeless thistle tends to be shorter than other noxious biennial thistles; it typically is 2 to 4 feet tall but can be 6 feet or more in ideal growing conditions. Canada thistle generally becomes weedy in pasture and rangeland only after the land has been disturbed such as from vehicle traffic or overgrazing. The purpose of these experiments was to evaluate plumeless thistle and Canada thistle control using clopyralid or dicamba alone or with various formulations of 2,4-D.

The Canada thistle experiment was established on a dense stand of thistle on May 23, 1995 when the plants were in the rosette to vegetative growth stage. The plants were generally less than 4 inches tall. The plumeless thistle experiment was established in a moderate infestation on May 31, 1995. Most plants were in the prebud growth stage and 12 to 14 inches tall, but some rosettes with up to 24 inch diam also were present. Treatments for both experiments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The experiments were in a randomized complete block design with three and four replications for the Canada thistle and plumeless thistle experiments, respectively. The plots were 10 by 30 feet in both experiments. Treatments were visually evaluated for percent control or height reduction compared to the untreated control.

Treatment	Rate	Plumeless thistle	Canada thistle	
		8 WAT[a]	8 WAT[a]	12 WAT[a]
	lb/A	%		
2,4-D[b]	1	97	26	33
2,4-D[b]	2	99	22	25
2,4-D	1	99	38	36
2,4-D	2	100	56	47
Clopyralid	0.2	99	80	50
Dicamba	0.35	98	58	33
2,4-D[b] + clopyralid	0.25 + 0.0625	99	68	50
2,4-D[b] + clopyralid	0.5 + 0.125	100	78	49
2,4-D[b] + clopyralid	1 + 0.25	100	78	76
2,4-D[b] + clopyralid	1 + 0.2	100	72	65
2,4-D + clopyralid	1 + 0.2	100	73	61
Clopyralid + 2,4-D[c]	0.19 + 1	100	85	56
2,4-D[b] + dicamba	0.25 + 0.0625	99	35	32
2,4-D[b] + dicamba	0.5 + 0.125	98	50	38
2,4-D[b] + dicamba	1 + 0.25	100	61	41
2,4-D[b] + dicamba	1 + 0.35	100	53	38
2,4-D + dicamba	1 + 0.35	100	54	27
Dicamba + 2,4-D[d]	0.31 + 0.89	100	57	37
LSD (0.05)		NS	20	23

[a]Weeks after treatment
[b]Mixed amine salts of 2,4-D (2:1 dimethylamine:diethanolamine) - Hi-Dep
[c]Commercial formulation - Curtail
[d]Commercial formulation - Weedmaster

All plumeless thistle treatments provided rapid topgrowth control and prevented plants from flowering (Table). Most treatments provided near 100% control 8 weeks after treatment (WAT). The most cost-effective treatment was 2,4-D at 1 lb/A applied alone which provided 97% or

greater control. Although plumeless thistle has been increasing in North Dakota following several seasons of above or much above average precipitation, it is easily controlled by inexpensive herbicides. Previous research at North Dakota State University has shown that when treatments are not applied until after plumeless thistle has bolted, dicamba at 0.5 lb/A or picloram at 0.25 lb/A were required to prevent flowering.

Canada thistle control was less successful using the same treatments that effectively controlled on plumeless thistle. Only clopyralid plus 2,4-D at 0.19 + 1 lb/A provided 85% or better height reduction 8 WAT (Table). No treatment provided satisfactory control 12 WAT. New stems were emerging following all treatments except those that contained clopyralid. Previous research has shown that clopyralid should be applied at 0.25 to 0.5 lb/A or more to control established Canada thistle in pasture and rangeland.

Canada thistle control with F-8426 plus 2,4-D and/or clopyralid in wheat. Calvin G. Messersmith, Rodney G. Lym, and Katheryn M. Christianson. F-8426 plus 2,4-D and/or clopyralid were evaluated for Canada thistle control and wheat injury. Nitrogen fertilizer at 125 lb N/A was applied and incorporated during seedbed preparation at Fargo, ND, on a Fargo silty clay. Hard red spring wheat, variety 2371, was seeded on May 18, 1995. The experiment was in a randomized complete block design with four replications, and each plot was 10 by 30 feet.

Herbicide treatments were applied with a tractor-mounted sprayer delivering 8.5 gal/A at 35 psi using Spraying Systems 8001 flat-fan nozzles. Treatments were applied on June 9, 1995, when wheat had 3 leaves, with early tillers visible. The Canada thistle was 2 to 8 inches tall and from the vegetative rosette to early bud stage. Weather conditions at treatment were 78 F and 51% relative humidity. Canada thistle control, as indicated by height reduction, and wheat injury were evaluated visually compared to the untreated control.

Foxtail spp. were controlled with diclofop at 0.75 lb ai/A plus Scoil methylated-seed-oil adjuvant at 1 pint/A applied June 14, 1995. Wheat was not harvested for yield, because excessive rainfall in late June and early to mid July resulted in visible reduction of wheat height and tillering where water accumulated on about one-third of the experimental area.

Necrosis ("burning") of wheat leaves was visible following F-8426 treatments when evaluated 7 days after treatment (DAT), and injury frequently was greater with F-8426 at 0.5 than 0.38 oz/A. Injury to wheat leaves 7 DAT was less than the necrosis observed 5 DAT (a preliminary observation). Wheat injury at 15 DAT primarily was visible as reduced plant size and number of leaves, but at 21 DAT was not visible regardless of F-8426 rate.

Canada thistle control 7 DAT averaged 49% and primarily was due to leaf necrosis. Visible injury to Canada thistle 21 and 60 DAT primarily was from slightly reduced size and number of seedheads. Canada thistle control at all three evaluation dates was greatest when 2,4-D and/or clopyralid were applied with F-8426 compared to F-8426 alone. An initial advantage for inclusion of F-8426 with clopyralid and/or 2,4-D was more rapid control (necrosis) of Canada thistle at 7 DAT than clopyralid plus 2,4-D alone, but control was similiar when evaluated 21 and 60 DAT. (Plant Sciences Dep., North Dakota State Univ., Fargo.)

Table. Canada thistle control with F-8426 plus 2,4-D and/or clopyralid in wheat (Messersmith, Lym, and Christianson).

Treatment	Rate	Wheat injury		Canada thistle control		
		7 DAT[a]	15 DAT	7 DAT	21 DAT	60 DAT
	— oz/A—			%		
F-8426 + X-77	0.38 + 0.25%	5	1	49	9	11
F-8426 + X-77	0.5 + 0.25%	11	9	49	11	6
F-8426 + 2,4-D ester	0.38 + 4	6	4	64	68	60
F-8426 + 2,4-D ester	0.5 + 4	11	6	68	71	12
F-8426 + 2,4-D+28% N	0.38 + 4 + 4%	8	6	57	73	27
F-8426 + 2,4-D+28% N	0.5 + 4 + 4%	7	4	75	73	60
F-8426 + clopyralid + 2,4-D[b]	0.38 + 1.5 + 8	4	5	51	69	54
F-8426 + clopyralid + 2,4-D	0.5 + 1.5 + 8	7	6	67	67	46
Clopyralid + 2,4-D	1.5 + 8	1	4	31	66	38
Untreated check	0	0	0	0	0	0
LSD (0.05)		3	5	20	20	23

[a]Days after treatment.
[b]Clopyralid plus 2,4-D was commercial formulation - Curtail.

Canada thistle control in imidazolinone-resistant corn with imazethapyr, dicamba and AC 513,995. Katheryn M. Christianson, Rodney G. Lym, and Calvin G. Messersmith. Canada thistle is a difficult perennial weed to control in corn. Dicamba and clopyralid are the primary herbicides registered for Canada thistle control in corn. Imazethapyr and AC 513,995 are imidazolinone herbicides for broadspectrum weed control and are injurious to corn. The objective of this experiment was to compare a tankmix of imazethapyr and dicamba to other herbicide treatments in imidazalinone-resistant corn for Canada thistle control.

The experiment was established at Fargo in a dense Canada thistle stand. Fertilizer was added according to soil test for the site and incorporated 18 May 1995. Pioneer IR-231R corn was seeded on 22 May 1995. Herbicides were applied 9 June 1995 when Canada thistle plants were in the 8- to 10-leaf rosette stage using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The plots were 10 by 30 ft, and the experiment was in a randomized complete block design with four replications. Canada thistle control evaluations were based on a visual estimate of percent stand height reduction as compared to the untreated control.

Treatment	Rate	Height reduction 14 DAT[a]	28 DAT[a]	56 DAT[a]
	oz/A		%	
Imazethapyr + dicamba[b] + X-77 + 28% N	0.8 + 3.2 + 0.25% + 1 qt	55	79	29
Imazethapyr + dicamba[b] + primisulfuron + X-77 + 28% N	0.8 + 3.2 + 0.29 + 0.25% + 1 qt	80	87	34
Imazethapyr + dicamba[b] + clopyralid + X-77 + 28% N	0.8 + 3.2 + 2 + 0.25% + 1 qt	76	90	66
Bromoxynil + primisulfuron + nicosulfuron + X-77 + 28% N	6 + 0.29 + 0.25 + 0.25% + 1 qt	86	63	46
AC 513,995 + X-77 + 28% N	3.9 + 0.25% + 1 qt	68	72	40
Clopyralid	4	79	93	96
LSD (0.05)		16	27	30

[a]Days after treatment
[b]Commercial formulation - Resolve

All treatments averaged greater than 75% topgrowth reduction except imazethapyr and dicamba alone which averaged on 55% 14 days after treatment (DAT) (Table). Plant height reduction averaged 84% with all treatments except bromoxynil plus primisulfuron plus nicosulfuron, 63%, when evaluated 28 DAT. The Canada thistle plants were actively growing by 56 DAT and control had declined for all treatments except those containing clopyralid which still averaged 80%. Yield was not taken, but no corn injury was observed. Clopyralid alone at 4 oz/A provided the best season-long Canada thistle control.

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

Annual application date and treatment	Cost[a]	Rate	Control			
			1994		1995	
			June	Sept.	June	Sept.
	$/A	— lb/A —			%	
September 1993						
Picloram + 2,4-D amine	28	0.5+1	90	80	98	95
Picloram	25	0.5	95	70	100	98
Picloram + 2,4-D amine	14	0.25+1	98	48	100	65
2,4-D amine	6	2	10	5	75	40
Dicamba	36	2	85	20	90	50
Glyphosate + 2,4-D[b]	8	0.4+0.6	80[c]	25[c]	35[e]	45
June 1994						
Picloram	13	0.25		20[d]	30	68
Fosamine	80	8		78[d]	77	87
Picloram + 2,4-D amine	28	0.5+1		63[d]	65	98
Picloram	25	0.5		33[d]	45	97
Picloram + 2,4-D amine	14	0.25+1		0[d]	•	25
2,4-D amine	6	2		0[d]	•	0
Dicamba	36	2		0[d]	•	23
Glyphosate + 2,4-D[b]	8	0.4+0.6		0[d]	•	25

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